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# TECHNICAL SPECIFICATIONS

For

## Southpoint Open Space Park (SOSP) Rip Rap Revetment Roosevelt Island, NY 10044

*Prepared For:*

**Roosevelt Island Operating Corporation  
591 Main Street  
Roosevelt Island  
New York, New York 10044**

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**20 February 2020  
100332702**

# **LANGAN**

**TABLE OF CONTENTS  
TECHNICAL SPECIFICATIONS**

**SOUTHPOINT OPEN SPACE PARK (SOSP)  
RIP RAP REVETMENT  
ROOSEVELT ISLAND, NEW YORK  
100332702**

**20 February 2020**

SECTION022050	PROTECTION OF EXISTING UTILITIES	20 Feb 2020
SECTION022100	PROJECT SURVEY AND LAYOUT	20 Feb 2020
SECTION029000	SITE PREPARATION	20 Feb 2020
SECTION031000	CONCRETE FORMWORK	20 Feb 2020
SECTION032000	CONCRETE REINFORCEMENT	20 Feb 2020
SECTION033000	CAST IN PLACE CONCRETE	20 Feb 2020
SECTION036000	GROUTING	20 Feb 2020
SECTION044313	STONE MASONRY VENEER	20 Feb 2020
SECTION310913	MONITORING OF ADJACENT STRUCTURES	20 Feb 2020
SECTION312300	EARTHWORK	20 Feb 2020
SECTION312319	DEWATERING	20 Feb 2020
SECTION312500	SOIL EROSION AND SEDIMENT CONTROL	20 Feb 2020
SECTION313700	RIP-RAP REVETMENT	20 Feb 2020
SECTION314100	SHORING AND BRACING	20 Feb 2020
SECTION321400	UNIT PAVERS	20 Feb 2020
SECTION321500	STABILIZED CRUSHED STONE PAVING	20 Feb 2020
SECTION321001	SITE STONework	20 Feb 2020
SECTION323100	SEAWALL RAILINGS	20 Feb 2020
SECTION323200	THERMAL SPRAYED METAL COATING	20 Feb 2020
SECTION323300	POWDER COAT PAINT	20 Feb 2020
SECTION323343	SITE FURNISHING	20 Feb 2020
SECTION328400	IRRIGATION	20 Feb 2020
SECTION329000	LANDSCAPE PLANTING	20 Feb 2020
SECTION329100	SOIL PREPARATION AND MIXES	20 Feb 2020
SECTION329200	LAWNS AND GRASSES	20 Feb 2020

**SECTION 022050****PROTECTION OF EXISTING UTILITIES****PART 1 - GENERAL**1.01 DESCRIPTION OF WORK

- A. Several utilities are known to exist with the Park; some of these utilities are located within the two shoreline areas that comprise the Southpoint Open Space Park – Rip Rap Revetment site; and some utilities exist immediately adjacent to the site fence-lines. Identification and field mark out of all existing utilities in and beyond the areas of work to remain in operation and/or be relocated during construction.
- B. Remove and dispose of off-site the remnants of utilities that were formerly active and exist as abandoned manhole and conduit/ductbanks.
- C. Submission of procedures to be used to ensure the safety of the utility.
- D. Repair of any damage during construction operations.
- E. Notification of affected utility companies and RIOC before starting work and compliance with their requirements.

1.02 RELATED SECTIONS

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 022100 – Project Survey and Layout
- B. Section 029000 – Site Preparation

**PART 2 – EXECUTION**2.01 IDENTIFICATION

- A. Existing Utilities: Locate existing underground utilities in and beyond the areas of work. This includes all existing utilities (including sewers, water lines, electrical lines and telecommunication lines) to remain in use within and adjacent to the area affected by the work of this project. If utilities are indicated to remain in place, provide adequate means of support and protection during the work. In the event of identifying and unforeseen conflict/condition, notify RIOC immediately.
- B. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner and RIOC immediately for directions. Cooperate with RIOC and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
- C. Do not interrupt existing utilities serving facilities occupied by RIOC or others, during occupied hours, except when permitted in writing by RIOC and then only after acceptable

temporary utility services have been provided. Provide minimum of 48 hour notice to RIOC, and receive written notice to proceed before interrupting any utility.

## 2.02 PROTECTION

- A. Prior to commencement of any work, consult the records for existing utilities, and note all conditions and limitations, which might affect the work.

The following utilities are known to exist within Southpoint Open Space Park:

- CON-EDISON – ELECTRIC POWER, LOW-VOLTAGE
- CON-EDISON – ELECTRIC POWER, 14 KVA HIGH-VOLTAGE
- CON-EDISON – ELECTRIC POWER, ABANDONED CONDUIT, DUCTBANK AND MANHOLES.
- NYCMTA - ELECTRIC POWER, LOW-VOLTAGE
- NYCMTA - ELECTRIC POWER, 14 KVA HIGH-VOLTAGE
- VERIZON – TELECOMMUNICATIONS
- RIOC – POTABLE WATER SUPPLY
- RIOC – NON-POTABLE WATER SUPPLY
- RIOC – IRRIGATION SYSTEM

As shown on the drawings, some of these utilities exist within the two shoreline areas that comprise the seawalls reconstruction site; and some formerly existed and today have manhole and conduit remnants with the site. In addition, some utilities exist immediately adjacent to the site fence-lines.

- B. The Contractor shall become acquainted with the existence and location of all surface and subsurface structures and utilities within the project area. Contractor shall not damage any of those that are to remain and shall leave them accessible.
- C. The work shall be executed so that no damage or injury will occur to existing public and adjoining or adjacent structures, streets, paving, sewers, water, electric or any other pipes. Should any damage or injury caused by the contractor, or anyone in Contractor's employ, or by the work under this Contract occur, the Contractor shall, at his own expense, make good such damage and assume all responsibility for such injury.
- D. The above shall also include the protection of all existing utilities (including sewers, water lines, electrical lines and telecommunication lines) to remain in use within and adjacent to the area affected by the work of this project.
- E. Monuments, bench marks and other reference features on streets bounding this project, shall be protected. Should these be disturbed in any manner, the Contractor shall have them replaced at own expense.
- F. Flag, barricade or suitably protect existing utilities during construction operations and equipment movement.
- G. At a minimum, Contractor shall provide timber mats or steel plates at locations where equipment will cross existing utilities. Provide any other safety measures and follow any additional procedures requested by the City of New York and the utility owner.

2.03 REMOVALS

- A. Any remnants, such as of the concrete conduit encasement and manholes of the former electrical ductbank at the west-shore seawall, of formerly active utilities shall be exposed, traced, demolished, excavated and removed off-site by the Contractor. The Contractor shall coordinate with the former utility owner (eg Con Edison) and RIOC for this purpose.

2.04 REPAIRS

- A. Any damage to existing active utilities by the Contractor shall be immediately repaired with the least impact to the utility service and to operational standards. If the repairs are not immediately addressed by the Contractor, the utility owner and/or RIOC will contract for the repair at the Contractor's expense.

END OF SECTION

**SECTION 022100****PROJECT SURVEY AND LAYOUT****PART 1 - GENERAL**1.01 **WORK INCLUDED**

- A. The Contractor is advised that highest standards of drawing coordination, survey analysis and preparation, and technical field layout are required in order to deliver the goals of the Project architectural and engineering design goals.
- B. The Contractor shall employ a New York Licensed Land Surveyor to do all necessary surveying required to construct all elements of the Project shown and specified using the control points and data furnished by the Engineer on the Project Drawings.
- C. The Contractor will also provide additional horizontal and vertical control points along the project area as required for construction or as directed by the Engineer.
- D. All surveys shall be signed and sealed by the Contractor's Land Surveyor, licensed to practice in the State of New York.
- E. All project installations improperly constructed, as a result of inadequate or erroneous survey layout shall be properly relocated by the Contractor at no cost to the Owner.
- F. The Contractor's Land Surveyor shall establish benchmarks and coordinate their coordinate dimensional relationships, and shall set additional benchmarks as necessary for initiation and progress of the work.
- G. Protection and monitoring of existing structures in accordance to Monitoring of Adjacent Structures Specification to be the prepared and submitted by the Contractor's professional in accordance with the requirements and criteria.

1.02 **RELATED SECTIONS**

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 022050 – Protection of Existing Utilities
- B. Section 029000 – Site Preparation
- C. Section 310913 – Monitoring of Adjacent Structures

**PART 2 - PRODUCTS**2.01 **MATERIALS**

- A. Provide all instruments, equipment, stakes, marking paints and other materials necessary to perform the work satisfactorily.

**PART 3 - METHOD OF CONSTRUCTION**3.01 GENERAL

- A. Contractor is responsible for all survey layout of the work, including coordination of project dimensional control. Certain aspects of horizontal and vertical control are not shown hereon, which control shall be established by the contractor's NY State licensed surveyor in order to build a structural sound, functional and aesthetic site program.
- B. The exact position of all work points shall be established from control points, base line transit points and/or other points of similar nature furnished by the Engineer on the Project Drawings.
- C. The Contractor shall establish, re-establish when necessary and maintain control points throughout the life of the Contract to permit the Architect and/or Engineer to make the necessary preliminary, interim and final measurements and to check the Contractor's layout.
- D. The Contractor shall be responsible for the preservation of all control points. If control points are damaged, lost or moved, they shall be reset at no additional expense to the Owner. Control points outside as well as inside the Contract Limits shall be used for construction.
- E. The Contractor shall provide and maintain offset stakes for each base line, at each station, and out of the limits of grading and construction. Each stake shall be identified and marked to show the offset distance from the base line and the Contractor shall furnish sheets showing cuts and fills to the finished profile and cross section lines.
- F. Any error, apparent discrepancy, or absence of data shown or required for accurately accomplishing the survey work shall be referred to the Engineer for interpretation or furnishing when such is observed or required.
- G. The Engineer may check all or any portion of the survey work or notes made by the Contractor. Any necessary correction to the work shall be made immediately by the Contractor. Such verification by the Engineer shall not relieve the Contractor of any responsibilities for the accuracy and completeness of his work.
- H. The Contractor shall keep a survey transit and level with tripod and survey rod on the project at all times to be used for checking inverts, surveyors stakes, etc.
- I. The Contractor shall submit all survey data for daily checks, to the Office of the Engineer within twenty-four (24) hours after the data is obtained.
- J. In cases where extra excavation is required, before and after cut-sheets shall be submitted for determination of quantities for excavation and backfill and extra bedding.
- K. All project installation improperly constructed or located as a result of inadequate or erroneous survey layout shall be relocated or reconstructed, after demolition and/or removal of the improper work as necessary, by the Contractor at no charge to RIOC.
- L. The Contractor shall make its Surveyor and field staff available at all times to carefully coordinate with the Engineer in the review of the work to inspect, confirm, adjust and/or correct the work in order that the Project close tolerances and aesthetic goals are met.
- M. Lines and Grades: Benchmarks for elevations and column or wall line offset marks for alignment shall be established by the Contractor, who shall be responsible for their accuracy.

- N. Protection and monitoring of existing structures in accordance to Monitoring of Adjacent Structures Specification to be the prepared and submitted by the Contractor's professional in accordance with the requirements and criteria.
- O. Allowable tolerances for the project shall be generally as follows:
1. Seawall, upland walls and other structures: horizontal location 0.02 feet; vertical elevation 0.01 feet.
  2. Foundation work: horizontal location 0.10 feet; vertical elevation 0.02 feet.
  4. Paving, fine grading: vertical elevation 0.02 feet – but required and/or intended positive drainage patterns must be provided on all paver surfaces.
  6. Rip-Rap Bedding Layer
    - a) Slope Lines and Grade: plus 2 inches or minus 1 inch.
    - b) Layer Thickness: plus 3 inches or minus 1 inch.
  7. Rip-Rap Armor Stone
    - a) Slope Lines and Grade: plus or minus 6 inches.
    - b) Layer Thickness: plus or minus 6 inches.
- Q. All parts of the work shall be erected plumb and true, in proper alignment and relation to established lines and grades, and as shown on approved shop drawings.

### 3.02 DIMENSIONAL CONTROL PLAN

- A. Contractor's NY state licensed surveyor shall prepare a dimensional control plan that will extend to cover all site areas within the scope of work awarded. The Contractor may obtain the electronic autocadd files of the project plan and profile views from the Engineer for this purpose; however the Contractor's NY state licensed surveyor must certify on the drawing that the planned seawall layout falls within the foundation of the existing or former seawall; and that both terminus points of the seawall layout meet the existing adjacent seawalls as intended by the project design.
- B. In general, the dimensional control plan shall consist of a system of coordinate geometry that connects all major longitudinal elements, such as seawall corners, seawall joints, foundation steps, concrete rail posts and steel railing supports. Other elements, such as foundation width changes, rip-rap limits and grades, fences, gates and maintenance paths, shall be located by means of perpendicular offsets to defined stations along the centerlines.
- C. The Contractor shall submit, and obtain approval for, the dimensional control plan in both hard copy and electronic autocadd form, to the Engineer as a shop drawing.
- D. The dimensional control plan shall serve to determine the Contractors' final location of seawall pour limits at construction joints, to be determined in coordination with planned locations of the railing concrete posts and steel supports.
- E. Upon completion of the concrete work, the dimensional control plan shall be updated as an as-built dimensional plan, upon which the Contractor shall base the shop drawings,

including fully stationed layout plans, for the concrete posts and railings. No railing concrete posts shall be placed pending approval of the steel railing shop drawings.

- F. In the vicinity of seawall construction joints, the placement of concrete posts and steel railing supports shall maintain the indicated minimum separation distances from joints in order to prevent stress cracking to the concrete at these locations. The Contractor shall place additional steel rebar should these minimum separation distances be exceeded.
- G. Should any aspect of either the dimensional control or the as-built seawall concrete work require additional cast lengths of railings with dimensions not shown on the contract drawings, the contractor shall incur all associated costs of remedial work necessary.
- H. Field identification and confirmation of survey layout control, consist with the drawing information, shall be the responsibility of the contractor. Stationing shown is generally to face of wall; dimensions are generally to wall centerline.
- I. Contractor is responsible for all estimates of project material quantities, taking both normal wastage and site factors into consideration. Imported and exported earthwork quantities shall account for fluff factors that differentiate between trucking and compacted in-place soil volumes. Rip-rap quantities shall account for initial losses during contract period, penetration of rocks into mud-line, and for a degree of early settlement due to increased load. Tremie concrete quantities shall account for expected excess needed to fill underlying subgrade voids and for difficult site conditions.
- J. Site planimetric conditions shown are based upon the following surveys:
  - a) Ground survey by Langan during March-April 2013 and July 2018.
  - b) Bathymetric (hydrographic) survey data supplied by Rogers Surveying, Inc, 6 July 2018.
  - c) As-built utility information provided by RIOC.
  - d) Prior surveys by Langan 2007-2009.
- K. Utilities have not been physically excavated by the Engineer's surveyor to confirm their locations. The Contractor shall excavate test-pits to confirm the location and depths of utilities within or close to working areas.
- L. All elevations shown on the drawings are referenced to the North American Vertical Datum (NAVD88) based upon GPS methods.
- M. The meridian of planimetric data shown on the drawings is referenced to NY Long Island State Plan System NAD83 coordinate system.

END OF SECTION

**SECTION 029000****SITE PREPARATION****PART 1 - GENERAL**1.01 DESCRIPTION OF WORK

- A. Remove all trees, vegetation, and existing improvements unless otherwise noted. Strip grass, topsoil, and grub all roots. Protect existing trees and other vegetation designated to remain as noted on drawings.
- B. A drawing titled "Soil Erosion & Sediment Control Plan" is included in the Contract Documents which guides the Contractor to: a) Prepare the site; b) Supplement, Maintain, Repair and Relocate as appropriate the site preparation/Urban Erosion & Sediment Control measures; c) Control erosion and sedimentation so as to properly manage the site and prevent pollution.
- C. Comply with the construction, maintenance, inspection, and cleaning, remedial and close-out measures per the project Storm Water Pollution Prevention Plan (SWPPP).
- D. Comply with the excavation, backfill construction, remedial and close-out measures per the project Soil Management Plan (SMP). Scope shall include the sampling, testing, delineation, excavation of hazardous hot-spot areas not exceeding 200 cubic yards in-place earthwork volume.
- E. The discharge of construction water from the foundation work, trenching, grading and other earthwork operations from non-stabilized areas, to off-site or directly to the East River is not permissible.
- F. The control of construction water discharge shall be managed by the Contractor in a manner to be determined as part of his Means-and-Methods. Measures which can be used include sedimentation basins and rock or diversion swale, etc., by which the control of construction water discharge may be accomplished. Actual numbers, locations, relocations, orientations and maintenance of these measures shall be the Contractor's responsibility, and in compliance with all applicable laws and regulations.
- G. Special care shall be taken at all times to prevent any damage to, or pollution to, or threat of injury to, the East River. The Contractor shall submit a statement or drawing to the Owner showing, as part of his Means-and-Methods, special measures to be implemented to this effect, and in compliance with the project Storm Water Pollution Prevention Plan (SWPPP).
- H. The Contractor shall preserve and protect all surrounding trees at all times.
- I. The Contractor shall contact regulatory agencies listed herein in the event the contractor encounters wildlife and/or nests within the limits of disturbance.

1.02 RELATED SECTIONS

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 022050 – Protection of Existing Utilities
- B. Section 022100 – Project Survey and Control
- C. Section 310913 – Monitoring of Adjacent Structures

#### 1.03 RELATED DOCUMENTS

- A. Information regarding geotechnical subsurface conditions is given in the following geotechnical engineering report, copies of which are available for bid evaluation purposes from the office of the Construction Manager:
  - 1. Geotechnical Engineering Memorandum dated 22 May 2013 by Langan Engineering and Environmental Services (Langan).
- B. Information regarding environmental soil/subsurface conditions and soil management practices are given in the following environmental engineering report, copies of which are available for bid evaluation purposes from the office of the Construction Manager:
  - 1. Soil Management Plan (SMP) dated 20 February 2019 by Langan Engineering and Environmental Services (Langan).
- C. The project Storm Water Pollution Prevention Plan (SWPPP) has been prepared by Langan Engineering and Environmental Services (Langan), copies of which are available for bid evaluation purposes from the office of the Construction Manager.
  - 1. Storm Water Pollution Prevention Plan (SWPPP) dated 20 February 2019 by Langan Engineering and Environmental Services (Langan).

#### 1.04 SUBMITTALS

- A. Notification of discrepancies in existing site conditions as compared to the survey and pre-bid inspections.
- B. Program or drawing to the Owner showing, as part of his Means-and-Methods special measures to be implemented to times to prevent any damage to, or pollution to, or threat of injury to, the East River.

#### 1.05 QUALITY ASSURANCE

- A. Qualifications

Company specializing in the Work of this Section shall have a minimum of 3 years' experience.
- B. Regulatory Requirements

Work of this Section shall conform to all requirements of the NYC Building Code, NYSDEC and all applicable regulations of governmental authorities having jurisdiction, including safety, health, and anti-pollution regulations.

#### 1.06 EXISTING CONDITIONS

- A. Prior to clearing and removal or abandonment of improvements, ascertain the exact locations of all existing underground utilities. Protect these during subsequent operations.

**1.07 SEQUENCING AND SCHEDULING**

- A. Perform work in such a manner to ensure a minimum interference with roads, walks, adjacent properties, and facilities to remain open. Do not close or obstruct these items without obtaining permits from the agencies having jurisdiction or the permission of the adjacent owners. Before major excavations in the proximate areas, perform the sampling, testing, delineation, excavation of hazardous hot-spot areas not exceeding 200 cubic yards in-place earthwork volume.

**PART 2 - PRODUCTS - NOT APPLICABLE****PART 3 - EXECUTION****3.01 VERIFICATION OF CONDITIONS**

Verify existing site conditions match those of the survey and pre-bid inspections. Notify the Owner in writing prior to commencement of Work of any discrepancies.

**3.02 PROTECTION**

- A. Provide adequate protection measures to protect workmen and pedestrians at the site.
- B. Provide for surface drainage during construction to avoid creating a nuisance to adjacent buildings and properties.
- C. Existing Improvements
  - 1. Prevent damage to existing improvements and Project trees designated to remain. If damaged during construction, restore to their original condition.
  - 2. Prevent damage to improvements on adjoining properties. Restore damaged improvements to their original condition to the satisfaction of their owner.
- D. Existing Project Trees
  - 1. All existing trees within limits of work are to be removed, refer to Demolition Plan – DM -100.00 for limit of work and tree removals.
- E. Stone Salvage
  - 1. Contractor shall salvage stone units from site activities, for both re-use as part of the project and for RIOC's later reuse, as described herein.
  - 2. The following types and quantities of stone shall be salvaged from existing seawall demolition.
    - a. Large granite block (average 27" x 27" x 60" long)
      - I. Approximately 200 cubic yards exist in segments of the existing west-shore seawall.
      - II. A small portion shall be re-used as seawall granite facing for the north terminus of the west-shore seawall, as shown and detailed on the drawings.

- III. The remainder shall be salvaged and stored securely on-site as directed, for RIOC's later re-use.
  - b. Hewn field-stone/medium (average 10" x 10" x 30" long to 12" x 12" x 48" long size)
    - I. Approximately 350 cubic yards exist in segments of the existing seawalls.
    - II. This stone shall be salvaged and stored securely on-site as directed, for RIOC's later re-use.
    - III. In addition, any stone found to bear engravings or inscriptions shall be brought to RIOC's attention for directions as to salvage.
- 3. Other types of stone or rock may be salvaged as follows.
  - a. Rough field-stone/small (average diameter 9" or larger)
    - I. To the extent that smaller classes of stone meet the rip-rap gradation specifications such stone may be re-used for rip-rap material.
    - II. Approximately 450 cubic yards of these smaller classes of stone units exist within the seawalls; however, please refer to project Soil Management plan (SMP) Report for regulatory compliance as to on-site and in-water re-use provisions.
    - III. Also stone sizes in modest quantities may exist within the soils to be excavated that may be sorted for re-use as rip-rap material; however, please refer to project Soil Management Plan (SMP) report and the NYSDEC conditions of approval thereof, for regulatory compliance as to preparation, on-site and in-water re-use provisions.
- F. Other Salvageable Improvements
  - 1. Carefully remove and protect all items to be saved and reused as indicated by the Owner. Replace any items which are damaged by removal at Contractor's own cost.
  - 2. Notify the Owner in writing of any item which is damaged prior to removal so that they may ascertain the item's condition.
- G. A Erosion & Sediment Control Plan drawing is included in the Contract Documents which guides the Contractor to: a) Prepare the site; b) Supplement, Maintain, Repair and Relocate as appropriate the Erosion & Sediment Control measures; c) control erosion, and sedimentation so as to properly manage the site and prevent pollution.
- H. The control of construction water discharge shall be managed by the Contractor in a manner to be determined as part of his Means-and-Methods. Actual measures for this purpose shall comply with all applicable laws and regulations.

### 3.03 CLEARING OF SITE

- A. General
  - 1. Remove all trees, vegetation, stumps, roots, site debris, and all other materials and encumbrances found unless designated to remain or be abandoned in their entirety. Remove abandoned improvements in part or whole that interfere with construction.

2. For removed tree disposal purposes, criteria issued by NYC Department of Design and Construction titled "Essential Information regarding the Asian Long-Horned Beetle" shall be observed.
- B. Clearing and Grubbing of Organic Matter.
1. Completely remove stumps, roots, and other organic matter. Grub roots to 18" below existing grade for new planted areas.
  2. Fill depressions caused by removal in accordance with Section 312300.
- C. Top Soil
1. Strip top soil to levels indicated in the Soil Management Plan. Prevent top soil from mixing with subsoil.
- D. Removal and Abandonment of Improvements
1. Remove all existing above and below grade improvements, unless they are designated to remain or be abandoned.
- E. Hazardous Hot-Spot Excavations
1. Before major excavations in the proximate areas, perform the sampling, testing, delineation, excavation of hazardous hot-spot areas not exceeding 200 cubic yards in-place earthwork volume.
- F. Disposal
1. Remove and dispose of away from the premises all excavated material of every kind, in a legal manner and in conformance with the requirements of Section 312300. Burning of material on the site is not permitted.
- G. Wildlife
1. In the event the Contractor encounters wildlife and/or nests within the limit of disturbance which need to be removed to allow construction, the Contractor shall notify the appropriate state and federal authorities. Nests or wildlife shall not be removed until the appropriate direction is received from the agency(s). It is recommended the Contractor contact these agencies prior to construction to obtain any preliminary guidance for removal. The agencies are:
    - a. Federal Agencies
      - U.S. Fish and Wildlife Service (birds, waterfowl, terrestrial wildlife, their nests and dens) – Long Island Field Office, 340 Smith Road, Shirley, NY 11967, Phone (631) 286-0485. Obtain a Resident Canada Goose Nest and Egg Depredation Permit, if needed.
      - NOAA National Marine Fisheries Service (Marine Wildlife, including but not limited to sick or injured Marine mammals and turtles) – (978) 281-9300 and (631) 369-9829 (Stranding Hotline)

b. State Agencies

- NYSDEC Wildlife Program – Phone: (718) 482-4922; Email: [r2.naturalresources@dec.ny.gov](mailto:r2.naturalresources@dec.ny.gov)

END OF SECTION

**SECTION 031000****CONCRETE FORMWORK****PART 1 - GENERAL**1.01 DESCRIPTION OF WORK

- A. Provide forms as necessary to confine concrete and shape it to required dimensions.
- B. Coordinate forming of seawall segments with the dimensional control requirements of the project. In particular observe criteria for placement of expansion-contraction joints in order to preserve the seawall railings pattern provided by the drawings.
- C. Contractor shall be entirely responsible for designing, constructing and maintaining formwork to withstand site conditions, including the impacts of East River tidal and vessel-wake environment.
- D. Contractor shall be entirely responsible for designing, constructing and maintaining formwork to limit deflections and/or failures under pour conditions.

1.02 RELATED SECTIONS

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 032000 – Concrete Reinforcement
- B. Section 033000 – Cast in Place Concrete
- C. Section 036000 – Grouting
- D. Section 044313 – Stone Masonry Veneer
- E. Section 314100 – Shoring and Bracing
- F. Section 310913 – Monitoring of Adjacent Structures

1.03 REFERENCES

References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

- A. American Concrete Institute (ACI) standards, latest editions.
  - 1. ACI 301 Specifications for Structural Concrete for Buildings.
  - 2. ACI 347 Guide to Formwork for Concrete.
- B. NYS Department of Transportation Specifications section 555-3.03 Forms

1.04 DESIGN REQUIREMENTS

- A. The design and engineering of the formwork, as well as its construction, is the responsibility of the Contractor.
- B. Design formwork in accordance with ACI 347 and paragraph 27-1035(c) of the Building Code.
- C. Comply also with NYS Department of Transportation Specifications section 555-3.03 for formwork minimum standards.

1.05 SUBMITTALS

## A. Product Data

Submit manufacturers' information for the following:

- 1. Overlaid plyform formwork or formliners
- 2. Ties, each type and where to be used
- 3. Form-release agent. Form-release agent to be submitted for review only.

## B. Samples

Submit 12" x 12" samples of the following items:

- 1. Overlaid plyform formwork or formliners

## C. Shop Drawings

- 1. Prepare and submit formwork shop drawings and calculations prepared and sealed by a Professional Engineer licensed in the State of New York for review as required by paragraph 27-1035(c) of the Building Code.
- 2. Formwork shall be designed on the shop drawings submitted to ensure tightness and prevention of leakage. Formwork shall also be designed to limit deflections.
- 3. Submit method of producing required concrete surface finish.

## D. Quality Control Submittals

- 1. Contractor Qualifications

Provide proof of Formwork Installer qualifications specified under "Quality Assurance".

1.06 QUALITY ASSURANCE

## A. Qualifications

Company specializing in performing the Work of this Section shall have three years minimum experience.

**B. Regulatory Requirements****1. Building Code**

Work of this Section shall conform to all requirements of the NYC Building Code. Where more severe requirements than those contained in the Building Code are given in this Section and ACI 347, the requirements of this Section and ACI 347 shall govern.

**2. Industrial Code Rule #23 of the Department of Labor, paragraphs 23.10.1 to 23-10.5 inclusive.****3. ACI 347.****1.07 DELIVERY, STORAGE, AND HANDLING****A. Protection**

1. Protect formwork materials before, during and after installation.

2. Protect installed work and materials of other trades.

**B. Replacement**

1. Repair or replace damaged formwork as needed.

2. Repair overlaid plyform formwork as per manufacturer's instructions. Replace pieces when number of manufacturer recommended reuses is up or when finish deteriorates.

**PART 2 - PRODUCTS****2.01 MATERIALS****A. Rough Formwork**

Shall be Commercial Douglas Fir, DFPA: 5/8" thick minimum or modular metal units.

**B. Overlaid Plyform Formwork**

Plywood with thermosetting phenolic resin or urethane coating bonded to it to provide a flat matte finish. Shall be equal to B-Matte Formguard by Simpson Timber Company.

**C. Release Agent**

VOC compliant material such as those of the Cresset Chemical Company for coating forms.

**D. Form Ties**

1. Form ties for exposed concrete shall be adjustable.

2. Form ties for exposed concrete and concrete to receive membranes shall be a break-off type and leave no metal closer than 1 1/2" to the surface.

3. Form ties for concrete stated in 2 above shall be free of devices which leave holes or depressions larger than 7/8" back of exposed surface.

### **PART 3 - EXECUTION**

#### **3.01 PREPARATION OF FORMWORK SURFACES**

- A. Clean all surfaces of forms and embedded items of any accumulated mortar or grout from previous concreting and other foreign material before concrete is placed in them. Repair or replace any formwork as required.
- B. Before placing either reinforcing steel or concrete, cover the surfaces of the rough or overlaid plyform formwork (when used) with an approved form release agent that will effectively prevent absorption of moisture, prevent bond with the concrete, and which will not stain the concrete surfaces. Material shall be carefully applied at the amount recommended by the release agent manufacturer to obtain the desired finish. Do not apply oil or release agents on formwork for concrete to receive coatings such as membrane waterproofing, plaster, or additional concrete (such as at construction joints). Follow manufacturer's recommendations for alternatives. For the overlaid plyform formwork, release agent should be a chemically reactive agent compatible with the factory treatment. Do not allow excess form coating material to stand in puddles in the forms nor allow coating to come in contact with hardened concrete against which fresh concrete is to be placed.

#### **3.02 CONSTRUCTION AND DETAILS**

- A. Adequately support and substantially brace formwork to hold lines and shape.
- B. Formwork shall be tight jointed to prevent leakage of mortar from the concrete.
- C. Place chamfer strips in the corners of forms to produce beveled edges (chamfers) on permanently exposed surfaces (such as exposed columns). Do not provide beveled edge for interior corners of such surfaces and where members are flush with partitions or walls, unless required by Drawings or specified elsewhere.
- D. Provide positive means of adjustment (wedges or jacks) for shores and struts to take up all settlement during concrete placing operations. Fasten wedges used for final adjustment of forms prior to concrete placement in position after final check. Securely brace forms against lateral deflection.
- E. Provide mud sills where shores rest on loose compressible materials.
- F. Provide temporary openings to permit cleaning and inspection. Provide ample time for proper inspection before placement of concrete.
- G. Provide "Rough Form Finish" for surfaces not exposed to view. Use plywood or metal forms coated with a release agent.
- H. Provide "Smooth Form Finish" for surfaces exposed to view. Use dress, square-edged lumber with form liner or overlaid plyform forms with applicable release agent. Do not exceed manufacture's recommendations for number of re-uses for the form liner or overlaid plyform. Arrange the forms or form liner in an orderly and symmetrical fashion, keeping the number of seams to a practical minimum. Concrete shall have CS3 or better surface finish.
- I. Form holes for weep-holes as required. Construct woodforms for wall forms to facilitate loosening, if necessary, to counteract swelling of forms.

- J. Provide for keys, pockets, projections and other built-in work prior to placement of concrete.
- K. Install dovetail slots, concrete inserts, and other metal fabrications. Secure to inside forms and space as required.
- L. At construction joints, contact surface of the form sheathing for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by not more than 1". The forms shall be held against the hardened concrete to prevent offsets or loss of mortar at the construction joint and to maintain a true surface.
- M. Form accessories to be partially or wholly embedded in the concrete, such as ties and hangers, shall be of a commercially manufactured type. Construct form ties so that the ends or end fasteners can be removed without causing appreciable spalling at the faces of the concrete. After the ends or end fasteners of the form ties have been removed, terminate the embedded portion of the ties not less than 2 diameters or twice the minimum dimension of the tie from the formed faces of concrete to be permanently exposed to view, except that in no case shall this distance be less than 3/4". When the formed face of the concrete is not to be permanently exposed to view, form ties may be cut off flush with the formed surfaces.
- N. Coordinate forming of seawall segments with the dimensional control requirements of the project. In particular observe criteria for placement of expansion-contraction joints in order to preserve the seawall railings pattern provided by the drawings.
- O. Contractor shall be entirely responsible for designing, constructing and maintained formwork to withstand site conditions, including the impacts of East Rover tidal and vessel-wake environment.
- P. Contractor shall be entirely responsible for designing, constructing and maintained formwork to limit deflections and/or failures under pour conditions. Carefully check all forms before placement of concrete.
- Q. Comply also with NYS Department of Transportation Specifications section 555-3.03 for formwork minimum standards.

### 3.03 REMOVAL OF FORMS AND SHORING

- A. Remove forms in such a manner as to assure the complete safety of the seawalls.
- B. Formwork may be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations and as required by C below. For normal temperature conditions, this shall be a minimum of 12 hours. For cold weather conditions, this shall be increased to 24 hours. Concrete shall remain protected at all times.
- C. When repair of surface defects or finishing is required at an early age, remove forms as soon as the concrete has hardened sufficiently to resist damage from removal operations.
- D. Remove top forms on sloping surfaces of concrete as soon as the concrete has attained sufficient stiffness to prevent sagging. Perform any needed repairs or treatment required on such sloping surfaces at once and follows it with the specified curing.
- E. Loosen wood forms for wall openings as soon as this can be accomplished without damage to the concrete.

- F. Proper safe shoring, number of shores, adequacy, size and location of these shores and forms shall be in accordance with acceptable good construction practice and it is the sole responsibility of the Contractor to provide safe conditions at all times during stripping.
- G. Under no circumstances shall forms be removed if curing methods are not ready for immediate implementation.

#### 3.04 TOLERANCES

- A. Construct formwork so that concrete surfaces will conform to the tolerance limits listed in Table 4.3.1 of ACI 301.
- B. Establish and maintain in an undisturbed condition and until final completion and acceptance of the project sufficient control points and bench marks to be used for reference purposes to check tolerances.
- C. Formwork shall not deflect more than 1/8" over the height of the seawall.

#### 3.05 INSPECTION

- A. Under the requirements of paragraph 27-607 of the Building Code, the Authority will designate an Engineer for Special/Controlled Inspection to inspect formwork, including shores, reshores, braces, and other supports, to verify the sizes of concrete members being formed. The Special Inspector will make inspections prior to placement of steel, after placement, and during placement of concrete.
- B. Under the requirements of paragraph 27-1035(b) of the Building Code, the Contractor's person superintending the work shall inspect the forms for conformance with form design drawings when such drawings are required by 27-1035(c). Make inspections prior to placement of steel and subsequently periodically after placement and during placement of concrete to detect incipient problems.
- C. Contractor shall be entirely responsible for designing, constructing and maintained formwork to withstand site conditions, including the impacts of East Rover tidal and vessel-wake environment.
- D. Contractor shall be entirely responsible for designing, constructing and maintained formwork to limit deflections and/or failures under pour conditions. Carefully check all forms before placement of concrete.
- E. During and after concrete placement, check elevations, camber, and vertical alignment of formwork systems using tell-tale devices.
- F. Keep a record of all inspections, the name of the persons making them, and the name of the foreman in charge of formwork at the site. Submit to the Authority's representative on the site a copy of the inspection records prior to each concrete placement.

END OF SECTION

**SECTION 032000****CONCRETE REINFORCEMENT****PART 1 - GENERAL**1.01 DESCRIPTION OF WORK

- A. Provide and install all reinforcement and associated items required for cast-in-place concrete seawalls and upland walls and other miscellaneous items as part of site restoration.

1.02 RELATED SECTIONS

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 031000 – Concrete Formwork
- B. Section 033000 – Cast in Place Concrete
- C. Section 036000 – Grouting

1.03 REFERENCES

References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

- A. American Society of Testing and Materials (ASTM) standards, latest editions.
  - A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - A184 Standard Specification for Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
  - A185 Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - A496 Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
  - A497 Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
  - A615 Standard Specifications for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - A775 Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- B. American Concrete Institute (ACI) standards, latest editions.
  - ACI 301 "Specification for Structural Concrete for Buildings."
  - ACI 315 "Details and Detailing of Concrete Reinforcement."

ACI 318 "Building Code Requirements for Reinforced Concrete (RS 10-3 of the NYC Building Code).

- C. "Placing Reinforcing Bars - CRSI-WCRSI Recommended Practices", latest edition. Concrete Reinforcing Steel Institute.
- D. "Structural Welding Code - Reinforcing Steel" D1.4 - American Welding Society (AWS).
- E. "Near-White Blast Cleaning" SSPC-SP10 - Steel Structures Painting Council (SSPC).

#### 1.04 DESIGN REQUIREMENTS

- A. Development lengths (and thereby splices) of epoxy-coated bars shall be increased 1.5 over the values given in ACI 318-89 for non-coated bars.

#### 1.05 SUBMITTALS

##### A. Product Data

Submit manufacturers' information for the following:

1. Epoxy-coated steel welded wire fabric
2. Epoxy-coated and non-coated steel reinforcement bars and dowels
3. Supports
4. Mechanical connectors

##### B. Shop Drawings

1. Immediately after award of Contract, prepare shop drawings showing all fabrication dimensions and locations for placing of the reinforcing steel and accessories. Shop Drawings are to be prepared by a rebar detailer.
2. Follow detailing recommendations of ACI 315.
3. Submit drawings gradually and not all at the same time so that sufficient time is allowed for checking and approval. Improperly prepared and incomplete shop drawings will be disapproved without review.
4. Shop drawings will be checked for size of material and spacing by the Engineer of Record, which shall not render the Engineer responsible for any errors in construction dimensions, quantities, bends, etc. that have been made in preparation of the shop drawings. The Contractor shall assume full responsibility for the correctness of quantities, dimensions and fit.
5. Do not order or deliver reinforcement to job site prior to approval of drawings.
6. Indicate location of epoxy-coated bars on the drawings.

##### C. Quality Control Submittals

1. Certificates

- a. Submit certificate stating that reinforcement meets or exceeds the specified requirements.
- b. Submit certification that properly identifies the number of each batch of epoxy coating material used on the project, material, quantity represented, date of manufacture, name and address of manufacturer and a statement that the supplied epoxy-coated reinforcing bars meet the requirements of this specification and the requirements of ASTM A775 including Annex A1.

2. Contractor Qualifications

Provide proof of Installer and Detailer qualifications specified under "Quality Assurance".

1.06 QUALITY ASSURANCE

A. Qualifications

1. Reinforcing Installer: Company specializing in performing the Work of this Section shall have three years minimum experience on successful projects of similar size.
2. Reinforcing Detailer: Company shall be specialized in the detailing of reinforcing bar shop drawings with a minimum of three years experience.

B. Regulatory Requirements

1. Building Code

Work of this section shall conform to all requirements of the NYC Building Code. As per paragraph 27-604, "Identification of metal-reinforcement", deliveries will be rejected unless:

- a. All reinforcing bars are identifiable as to point of origin, grade of steel and size.
- b. All bundles or rolls of cold drawn steel wire reinforcement are securely tagged to identify the manufacturer, the grade of steel and the size.

Where more severe requirements than those contained in the Building Code are given in this Section and ACI 318, the requirements of this Section and ACI 318 shall govern.

2. Industry Standards

Details of Concrete reinforcement not covered herein shall be in accordance with "Building Code Requirements for Reinforced Concrete" (ACI 318) and "Details and Detailing of Concrete Reinforcement" (ACI 315), latest editions and the Concrete Reinforcing Steel Institute Manual on "Placing Reinforcing Bars" (CRSI-76).

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Store in location to prevent rusting, etc.
- B. Protect reinforcement before, during, and after installation.
- C. Insure proper identification after bundles are broken.

D. Epoxy-Coated Reinforcing Bars

1. Equipment for handling epoxy-coated bars shall have protected contact areas. Lift Bundles of coated bars at multiple pick-up points to minimize bar-to-bar abrasion from sags in the bundles.
2. Do not drop or drag coated bars or bundles of coated bars. Store coated bars on protective cribbing.
3. Fading of the color of the coating shall not be cause for rejection of epoxy-coated reinforcing bars. Coating damage due to handling, shipment, and placing need not be repaired in cases where the damaged areas is 0.1 in<sup>2</sup> or smaller. Repair damaged areas larger than 0.1 in<sup>2</sup> in accordance with Article 2.02. The maximum amount of damage, including repaired and unrepaired areas, shall not exceed 2% of the surface area of each bar. Bars with greater than 2% damaged areas will be rejected.

**PART 2 - PRODUCTS**

2.01 MATERIALS

A. Non-coated Reinforcing Bars

1. All non-coated reinforcing bars shall be of deformed type of new billet steel conforming to current requirements of ASTM A615. No rail or re-rolled steel will be permitted.
2. Grade or yield strength of reinforcing bars are indicated on Drawings.

B. Welded Steel Wire Fabric

1. Wire Fabric shall conform to the requirements of ASTM A185.
2. Required net area, placement details, and other requirements are indicated on Drawings.

C. Epoxy-Coated Reinforcing Bars

1. All steel reinforcing bars to be coated shall be of deformed type of new steel conforming to current requirements of ASTM A615. Bars shall be free of contaminants such as oil, grease or paint. No rail or re-rolled steel will be permitted.
2. Grade or yield strength of reinforcing bars are indicated on Drawings.
3. Bars shall be epoxy-coated in accordance with ASTM A775.
4. The coating material shall be of organic composition meeting the requirements listed in ASTM A775 Annex A1 entitled "Requirements for Organic Coating." Resistance to chemicals, applied voltage, chloride permeability, flexibility, bond strength, abrasion resistance, impact, and hardness shall be tested in accordance with Annex A1.

D. Supports for Reinforcement

1. Non-coated Reinforcement

- a. Supports for reinforcement supported by formwork or deck shall consist of metal bolsters and chairs of adequate strength, size, and number. Provide CRSI Class C supports (plastic tipped) for formed concrete surfaces and Class A (bright basic) for metal deck.
- b. Supports for reinforcement of slabs supported by ground shall consist of above supports with sand plates or horizontal runners. Support for reinforcement of footings/ pilecaps shall consist of the above supports or precast concrete block, 4" square, having a compressive strength equal to that of the concrete being placed.

## 2. Epoxy-coated Reinforcement

- a. Epoxy-coated reinforcing bars supported from formwork shall rest on coated wire bar supports, or on bar supports made of dielectric material or other acceptable materials. Wire bar supports shall be coated with dielectric material for a minimum distance of 2" from the point of contact with the epoxy-coated reinforcing bars.
- b. Reinforcing bars used as support bars shall be epoxy-coated. In walls having epoxy-coated reinforcing bars, spreader bars, where specified on the Drawings or shop drawings, shall be epoxy-coated. Proprietary combination bar clips and spreaders used in walls with epoxy-coated reinforcing bars shall be made of corrosion-resistant material.

## E. Tie Wire

Tie wire for fastening epoxy-coated reinforcing bars shall be nylon-epoxy, plastic-coated, or other material acceptable to the Authority.

## 2.02 FABRICATION

### A. General

Fabricate reinforcing bars in accordance with fabricating allowances given in ACI 315.

### B. Epoxy-Coated Bars

#### 1. Surface Preparation

Clean the surface of the steel reinforcing bars to be coated by abrasive blast cleaning to near-white metal in accordance with SSPC-SP10.

#### 2. Application of Coating (In Shop)

- a. Apply the coating to the cleaned surface as soon as possible after cleaning and before oxidation of the surface discernible to the unaided eye occurs. However, in no case delay application of the coating more than 8 hours after cleaning.
- b. The coating shall be applied by the Electrostatic Spray Method and fully cured in accordance with the recommendations of the manufacturer of the coating material.
- c. Coat ends of bars in accordance with the manufacturer's standards.

3. Thickness of Coating Material
  - a. The film thickness of the coating after curing shall be 5 to 12 mils inclusive. Take a minimum of 15 measurements approximately evenly spaced along each side of the test bar. At least 90% of these measurements shall be within the specified limits.
  - b. Test the thickness of the film coating in accordance with ASTM G12.
4. Coating Repair: Repair coating damage due to fabrication or handling in cases where damaged area is 0.1 in<sup>2</sup> or greater. Repair all damaged areas larger than 0.1 in<sup>2</sup> with patching material. The maximum amount of damage shall not exceed 24% of the surface area of each bar. Patch in accordance with the patching material manufacturer's recommendations. Repair ends of bars cut in the field with the patching material.
5. Bending of Epoxy-Coated Reinforcement: Bend all epoxy-coated reinforcement cold unless otherwise approved by the Authority. When epoxy coated reinforcement bars are field or shop bent, repair coating damage in accordance with paragraph B.4 above. Rollers of bending apparatus shall have neoprene collars.

### 2.03 SOURCE QUALITY CONTROL

- A. The Authority shall have the right to inspect the material at all times while work on the Contract is being performed. Epoxy-coated reinforcing bars that do not meet the requirements of this Specification will be rejected. Replace all rejected bars at no cost to the Authority.

## **PART 3 - EXECUTION**

### 3.01 PLACEMENT

- A. General
  1. Place reinforcement in accordance with CRSI "Placing Reinforcement Bars."
  2. Unless otherwise permitted, welding of crossing bars (tack welding) for assembly of reinforcement is prohibited.
  3. Avoid cutting or puncturing vapor barrier during placement.
- B. Supports
  1. Support and fasten together all reinforcement to prevent displacement by construction loads or placing of concrete.
  2. Provide supports specified in Article 2.01.
  3. Provide Continuous High Chair Upper (CHCU) or Continuous Support (CS) for welded wire fabric in the metal deck and place every four feet (4') parallel to the supporting beams.
  4. Lifting of bars and welded wire fabric into position during placement of concrete is not permitted.

5. Where the concrete surface will be exposed to the weather in the finished structure, the portions of all accessories within 1/2" of the concrete surface shall be non-corrosive or protected against corrosion.

C. Cover

Provide minimum protective cover given in Chapter 7 of ACI 318 if not indicated on Drawings.

D. Splices

1. All splices not shown on the Project Drawings shall be shown on the shop drawings and approved by the Engineer of Record.
2. Welded splices - Provide where indicated on Drawings. All welding shall conform to AWS D1.4.
  - a. Provide suitable ventilation when welding epoxy-coated reinforcing bars.
  - b. After completion of welding on epoxy-coated reinforcing bars, repair coating damage in accordance with Article 2.02. All welds, and all steel splice members when used to splice bars, shall be coated with the same material used for repair of coating damage.
3. Mechanical Connectors
  - a. Provide where indicated on Drawings. Install in accordance with splice device manufacturer's recommendations.
  - b. After installing mechanical connectors on epoxy-coated reinforcing bars, coating damage shall be repaired in accordance with Article 2.02. All parts of mechanical connectors used on coated bars, including steel splice sleeves, bolts, and nuts shall be coated with the same material used for repair of coating damage.

E. Embedment Lengths

All embedment lengths not shown on the Project Drawings shall be shown on the shop drawings and approved by the Engineer of Record.

3.02 FIELD CUTTING

- A. When epoxy-coated reinforcing bars are cut in the field, coat the ends of the bars with the same material used for repair of coating damage.

3.03 TOLERANCES

- A. Place reinforcing bars in accordance with the tolerances given in paragraph 5.6.2 of ACI 301.
- B. Move bars as necessary to avoid interference with other reinforcement, conduits, or imbedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangements are subject to approval by the Engineer of Record.

3.04 FIELD QUALITY CONTROL

- A. Under the requirements of paragraph 27-607 of the Building Code, the Authority will designate an Engineer for Special/Controlled Inspection to inspect the size and placement of reinforcement. A record will be made of all inspection of reinforcement at the bending bench and in place.
- B. Do not proceed with the completion of wall forms until all reinforcement has been approved and recorded by the Engineer for Controlled Inspection.
- C. Do not proceed with concreting until all reinforcing in place has been approved and recorded.
- D. Promptly correct all reinforcement displaced during pouring of concrete.
- E. Damaged reinforcement shall not be used.

3.05 CLEANING

- A. Steel reinforcement shall be free of all rust, scale, oil, paint, grease, loose mill scale, and all other foreign matter that will prevent bonding of concrete and steel just prior to pouring of concrete.

END OF SECTION

**SECTION 033000****CAST-IN-PLACE CONCRETE****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Furnish material, equipment, labor, services required to provide for cast-in-place concrete. Work includes but is not limited to tremie-concrete foundation mats, reinforced gravity concrete seawall retaining walls, repairs and sub-paver slabs. Work also includes protocols for formwork, reinforcement, concrete materials, mixture design, pre-pour concrete conference, placement procedures, finishes and installation of miscellaneous related items listed in the Documents.
- B. The Contractor is alerted to the fact that the setting for the Project seawalls is a most severe environment. This marine environment is saline, abrasive, erosive and highly exposed, such that patchwork repairs to water-side wall faces will not equal the contract requirement for a long-life concrete seawall. Due to these circumstances, construction of seawalls that include material errors or shortfalls in meeting the Special Testing criteria, or exhibiting any substantial voids, sloughs, gaps, excessively-cracked (cracks greater than 1/8" width at any point) etc as revealed in the cured or curing concrete wall face, shall result in rejection of the construction. Such rejection shall include an instruction to demolish the poured wall down to the foundations, and to re-form, re-reinforce and re-pour the wall.

**1.02 RELATED SECTIONS**

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 032000 – Concrete Reinforcement
- B. Section 033000 – Cast in Place Concrete
- C. Section 036000 – Grouting
- D. Section 044313 – Stone Masonry Veneer
- E. Section 314100 – Shoring and Bracing
- F. Section 310913 – Monitoring of Adjacent Structures

**1.03 REFERENCES**

References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

- A. American Society of Testing and Materials (ASTM) standards, latest editions.

- C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- C33 Standard Specifications for Concrete Aggregates.
- C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- C78 Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Three-point Loading)
- C94 Standard Specification for Ready-Mixed Concrete.
- C127 Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Course Aggregate.
- C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- C138 Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
- C143 Standard Test Method for Slump of Hydraulic Cement Concrete.
- C150 Standard Specification for Portland Cement.
- C172 Standard Method of Sampling Freshly Mixed Concrete.
- C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- C192 Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory.
- C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- C260 Standard Specifications for Air-Entraining Admixtures for Concrete.
- C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- C387 Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
- C494 Standard Specification for Chemical Admixture for Concrete.
- C496 Standard Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
- C685 Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing.
- C882 Standard Test Method for Bond Strength of Epoxy-Resin Systems used with Concrete by Slant Shear

C1315 Standard Specification for Liquid-Forming Compounds Having Special properties for Curing and Sealing Concrete

E329 Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials used in Construction

B. American Concrete Institute (ACI) standards, latest editions.

ACI 117 Standard Tolerances for Concrete Construction and Materials

ACI 211.1 Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

ACI 212.3R Chemical Admixtures for Concrete.

ACI 214 Evaluation of Results of Tests Used to Determine the Strength of Concrete.

ACI 301 Specifications for Structural Concrete for Buildings.

ACI 304R Guide for Measuring, Mixing, Transporting and Placing Concrete.

ACI 305R Hot Weather Concreting.

ACI 306R Cold Weather Concreting.

ACI 308 Standard Practice for Curing Concrete.

ACI 309R Guide for Consolidation of Concrete.

ACI 311.4R Guide for Concrete Inspection.

ACI 318-89 Building Code Requirements for Reinforced Concrete.

C. American Association of State Highway and Transportation Officials

T318 Water Content of Freshly Mixed Concrete Using Microwave Oven Testing

D. NYS Department of Transportation

NYS Department of Transportation Standard Specifications.

1.04 PERFORMANCE REQUIREMENTS

- A. Seawall and Upland (Retaining Walls)
  - a. The concrete mix shall be designed for ACI exposure Classes F3, S1, P1, and C2.
  - b. Chloride Ion Penetration: 4x8-inch concrete cylinders shall be standard cured to an age of 28 days and tested in accordance with ASTM C 1202 or AASHTO T277. The charge passed in six hours shall not exceed 1500 coulombs.
  - c. Compressive Strength: 4x8-inch cylinders shall be standard cured and tested at 7, 14, and 28 days in accordance with AASHTO T22. Minimum compressive strength shall be 5,000 psi.
  - d. Freeze/Thaw Durability: 4x8-inch concrete cylinders shall be standard cured and tested in accordance with New York State Department of Transportation test method 502-3P using 3% salinity solution. Total weight loss shall be less than 1 percent at the end of the test.
  - e. Shrinkage: Prisms, 2 inches square by 11.25 inches long, shall be tested in accordance with ASTM C 157. The maximum shrinkage shall be 600 microstrains or less.
- B. Foundation Mat Concrete
  - a. The concrete mix shall be designed for ACI exposure Classes F2, S1, P1, and C2.
  - b. Foundation Mats: Normal weight concrete that shall meet minimum standards referenced by NYS Department of Transportation Specifications section 555-3.05 "Depositing Structural Concrete Under Water".
  - c. Compressive Strength: 4x8 inch cylinders shall be standard cured and tested at 7, 14, and 28 days in accordance with AASHTO T22. Minimum compressive strength shall be 5,000 psi.
- C. Paver Under Slab Concrete
  - a. The concrete mix shall be designed for ACI exposure Classes F3, S1, P1, and C2.
  - b. Chloride Ion Penetration: 4x8-inch concrete cylinders shall be standard cured to an age of 28 days and tested in accordance with ASTM C 1202 (or AASHTO T277. The charge passed in six hours shall not exceed 1500 coulombs.
  - c. Compressive Strength: 4x8 inch cylinders shall be standard cured and tested at 7, 14, and 28 days in accordance with AASHTO T22. Minimum compressive strength shall be 5,000 psi.
  - d. Freeze/Thaw Durability: Prisms, between 3 and 5 inches with width and depth and 11 to 16 inches in length tested in accordance with New York State Department of Transportation test method 502-3P using 3% salinity solution. Total weight loss shall be less than 1 percent at the end of the test.
  - e. Shrinkage: Prisms, 2 inches square by 11.25 inches long, shall be tested in accordance with ASTM C 157. The maximum shrinkage shall be 600 microstrains or less.
- G. Materials used in the mix designs shall conform with ACI 301 Section 4.2.1 Materials.

## 1.05 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture, signed and sealed by a qualified professional engineer registered in the State of New York, responsible for their preparation. Submit alternate design mixtures when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. No additional water shall be added to the mix after water is added by the plant.
- C. Formwork Shop Drawings: Prepared, signed, and sealed by a qualified professional engineer licensed in the State of New York detailing fabrication, assembly, and support of formwork.
- D. Steel Reinforcement Shop Drawings:
  - 1. Immediately after award of Contract, prepare shop drawings showing all fabrication dimensions and locations for placing of the reinforcing steel and accessories. Follow detailing recommendations of ACI 315. Shop Drawings are to be prepared by a rebar detailer.
  - 2. Shop drawings shall detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement, as may be needed. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures."
  - 3. Steel and formwork shop drawings will be checked for size of material and spacing by the Engineer of Record, which shall not render the Engineer responsible for any errors in construction dimensions, quantities, bends, etc. that have been made in preparation of the shop drawings. The Contractor shall assume full responsibility for the correctness of quantities, dimensions and fit.
  - 4. Do not order or deliver reinforcement to job site prior to approval of drawings.
- E. Qualification Data: For Installer, manufacturer, and independent testing agency.
- F. Material Certificates: For each of the following, signed by manufacturers:
  - i. Cementitious materials.
  - ii. Admixtures.
  - iii. Form materials and form-release agents.
  - iv. Steel reinforcement and accessories.
  - v. Fiber reinforcement.
  - vi. Curing compounds.
  - vii. Floor and slab treatments.
  - viii. Bonding agents.
  - ix. Adhesives.
  - x. Semirigid joint filler.
  - xi. Joint-filler strips.
  - xii. Repair materials.

- G. List of equipment and Contractor's plan of staging for each foundation mat tremie concrete pour.
- H. List of equipment and Contractor's plan of staging for each seawall concrete pour.
- I. Names of all personnel involved in concrete pour operations, and for each, identify roles of reporting and/or decision-making.
- J. Minutes of pre-construction concrete conference.

#### 1.06 QUALITY ASSURANCE

##### A. Qualifications/Certifications

Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities." Concrete producer's certificate must be presented at site before concrete is placed in accordance with paragraph 27-605(c)(2) of the Building Code.

The Contractor's superintendent's (the person superintending the concrete work) affidavit that all items have been installed as per the documents.

- B. Testing Agency Qualifications: The Contractor shall retain, and submit test reports from, an independent concrete testing agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548. Testing agency shall also be qualified per NYC Building Code criteria as a "Controlled" or "Special Inspector".
- C. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
- D. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- E. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer
- F. Regulatory Requirements
  - 1. Building Code: Work of this Section shall conform to all requirements of the NYC Building Code and all applicable regulations of other governmental authorities. Where more severe requirements than those contained in the Building Code are given in this Section, the requirements of this Section shall govern.
  - 2. Industry Standards: The ACI Standards contained in the ACI Manual of Concrete Practice apply to Work of this Section. Where more severe requirements than those contained in the Standards are given in this Section or the Building Code,

requirements of this Section or the Building Code shall govern. The Contractor shall keep a copy of ACI SP-15 - "Field Reference Manual" at the site.

- G. Certifications
  - 1. Cast-in-Place Concrete shall conform to the material acceptance, certification, and inspection requirements of Article 7, Chapter 1 - Subchapter 1 and Tables 10-1 and 10-2 of the Building Code (Title 27).
  - 2. Cement and aggregate shall be acquired from the same source for all work.
- H. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.  
ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- I. The test results for each proposed design mix shall be one year or less at the time of proposed initial use.

#### 1.07 PRE-POUR CONCRETE CONFERENCE

- A. Contractor shall arrange and conduct pre-pour concrete conference(s) at Project site to demonstrate compliance with Project concrete requirements, to establish protocols for concrete mixing, inspection, delivery and on-site testing, and to coordinate all parties involved with concrete work.
- B. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
  - a. Contractor's project manager, superintendent, foreman and flagman
  - b. Independent testing agency responsible for concrete design mixtures.
  - c. Ready-mix concrete manufacturer.
  - d. Independent testing agency responsible for concrete testing, formwork and rebar verification: provide lab supervisor and field personnel.
  - e. Construction Administrator, if applicable.
  - f. Engineer of Record.
  - g. RI Department of Public Safety officer.
  - h. RIOC.
- C. The conference(s) shall be chaired by the Contractor who shall discuss mix design and demonstrate meeting of the Project concrete design criteria, such as compressive strength, chloride-ion control, shrinkage control, thermal stress control, and material specifications. Proximate examples of prior work using the design mix shall be provided in advance of conference, so as to allow Engineer and RIOC ample time to visit.
- D. At the conference(s) the Contractor shall provide plans or maps showing proposed access routes for concrete trucks, truck waiting area, truck staging for pre-pour testing located within 100ft of the pour location, truck staging for concrete pour, and truck wash-down area with related controls.
- E. At the conference(s) the Contractor shall provide statements and graphics showing means-and-methods of dewatering, including control of tidal waters.

- F. At the conference(s) the Contractor shall establish lead, travel and waiting times for ready-mix pours. The Contractor shall review value-added mix admixtures, and who can authorize their use or adjust their proportions in accordance with the NYC Building Code.
- G. At the conference(s) the Contractor shall review controlled inspection and inspecting agency procedures for plant quality control, field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction of contraction and isolation joints, and joint-filler strips, semi-rigid joint fillers, anchor rod and anchorage device installation tolerances, steel reinforcement installation, concrete repair procedures, and concrete protection.
- H. At the conference(s) the Contractor shall review the field testing and observation criteria, including the specified numerical test values, for acceptance of the concrete, subgrade or substrate, reinforcement and formwork.
- I. At the conference(s) the Contractor shall indicate who has the power to reject the concrete, including which parameters or reasons, and to reject the subgrade or substrate, reinforcement and formwork, or otherwise halt the work.
- J. At the conference(s) the Contractor shall indicate who shall authorize the pour to proceed.
- K. At the conference(s) the Contractor shall review time-frames for preparation and issuance of concrete test reports, distribution list, and provide a draft report copy for review.
- L. At the conference(s) the Contractor shall review criteria for stripping of forms, including specifications' criteria, acceptance and who will authorize forms removal.
- M. At the conference(s) the Contractor shall address backup measures in the event of post-pour testing failures or other material shortfalls to the Project requirements.
- N. Additional pre-pour concrete conferences shall be held at the Project site as needed, such as for phased pre-pour submittals, underpinning (if any) and phased work such as for foundation tremie pours, opposite shoreline pours, change in mix, remedial work, etc.
- O. At the conference(s) the Contractor shall record the meeting minutes and provide time-frames for issuance and review.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement. Deliver reinforcement in bundles properly tagged showing quantity, grade, and suitable identifications marks to allow checking, sorting, and placing. Store reinforcement under cover on supports above the ground.

### **PART 2 - PRODUCTS**

#### 2.01 CONCRETE MATERIALS

- A. Materials used in the mix designs shall conform with ACI 301 Section 4.2.1 Materials.
- B. Max Maximum Coarse-Aggregate Size: no larger than 3/4 inch nominal.

- C. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

## 2.02 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

## 2.03 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and furnish batch ticket information.
- B. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

## 2.04 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.  
  
Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.

## 2.05 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:  
  
Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

## 2.06 REPAIR MATERIALS

- A. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.

Primer: Product of topping manufacturer recommended for substrate, conditions, and application.

Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.

Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109.

### **PART 3 - EXECUTION**

#### **3.01 FORMWORK**

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Coordinate forming of seawall segments with the dimensional control requirements of the project. In particular observe criteria for placement of expansion-contraction joints in order to preserve the seawall railings pattern provided by the drawings.
- D. Contractor shall be entirely responsible for designing, constructing and maintaining formwork to withstand site conditions, including the impacts of East Rover tidal and vessel-wake environment.
- E. Contractor shall be entirely responsible for designing, constructing and maintaining formwork to limit deflections and/or failures under pour conditions.

#### **3.02 STEEL REINFORCEMENT**

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
- B. Minimum concrete cover shall be 3 inches except for under-slab reinforcement shall have a minimum cover of 2 inches.
- C. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- D. Where new concrete is placed on existing concrete, roughen existing surface to ¼-inch amplitude.
- E. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- F. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

- G. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.

### 3.03 JOINTS

- A. Dimensional Control: Coordinate forming of seawall segments with the dimensional control requirements of the project. In particular observe criteria for placement of expansion-contraction joints in order to preserve the seawall railings pattern provided by the drawings.
- B. Construct joints true to line with faces perpendicular to surface plane of concrete.
- C. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.  
  
Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated.  
  
Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.  
  
Space vertical joints in walls as indicated on the drawings.  
  
Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- D. Doweled Joints: Use at locations shown on the Drawings, in particular at transitions to other seawall or wall segments where a key-way is not provided. Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

### 3.04 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement..
- C. Foundation mats shall be cured for a minimum 7 days or the foundation mat reaches a minimum of 75 percent of design strength before concrete for the concrete wall is placed on a mat.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. Deposit concrete to avoid segregation.

Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.

Consolidate placed concrete with mechanical vibrating equipment according to ACI 301. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to

consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

- F. Hot-Weather Placement: Comply with ACI 301 and as follows:

Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

### 3.05 TREMIE PLACEMENT

- A. The Contractor shall be solely responsible to design methods for formwork, dewatering, support to adjacent excavations if needed, support to adjacent structures if needed, and concrete keys as shown on the drawings for seawall foundation mat construction.
- B. Deposit concrete by pump continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. Deposit concrete to avoid segregation.

### 3.06 FINISHING FORMED SURFACE

- A. Smooth-Formed Finish per ACI 301 5.3.3.3.b: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections per the standard. Bevel slightly (1/8") to shed surface water over seawalls top surfaces
- B. Grout-Cleaned Finish per ACI 301 5.3.3.4.b: On new concrete surfaces that are publically visible.

### 3.07 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend

with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

### 3.08 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing. Comply also with NYS Department of Transportation Specifications section 555-3.08 for curing minimum standards.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.

Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.

Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..

### 3.09 JOINT FILLING (IF REQUIRED)

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
- B. Defer joint filling until concrete has aged at least three months. Do not fill joints until construction traffic has permanently ceased.

- C. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- D. Install semi-rigid joint filler at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

### 3.10 CONCRETE SURFACE REPAIRS (IF APPROVED)

- A. The Contractor is alerted to the fact that the setting for these seawalls is a most severe environment. This marine environment is saline, abrasive, erosive and highly exposed, such that patchwork repairs to water-side wall faces will not equal the contract requirement for a long-life concrete seawall. Due to these circumstances, any substantial voids, sloughs, gaps, excessively-cracked (cracks greater than 1/8" width at any point) etc revealed in the cured or curing concrete, shall result in rejection of the product. Such rejection shall include an instruction to demolish the poured wall down to the foundations, and to re-form, re-reinforce and re-pour the wall.
- B. Defective Concrete: Repair and patch defective areas only if approved by Engineer. Remove and replace concrete that cannot be repaired and patched to the Contract requirements and meeting Engineer's approval.
- C. Patching Mortar: Only if approved by Engineer – refer to Grouting specifications section.
- D. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.

Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

- E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

### 3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
  - Reinforcement placement.
  - Headed bolts and studs.
  - Verification of use of required design mixture.

Concrete placement, including conveying and depositing.  
Curing procedures and maintenance of curing temperature.

- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

Slump: ASTM C 143; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.

Compression Test Specimens: ASTM C 31.

Cast and laboratory cure three sets of two standard cylinder specimens for each composite sample.

When required, cast and field cure two sets of two standard cylinder specimens for each composite sample.

Compressive-Strength Tests: ASTM C 39; test first set of two laboratory-cured specimens at 7 days, second set of two specimens at 28 days and third set of two specimens at 56 days.

Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.

A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.

Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 5000 psi.

Test results shall be reported in writing to Engineer, concrete supplier, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for all 7-day, 28-day and 56-day tests.

Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Engineer but will not be used as sole basis for approval or rejection of concrete.

Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION

**SECTION 036000****GROUTING****PART 1 - GENERAL**1.01 DESCRIPTION OF WORK

- A. Furnish material, equipment, labor, services required to provide non-shrink grout. Work includes, but is not limited to grouting for masonry courses in granite block-faced seawall, filling of rail post bolt-holes, base-pads or sleeves, and miscellaneous grouting work.
- B. The Contractor shall be solely responsible for selection of the appropriate grout product and the means-and-methods for its secure and complete placement, in particular within the granite block courses of the seawall.

1.02 RELATED SECTIONS

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 031000 – Concrete Formwork
- B. Section 032000 – Concrete Reinforcement
- C. Section 033000 – Cast in Place Concrete

1.03 REFERENCES

References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work.

- A. American Society of Testing and Materials (ASTM) Standards, latest editions.
  - ASTM C109 Test Method for Compressive Strength of Hydraulic Cement Mortars.
  - ASTM C827 Test Method for Early Volume Change of Cementitious Mortars.
  - ASTM C1107 Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
- B. Army Corp of Engineers
  - CRD C-621 Specification for Non-Shrink Grout.

1.04 SUBMITTALS

- A. Product Data
  - Submit manufacturer's information on the non-shrink grout, including mixing and installation instructions for each type of application.
- B. Quality Control Submittals

1. Contractor Qualifications

Provide proof of Contractor qualifications specified under "Quality Assurance".

2. Mock-Up

For use in both the granite block-faced seawall and as a leveling pad for railings, in each case initially prepare and provide a mock-up for field review by the Engineer.

3. Submit manufacturer's letter of warrantee that the non-shrink mortar/grout, is appropriate for the intended use, and that a field representative has visited the site to observe, understand and recommendation the application of the product. Letter shall include any site-specific or temperature-specific adjustments to the product mixing and installation instructions for each type of application.

1.05 QUALITY ASSURANCE

A. Qualifications

1. Manufacturer: Company specializing in the production of grout shall have a minimum of five years experience.
2. Installer: Company specializing in performing the work of this section shall have three years minimum experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered in manufacturer's sealed and undamaged packaging. Each package shall contain clear and legible labels that meet requirements of local, state and federal regulations identifying manufacturer's name, product name, quantity of material, and batch number.
- B. Protect material from the elements and from other damage at site.
- C. Replace and pay for material and work damaged to the satisfaction of the Authority.

1.07 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply grout at temperatures below 40°F. Follow manufacturer's recommendations for placement temperatures, which is typically at an optimum range of 50°F to 80°F. Provide hot and cold weather procedures at other temperatures.

**PART 2 - PRODUCTS**

2.01 MATERIALS

A. Grout (Cement)

1. Grout shall be non-shrink, non-metallic, cement based material meeting ASTM 1107 and CRD C-621 with the following characteristics:
  - a. Minimum compressive strength of 6000 psi @ 28 days when testing in accordance with ASTM C109 or CRD C-621.

- b. Slight positive expansion when tested in accordance with CRD C-621 or ASTM C827.
  2. Products:
    - a. SikaGrout 212 by Sika Corp.
    - b. Dry Pack Grout and NS Grout by Euclid Chemical Company
    - c. "Five Star Grout" by U.S. Grout Corp.

Contractor to submit for approval during construction

**B. Epoxy Grout**

1. For use as an epoxy-based mortar, an adhesive bonding agent between new and hardened concrete, or for concrete repairs, use a two-component epoxy system similar to section 721-01 or 721-03 of the NYS Department of Transportation Specifications. One component shall be an epoxy resin, the other shall be either a polysulfide polymer or an amine adduct curing agent. Both the selection for use and methods of application shall follow the manufacturer's recommendations.

**2.02 MORTOR COLOR**

- A. Contractor to provide color samples to owner for selection prior to construction.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Examine all adjoining work on which this Work is in anyway dependent for proper installation and workmanship. Report to the Engineer any condition that prevents the performance of this Work.
- B. The Contractor shall be solely responsible for selection of the appropriate grout product and the means-and-methods for its secure and complete placement, in particular within the granite block courses of the seawall.
- C. The Contractor shall prepare a mock-up, for field review by the Engineer, demonstrating the use in both the granite block-faced seawall and as a leveling pad for railings. In particular demonstrate how grout can be applied without creation of voids between the courses. Approval by the Engineer shall not relieve the Contractor of its responsibility to achieve a void-free substrate between the granite block courses.
- D. Repair surfaces to receive grout as approved by the Engineer of Record to ensure that the maximum allowed thickness of material is not exceeded.

**3.02 SURFACE PREPARATION**

- A. Concrete and masonry surface shall be free of all loose material.
- B. Steel shall be clean and free of corrosion.

- C. Surfaces shall be free of oil, grease, loose paint, corrosive deposits, dust, laitance and other contaminants.

### 3.03 APPLICATION

- A. Perform all grouting in accordance with the recommendations of ACI, CSI, and the grout manufacturer's published specifications for site preparation, product mixing, and placing. For grouting in weather below 50°F, contact manufacturer for cold weather instructions.
- B. Arrange with the manufacturer of the grout for the services of a qualified field representative to instruct the work crews in the mixing of components, preparation of surfaces, technique of installation, and inspection procedures.
- C. Place grout at a no more than "flowable" consistency, carefully using the manufacturer's recommended water content.
- D. Follow manufacturer's instructions for curing.

### 3.04 PROTECTION AND CLEANING

- A. Clean all adjacent area of excess material and clean all floors and walls of powder and droppings.

### 3.05 FIELD QUALITY CONTROL

- A. The Contractor's Testing Agency will inspect the grouting procedure and take cube specimens to test compressive strength.
- B. The Engineer will inspect and reject any grout or mortar installations that are of inadequate strength or contains cracks or other defects. These areas shall be fixed at contractor's expense.
- C. Engage the services of the material manufacturer's representative to instruct in the proper mixing and usage of the material to ensure the grout is placed at the correct consistency and manner.

END OF SECTION

**SECTION 044313****STONE MASONRY VENEER****PART 1 - GENERAL**1.01 DESCRIPTION OF WORK

- A. Furnish material, equipment, labor, services required to reuse granite/stone blocks to be re-set into specified seawall section.
- B. The Contractor shall be solely responsible for selection of the appropriate grout product and the means-and-methods for its secure, stable and complete placement within the granite block courses of the seawall.

1.02 RELATED SECTIONS

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 029000 – Site Preparation
- B. Section 033000 – Cast in Place Concrete
- C. Section 036000 – Grouting

1.03 SECTION REQUIREMENTS

- A. Submit qualification data for masonry contractor per spec section 036000.
- B. Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- C. Comply with cold-weather and hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
- D. Submit a detailed procedure supported by the manufacturer and precedent work to show that the Contractor can apply and sustain the mortar product to fill the granite-to-concrete joints. A representative from the mortar manufacturer shall attend a special site meeting convened for the purpose. Contractor shall be solely responsible for selection of the appropriate grout product and the means-and-methods for its secure, stable and complete placement within and around the granite block courses of the seawall.

**PART 2 - PRODUCTS**2.01 STONE

- A. Granite: ASTM C 615.
- B. Stone blocks sourced on site from demolished stone seawalls.

- C. Stones selected for seawall reconstruction to be of similar size and shape, to be determined by the Contractor as fitting the recess of the concrete wall as shown on the drawings. A selection of blocks shall be submitted by the Contractor to RIOC for color review and approval.

2.02 MORTAR

- A. Mortar for Stone Masonry Veneer shall conform to requirements of section 036000.

2.03 MISCELLANEOUS MATERIALS

- A. Acidic Cleaner: Cleaner designed for removing mortar stains from stone masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

**Manufacturers:**

Diedrich Technologies, Inc.  
EaCo Chem, Inc.  
Hydrochemical Techniques, Inc.  
Approved submitted equivalent.

**PART 3 - EXECUTION**

3.01 STONE MASONRY GENERAL

- A. Stone blocks sourced on site from demolished stone sea walls.
- B. Stones selected for seawall reconstruction to be of similar size and shape, to be determined by the Contractor as fitting the recess of the concrete wall as shown on the drawings. A selection of blocks shall be submitted by the Contractor to RIOC for color review and approval.

3.02 INSTALLATION

- A. Execute stone masonry by skilled masons experienced with the kind and form of stone and installation method indicated. Arrange stones for good fit, in pattern indicated.
- B. Maintain uniform joint widths except for variations due to different stone sizes and minor variations required to maintain bond alignment. Lay walls with joints not less than 3/8 inch (10 mm) at narrowest points or more than 5/8 inch (16 mm) at widest points.
- C. Set stone in full bed of mortar with full head joints.
- D. Rake out joints for pointing 1/2 inch (13 mm) deep.

3.03 POINTING

- A. The Contractor shall be solely responsible for selection of the appropriate grout product and the means-and-methods for its secure, stable and complete placement within the granite block courses of the seawall.

- B. Point stone joints by placing and compacting pointing mortar in layers not more than 3/8 inch (10 mm) deep. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce joint profile indicated.

3.04 CLEANING

- A. In-Progress Cleaning: Clean masonry as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly cured, remove large mortar particles, scrub, and rinse stone masonry veneer.
- C. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.

END OF SECTION

**SECTION 310913****MONITORING OF ADJACENT STRUCTURES****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Monitoring of existing structures shall be performed in accordance with the requirements of the Contract Documents and the 2014 NYC Building Code.
- B. Work in this Section includes, but is not necessarily limited to the following:
  - 1. All labor, materials, equipment, and services necessary to document conditions and protect existing structures (including but not limited to buildings, roadways, sidewalks and utilities) from damage during construction
  - 2. All engineering, surveying, layout, monitoring, and submittals in connection with the work in this Section.
  - 3. Photographic documentation of pre-construction conditions of adjacent structures and nearby historic landmark buildings.
  - 4. Survey monitoring of adjacent structures and nearby historic landmark buildings for the duration of construction.
  - 5. Crack propagation monitoring of adjacent structures and nearby historic landmark buildings for the duration of construction.
  - 6. Vibration monitoring of adjacent structures and nearby historic landmark buildings during excavation, foundation installation and other below-grade construction for the duration of construction.
  - 7. Review of existing relevant, subject building and structural drawings as needed to perform a structural stability assessment by a New York State licensed professional engineer.
  - 8. Other labor and materials as may be reasonably inferred to be required to make the work under this Section complete.

**1.02 RELATED SECTIONS**

The contract drawings, other sections of these specifications, and the contract general provisions, including general and special conditions and related contract documents, apply to this section.

- A. Section 022100 – Project Survey and Layout
- B. Section 029000 – Site Preparation
- C. Section 312300 – Earthwork

**1.03 DEFINITIONS**

- A. Where “structure” is used herein, it shall include all buildings, tunnels, sheds,

roadways, sidewalks, utilities, poles, curbs, pavements, and other appurtenances which are to remain during construction.

- B. “Review Level”: The instrumentation value above which will trigger the evaluation of current construction methodology and, if necessary, implementation of mitigative action as shown in this specification to avoid detrimental effects on the surrounding facilities.
- C. “Alert Level”: The instrumentation value above which will halt the construction, require evaluation of subject, relevant structures affected, and necessitate mitigative action as shown in this specification to prevent damages to surrounding structures. The action must be such that the Alert Level is not exceeded in subsequent construction.

#### 1.04 REFERENCES

- A. All work shall comply with all applicable codes and regulations having jurisdiction, including but not limited to the requirements of the Building Code of the City of New York (Building Code), requirements of the New York State Department of Labor, requirements of Occupational Safety and Health Administration (OSHA), requirements of New York State Department of Health (NYSDOH), requirements of the New York State Department of Environmental Conservation (NYSDEC), requirements of the New York City Department of Environmental Protection (NYCDEP), requirements of the New York State Department of Transportation (NYSDOT), requirements of New York City Department of Transportation (NYCDOT), and with applicable requirements of all other authorities having jurisdiction.
- B. New York City Department of Buildings (DOB) Technical Policy and Procedure Notice (TPPN) #10/88, published on 6 June 1988.
- C. United States Bureau of Mines (USBM), Report of Investigations (RI) 8507, “Structure Response and Damage Produced by Ground Vibrations from Surface Blasting,” by D. E. Siskind, M. S. Stagg, J. W. Kopp, and C. H. Dowding, dated 1980.
- D. Deutsches Institut für Normung (DIN) 18723 – Field Procedure for Precision Testing of Surveying Instruments.
- E. National Institute of Standards and Technology (NIST).
- F. The following project-specific documents shall be referenced for the work of this Section:
  1. Project Specifications and Contract Drawings
  2. Geotechnical Engineering Memorandum prepared by Langan Engineering, Environmental Surveying, Landscape Architecture and Geology, D.P.C. and dated 22 May 2013.
  3. Construction Protection Plan prepared by the Owner’s Consultant for monitoring plans and details for subject relevant buildings, and structures to be monitored.

#### 1.05 SUBMITTALS

Unless noted otherwise, the contractor shall prepare and submit the following items to the engineer for approval at least 30 days before the start of said work.

- A. Submit the preconstruction conditions documentation report of the subject surrounding structures.
- B. Submit documentation verifying that those performing the monitoring program have

the required qualifications as specified herein.

- C. The Contractor shall review the monitoring plan prepared by a licensed professional land surveyor. The plan shall show the location of all installed vibration monitoring devices, crack monitoring gages, survey monitoring points and the survey benchmark(s) that will be used for vibration and optical survey monitoring. Monitoring plan and periodic elevation and lateral position control point monitoring data for the subject structures shall be submitted by the professional land surveyor.
- D. Provide proposed method and locations of elevation and lateral position control points to be established to monitor any vertical and horizontal movements during excavation and shoring installation.
- E. Provide results of monitoring point survey and crack monitoring within 24 hours of taking the readings. Provide via remote notification vibration monitoring results in real time.
- F. Weekly monitoring reports shall be submitted by the professional land surveyor to the Owner's Engineers for review. The reports shall include incremental and cumulative deviation in vertical, longitudinal, and transverse axes; vertical and horizontal deviation at crack gauges; maximum daily peak particle velocity in vertical, longitudinal, and transverse axes; waveform recording of vibrations that exceed the threshold specified below.

#### 1.06 QUALITY ASSURANCE

- A. Optical monitoring shall be performed by a Professional Land Surveyor licensed in the state of New York with a minimum of three years of experience (or as approved by the Engineer) in deformation measurements of the types and accuracies specified herein.
- B. Crack propagation and vibration monitoring shall be performed under the supervision of a Professional Engineer licensed in the State of New York with a minimum of three years of experience (or as approved by the Engineer) in monitoring of the types and accuracies specified herein.
- C. The engineer responsible for Structural Stability of adjacent structures shall be a Professional Engineer licensed in the State of New York State with a minimum of five years of experience (or as approved by the Engineer) in performing structural stability assessment.

#### 1.07 PROJECT CONDITIONS

- A. The Contractor shall visit the site and shall review the above mentioned project documents and geotechnical engineering studies to familiarize themselves with the existing conditions of the surrounding historic buildings. All existing building elements and utilities shall be inspected by the Contractor prior to entering a bid.
- B. There are sensitive buildings adjacent to and within the vicinity of the site. The work shall be executed so that no damage or injury will occur to the existing neighboring structures. Should any damage or injury occur that is caused by the Contractor, or by anyone in Contractor's employ, or by the work under this Contract, the Contractor shall repair such damage at his own expense and shall assume all responsibility for such injury.
- C. The site is located within the Southpoint Open Space Park, Roosevelt Island, New York. The site is bound by South Loop Road to the north, East River to the east, Franklin D. Roosevelt Four Freedoms Park to the south and East River to the west.

- D. Buildings/Structures of Interest for Preconstruction Documentation and Monitoring Purposes include the following:
1. Smallpox Memorial Hospital Ruins: The 3-story stone building is located southeast of the Southpoint Open Space Park adjacent to the East Road.
  2. Strecker Memorial Laboratory: The 2-story building with 1-level basement is located east of the Southpoint Open Space Park adjacent to the East Road.
- E. No guarantee is expressed or implied for the inferred information based on the subsurface logs and profiles provided in the geotechnical studies mentioned above. Boring logs are available for the Contractor's review. The Owner makes no predictions or representations regarding the character or extent of soil, rock, or other subsurface conditions to be encountered during the work. No information derived from such boring logs or plans will, in any way, relieve the Contractor from the responsibility of making his own evaluations, inspections and determinations in regards to the conditions at the site. The Contractor shall make his own assumptions of subsurface conditions that may affect methods of construction of the work hereunder, and he agrees that he will make no claims for damages or compensations, except as are provided under the agreement, should he find conditions during the progress of the work different from those as calculated and/or anticipated by him. Additional borings and other exploratory operations may be performed by the Contractor, at the Contractor's expense and following the Owner's approval. No change in the Contract Sum will be authorized for such additional exploration undertaken by the Contractor.
- F. The Contractor shall be held to have visited the site and to have familiarized themselves with the existing conditions of site and the historic buildings.
- G. Existing Utilities: Locate existing underground utilities in and beyond the areas of work. If utilities are indicated to remain in place, provide adequate means of support and protection during the work. The locations of utilities shall be verified in the field by the Contractor prior to work. Protection of all utilities located on the site is the sole responsibility of the Contractor.
1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner immediately for directions. Cooperate with the Owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
  2. Do not interrupt existing utilities serving facilities occupied by the Owner or others, during occupied hours, except when permitted in writing by the Construction Manager and then only after acceptable temporary utility services have been provided. Provide minimum of 48 hour notice to the Construction Manager, and receive written notice to proceed before interrupting any utility.
  3. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies for shutoff of services if lines are active.

- H. The Contractor, by careful examination, shall inform themselves of the nature and location of the work, the conformation of the ground, the nature of the subsurface conditions, the locations of the groundwater table, the character, quality and quantity of the materials to be encountered, the character of the equipment and facilities needed prior to and during the execution of the work, and all other matters which can in any way affect the work.
- I. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, and ingress and egress of the site of the work. The Contractor shall conform to all New York City and State, and Federal regulations in regard to the transportation of materials to and from and at the job site and shall secure in advance such permits as may be required.
- J. Coordination: Examine drawings to determine sequence of operations, and relation to work of other trades. Start of work will signify acceptance of field conditions and will acknowledge coordination with other trades.
- K. Comply with all federal, state and local environmental and health and safety regulators, including but not limited to Occupational Safety and Health Administration (OSHA).
- L. The Contractor shall verify all dimensions, distances, and elevations of existing structures prior to start of work.

## **PART 2 - PRODUCTS**

### **2.01 MONITORING EQUIPMENT**

- A. Optical Survey Monitoring Points and Equipment
  - 1. Optical monitoring points on buildings for vertical and lateral displacement shall be mountable targets or prisms.
  - 2. Settlement monitoring points may be set using pins or cross hatches in the structure to be monitored.
  - 3. Accuracy of the survey monitoring readings shall be within 1/16 inch (0.005 ft) or better. Use appropriate calibrated survey equipment and procedures to achieve the specified accuracy level.
- B. Crack Gauges
  - 1. If allowed by the Property Owner, clear plastic crack gauges with reference line and measuring grid shall be used. Crack gauges shall be attached to structures using epoxy or bolts in accordance with manufacturer's recommendations. Photographic documentation should be used for monitoring.
  - 2. If the Property Owner will not allow installation of crack gauges, reference lines may be used. A reference line should be drawn across and perpendicular to the crack. Two measurement points (one on either side of the crack) should be drawn and the initial distance between the two measurement points recorded for future comparison. Measurements should be taken in 1/32-inch increments.
- C. Vibration Monitoring Equipment
  - 1. Portable seismographs with the ability to record vibration events up to 10

inches per second (in/sec) with an accuracy of  $\pm 5\%$  over a range of frequencies from 2 to 250 Hz.

2. Seismographs shall have the ability for remote monitoring and shall be set up to send recorded data at least twice daily and send out immediate, automatic alerts if threshold values are exceeded.

### **PART 3 - EXECUTION**

#### **3.01 PROTECTION OF ADJACENT STRUCTURES**

- A. The work shall be executed so that no damage or injury will occur to the subject landmark buildings. Should any damage or injury occur that is caused by the Contractor, or by anyone in Contractor's employ, or by the work under this Contract, the Contractor shall repair such damage at his own expense and shall assume all responsibility for such injury.
- B. The above shall also include the protection of all existing utilities (including sewers, water lines, electrical lines and telecommunication lines) to remain in use within and adjacent to the area affected by the work of this project.
- C. Prior to commencement of any work, consult the records for existing utilities, and note all conditions and limitations which might affect the work required under this Section. The Contractor shall not damage any utilities that are to remain and shall leave them accessible.
- D. Monuments, benchmarks and other reference features on streets bounding this project, shall be protected. Should these be disturbed in any manner, the Contractor shall have them replaced at no cost to the Owner.

#### **3.02 PRE-CONSTRUCTION CONDITIONS DOCUMENTATION**

- A. General: The Owner's Consultant shall perform a condition documentation of all the adjoining properties and structures of interest (or within 50 feet of the site, whichever is more stringent) prior to beginning of the work. The buildings of interest for this task are identified Part 1. Condition documentation shall include photographs, sketches, crack reference lines, elevation control points and measurements of ambient vibrations.
- B. Photographs: Take photographs of the building walls of the adjoining properties and existing school (if applicable) so that the surfaces may be examined during construction and compared with the pre-work condition. If any cracks or other stress signs are exhibited by the buildings, halt operations until corrective action has been provided and is acceptable to the Owner.
- C. Crack Reference Lines/Gauges: Install several crack monitoring gauges or lines on any nearby existing crack on adjacent properties. Monitor the lines/gauges during construction and compare with the pre-work condition. If increased stress signs are observed on the crack reference lines/gauges, halt operations until corrective action has been provided and is acceptable to the Owner.
- D. A copy of the pre-construction conditions documentation of the subject structures will be made available to the Contractor upon contract award.
- E. The Contractor may perform, if he wishes, his own conditions verification survey and shall submit any findings that differ from the Owner's Engineer's documentation at least 15 work days before beginning the work.

- F. Before starting work, the Professional Engineer and Land Surveyor shall check and verify governing dimensions and elevations, survey conditions of adjoining properties and historic landmark buildings, and record any prior settlement or cracking of structures, pavements, and other improvements.

### 3.03 MONITORING OF EXISTING STRUCTURES

For this project, the buildings, structures, elements of interest for monitoring purposes are identified in the Part 1 of these specifications.

#### A. Vertical and Lateral Displacements -

1. Monitor each building/structure/element of interest within 50 feet of the site laterally.
2. Install a minimum of 10 optical survey monitoring points on each façade of the buildings/structures of interest (minimum of 5 sets of 2 points each – each set consisting of one point within the lower level (street level) and one point at the roof line, at a minimum) for monitoring vertical and lateral displacement. Monitoring locations shall not be spaced at intervals exceeding 25 feet laterally. Install additional sets of monitoring points as necessary to maintain this spacing.
3. All monitoring locations shall be subject to review by the Owner's Engineers.
4. The monitoring points shall be established and monitored by the Professional Land Surveyor licensed in the State of New York, and referenced to a fixed, off-site benchmark.
5. The Contractor may establish additional monitoring points on the existing adjacent structures, subject to the Property Owner's approval, to adequately monitor and otherwise keep himself informed of the structures' conditions during the work.

#### B. Crack Gauge Monitoring

1. Install crack gauges at large visible cracks in the foundation walls on the buildings/structures of interest identified in Part 1 to monitor changes in crack width during construction. Initial conditions of the crack gauges shall be measured and/or documented photographically.
2. Location of crack gauges shall be selected by agreement between the building owner, Contractor, the engineer responsible for Structural Stability and the Owner's Engineer.

#### C. Vibration Monitoring

1. Install at least 1 seismograph in each adjacent/neighbor building. Seismographs are to be installed at the lowest level of each building at a point closest to the construction anticipated to cause maximum vibrations (e.g. demolition, heavy equipment, earthwork etc).

2. Alerts shall be sent out automatically to designated recipients (Owner's Engineer, Owner's Representative, Contractor, and engineer responsible for Structural Stability) if threshold levels specified below are exceeded.
3. Waveform recording of vibrations shall be provided for vibration events exceeding a peak particle velocity of 0.250 inches per second as measured along any axis.

### 3.04 FREQUENCY AND REPORTING

- A. Optical Survey Monitoring
  1. Monitoring shall be performed by the Professional Land Surveyor once weekly during construction. The accuracy (margin of error) of the survey readings shall be 0.005 feet or better. All monitoring data shall be transmitted to the Owner on a weekly basis.
- B. Crack gauges shall be monitored once a week during construction activities. Monitoring shall consist of measuring the distance between the points established during installation or by documenting the crack gauge photographically.
- C. Vibration monitoring shall be performed on a continual basis during construction activities.
- D. Should movements or vibrations exceed the specified thresholds, monitoring intervals shall be increased to daily unless otherwise instructed by the Owner's Engineer.
- E. Owner's engineer shall decide when to terminate monitoring based on the construction operations.

### 3.05 ALERTING

- A. Alerts shall be generated when data collected are determined by those responsible for that aspect of monitoring to have reached or exceeded the Review and Alert Level thresholds as defined herein.
- B. Alerts for Review and Alert Level thresholds shall be promptly forwarded to the Construction Manager, Owner, and Owner's Engineer. The alert shall contain the monitoring point that has exceeded its Review and Alert Level threshold, the data, the date and time of the reading, the reading value and the Review or Alert Level. For vibrations exceeding the Review or Alert Level thresholds, the alert should include the waveform recording of the vibrations.
- C. The alert system shall include a means for the recipient of the alert to acknowledge that the alert has been received and to disable repeated alarming on that sensor.
- D. The Contractor shall make every effort to work with those responsible for monitoring to provide timely readings for review of data and sending of alerts.

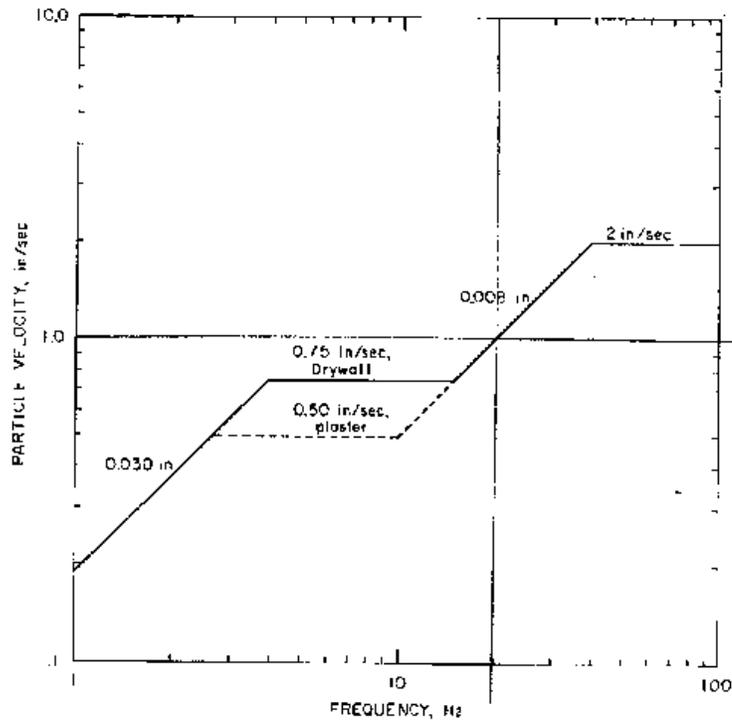
### 3.06 THRESHOLD LIMITING VALUES

- A. The Contractor shall take every precaution to guard against excessive movement, settlement, groundwater drawdown, vibration, or damage of adjacent buildings and structures. The Contractor is solely and entirely responsible for the safety and support of such structures, and liable for any damage and injury caused thereby or resulting therefrom.
- B. The following Review Level Thresholds shall require that the Contractor cease construction, review their means and methods of construction and suggest revised means and methods to limit movements and vibrations in adjacent structures. A written

description of revised means and methods must be submitted by the Contractor before work can proceed.

1. Vertical or Horizontal Movement
    - a. Buildings or other Structures: Two consecutive readings of 1/8-inch of movement, or one confirmed reading of 1/4-inch.
    - b. Excavation Support Systems: Three consecutive readings of 1/4-inch of movement, or one confirmed reading of 1/4-inch.
  2. Crack Gauges: three consecutive readings of 1-millimeter, or one confirmed reading of 3-millimeters.
  3. Vibrations
    - a. Buildings of Interest and Other Structures: Peak Particle Velocity exceeding 0.500 inches per second measured along any axis.
- C. The following Alert Level Threshold (maximum allowable limits) values shall require the Contractor to cease construction activities and notify the construction manager, Owner, Owner's Engineer, and Department of Buildings (DOB) Excavation Unit immediately. The engineer for Structural Stability engaged by the Contractor will make an inspection of the affected building within 24 hours of the reported exceedances. The contractor's engineer will prepare a report assessing the condition of the affected building and any required remediation. The report will be submitted to the construction manager, the design team, and the DOB Excavation Unit within 48 hours of the incident. If the building is judged to be in an unstable condition, the DOB will be notified immediately. Construction activities shall not continue until adequate measures are in place to achieve stability of adjacent structures or excavation support systems. Where significant movements are detected the frequency of data collection shall be increased to once daily or as directed by the Owner's Engineer.

1. Alert Level Vertical and Horizontal Movements
  - a. Buildings or other Structures: 0.35-inch total vertical or 0.35-inch total horizontal.
  - b. Excavation Support Systems: 0.5-inch total movement.
2. Crack Gauges: 4 millimeter increase in crack width.
3. Vibrations:
  - a. Buildings: Peak particle velocities (PPV) exceeding the USBM plot of allowable PPV versus frequency as published in RI 8507 (graphically shown below).



- b. Buildings/Structures of Interest: For landmark buildings, such as the surrounding structures identified in part 1, PPV shall not exceed 0.5 inch per second for all frequencies.
- D. Any movement or vibration levels exceeding the above criteria shall be reported immediately to the Owner. If the above thresholds are exceeded:
1. The Contractor will immediately stop work in the vicinity of the exceedance.
  2. The engineer for Structural Stability engaged by the Contractor will make an inspection of the affected building or structure within 24 hours of the reported exceedances. The Contractor's engineer will prepare a report assessing the condition of the affected building and any required remediation. The report will be submitted to the construction manager, the design team, and the DOB Excavation Unit within 48 hours of the incident.
  3. The Contractor shall develop alternate methods and procedures, subject to the review and approval of the Owner's Engineers and the affected building's engineers.
  4. Resume work using the agreed upon alternative method.
  5. Corrective measures to achieve stability of adjacent structures shall be the responsibility of the Contractor. The Contractor shall restore, to the satisfaction of the Property Owner, by repair or otherwise, the portions of buildings, or their contents, altered by the Contractor's work. Restoration shall be completed to the conditions which existed prior to the start of work.

END OF SECTION

**SECTION 312300****EARTHWORK****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Cutting, filling, and grading to required lines, dimensions, contours, and elevations for proposed improvements.
- B. Scarifying, compacting, drying, and removal of unsuitable material to ensure proper preparation of areas for fills or proposed improvements.
- C. Rock excavation where necessary.
- D. Stabilization of soils and rock cuts.
- E. Subgrade preparation for foundations, slabs, pavements, walls and proofrolling.
- F. Shoring and Bracing
- G. Dewatering where necessary.
- H. Placement of vertical drainage mats behind foundation walls.
- I. Installation of perimeter drainage system behind foundation walls.
- J. Comply with the project Storm Water Pollution Prevention Plan (SWPPP).
- K. Comply with the project Soil Management Plan (SMP).
- L. Excavation, testing, and disposal of contaminated soil

**1.02 RELATED SECTIONS**

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 29000 – Site Preparation
- B. Section 312500 – Soil Erosion and Sediment Control
- C. Section 312500 – Rip-Rap Revetment

**1.03 RELATED DOCUMENTS**

- A. Information regarding geotechnical subsurface conditions is given in the following geotechnical engineering report, copies of which are available for bid evaluation purposes from the office of the Construction Manager:
  - 1. Geotechnical Engineering Memorandum dated 22 May 2013 by Langan Engineering and Environmental Services (Langan).

- B. Information regarding environmental soil/subsurface conditions and soil management practices are given in the following environmental engineering report, copies of which are available for bid evaluation purposes from the office of the Construction Manager:
  - 1. Soil Management Plan (SMP) dated 20 February 2019 by Langan Engineering and Environmental Services (Langan).
- C. The project Storm Water Pollution Prevention Plan (SWPPP) has been prepared by Langan Engineering and Environmental Services (Langan), copies of which are available for bid evaluation purposes from the office of the Construction Manager.
  - 1. Storm Water Pollution Prevention Plan (SWPPP) dated 20 February 2019 by Langan Engineering and Environmental Services (Langan).

#### 1.04 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM) latest edition.
  - D422 Method for Partial Size Analysis
  - D 1557 Laboratory Compaction Characteristics of Soil Using Modified Effort
  - D 2216 Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil-Aggregate Mixtures
  - D 2487 Classification of Soils for Engineering Purposes
  - D 2922 Density of Soil and Soil-Aggregate In Place by Nuclear Methods (Shallow Depth)
  - D 3017 Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)
  - D 4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- B. American Association of State Highway and Transportation Officials (AASHTO) latest edition.
  - T 88 Particle Size Analysis of Soils
- C. New York State Department of Transportation Standard Specifications for Road and Bridge Construction and Materials, January 2, 1990.
- D. New York State Department of Environmental Conservation
- E. All Applicable USEPA Rules & Regulations
- F. All Applicable NYCDEP Rules & Regulations
- G. All Applicable Department of Transportation and Department of Sanitation Rules and Regulations.
- H. New York City Building Code
- I. OSHA Regulations

1.05 DEFINITIONS

## A. Excavation

Wherever the word "excavating", "excavate", "excavation", "carried down", "remove", etc., are used, they shall be taken to include the removal of all existing work, including brick work, rubble work, rubbish, earth, as well as rock, boulders, steel grillages and concrete and all other materials and obstructions encountered; they shall also be taken to include all sheet piling, bracing, pumping, and all operations and items needed for the proper execution of the work. Excavation is considered unclassified and consists of removal of material encountered to contract level and subsequent loading, transporting and legal disposal of such.

## B. Improvements

Man-produced items such as concrete, stone, brick, asphalt, piping, etc. Those items are not naturally occurring.

## C. Non-Hazardous Excavated Material

Material includes recognized soil (including natural undisturbed material), debris, concrete and concrete products (including steel or fiberglass reinforcing rods that are embedded in the concrete), asphalt pavement, brick, glass, and rock, and having contaminants at levels of organic compounds or inorganic analytes that do not exceed NYSDEC TAGM HWR-94-4046 Recommended Soil Cleanup Criteria. This material includes material defined in Title 6 New York Codes, Rules and Regulations Part 360-7.1(b)(i).

## D. Hazardous Waste:

Material meeting the definition of a Resource Conservation and Recovery Act hazardous waste as defined in 40 CFR Part 261 or 6 NYCRR Part 371.

## E. Environmentally Clean Fill and Backfill

Material that has been tested and found to contain levels of organic compounds or inorganic analytes that do not exceed NYSDEC TAGM HWR-94-4046 Recommended Soil Cleanup Criteria.

1.06 QUALITY ASSURANCE

## A. Qualifications

1. Company specializing in performing the Work of this Section shall have a minimum of 3 years experience and shall have worked on 3 projects of similar size.
2. Preparation of details of shoring and bracing, if needed for deep excavations, shall be under the direct supervision of and bear the seal of a Licensed Professional Engineer of the State of New York experienced in the design of such work, who shall also be responsible for construction supervision of such.

## B. Regulatory Requirements

1. Work of this Section shall conform to all requirements of the NYC Building Code and all applicable regulations and guidelines of all governmental authorities having jurisdiction, including, but not limited to, safety, health, and anti-pollution regulations. Where more stringent requirements than those contained in the

Building Code or other applicable regulations are given in this Section, the requirements of this Section shall govern.

2. Conform to requirements of "Safety and Health Standards, Subpart P - Excavations, Trenching and Shoring" - OSHA.
- C. RIOC shall retain a qualified independent geotechnical engineering agency, herein referred to as RIOC's Engineer or Geotechnical Engineer, to conduct quality assurance as specified in this section.
- D. All the earthwork shall be conducted under the full-time inspection of RIOC's Geotechnical Engineer who will inspect the excavation and determine which excavated soils may be reused as backfill material.
- E. RIOC's Geotechnical Engineer may perform field density tests during the placement of fill material and compaction.
1. In cut areas, not less than 1 compaction test for every 10,000 sq. ft. or for each section being backfilled in fill areas, the same rate of testing for each lift. In no case shall less than 4 tests be performed.
  2. Foundations subgrade areas: In cut areas, not less than 1 compaction test each footing. In fill areas, the same rate of testing for each lift.
  3. Field density tests of subgrade for foundations bearing on tremie mat shall not be necessary.
- F. If compaction requirements are not complied with at any time during construction process, remove and recompact deficient areas until proper compaction is obtained at no additional expense to Owner.
- G. The following tests will be performed by the Contractor as part of construction testing requirements on the soil samples that the Contractor provided of each type of on-site or imported soil material used as compacted fill:
1. Moisture and Density Relationship: ASTM D 1557.
  2. Particle Size Analysis: ASTM D422
  3. Plasticity Index: ASTM D 4318 (if necessary based upon 1+2 above)
- H. Field density tests for in-place materials shall be performed in accordance with the following standard:
1. Nuclear Method: ASTM D 2922 (Method B-Direct Transmission)
- I. The Geotechnical Engineer will prepare test reports that indicate test location, elevation data, and test results. RIOC and Contractor will be provided with copies of reports within 96 hours of the time that the test was performed. In the event that tests performed fail to meet Specifications, RIOC and Contractor will be notified immediately by Geotechnical Engineer.

#### 1.07 SUBMITTALS

All submittals shall be submitted at least 15 days prior to start of work unless specified otherwise. All design submittals shall be sealed by a professional engineer licensed in New York. All surveying submittals shall be sealed by a land surveyor licensed in New York.

A. Product Data

Provide manufacturer's information on the proofrolling and compaction equipment to be used on each type of material for review after Notice to Proceed.

B. Design, Procedure and Shop Drawings

1. Submit shop drawings and/or Engineer's reports required under Part 3.
2. Submit dewatering procedure, design and calculations.
3. Submit temporary excavation support and shoring design, calculations and procedure.
4. Submit excavation procedure
5. Submit procedure for protection and monitoring of adjacent structures.
6. Submit monitoring reports of adjacent structures at a frequency dictated by design drawings.

C. Samples

- a. Submit 50-lb samples of each type of off-site fill material (from each borrow source) and/or proposed pavement sub-base material that is to be used at site in air tight container for the Geotechnical Engineer to test or submit gradation and certification of aggregate material that is to be used to Geotechnical Engineer for review.
- b. Submit name of each material supplier and specific type and source of each material. Change in source throughout project requires approval of Owner. Certification of compliance and, if requested, test results substantiating compliance shall be furnished to the Geotechnical Engineer by the Contractor.
- c. Submit a 12 inch by 12 inch sample of geotextile fabric and a 12 inch long drainage pipe sample to be used in the foundation drainage work for review and approval.
- d. Submit a 12-inch-long drainage pipe sample, for each pipe diameter to be used, for review and approval.
- e. Submit a 12 inch by 12 inch sample of the vertical drainage mat to be used in the foundation drainage work for review and approval.

D. Quality Control Submittals

1. Design Data

Provide the following information:

- a. Gradation analysis for fill materials.
- b. Gradation analysis for aggregate bases.
- c. Gradation analysis for broken stone ballast.

## 2. Certificates

- a. Provide certificate guaranteeing fill and backfill material used for construction conforms to the samples supplied and the requirements of this Section.
- b. Provide certificate guaranteeing aggregate materials used for construction conforms to the gradation supplied and the requirements of this Section.
- c. Provide facility permits, disposal requirements, and waste analytical requirements for each proposed off-site disposal facility.
- d. Provide letter from the borrow area(s) stating that the imported fill is environmentally clean. Submit results of TAL/TCL+30 environmental tests results.

## 3. Contractor Qualifications

- a. Provide proof of Contractor and Professional Engineer qualifications specified under "Quality Assurance".

## 4. Testing

Provide analytical testing of:

- a. Soil classification in accordance with ASTM D 2487
- b. Moisture content in accordance with ASTM D 2216
- c. Modified Compaction Test in accordance with ASTM D 1557
- d. Particle size analysis in accordance with ASTM D 422 (sieve only)
- e. Plasticity index in accordance with ASTM D 4318
- f. Existing material to be removed to verify material classification listed in Article 1.04.
- g. Borrow (imported fill) material to verify it is environmentally clean (in addition to certificate).

## E. Regulatory Plan Compliance

1. Comply with the project Storm Water Pollution Prevention Plan (SWPPP), and make required submittals.
2. Comply with the project Soil Management Plan (SMP), and make required submittals. Include an Excavated Material Disposal Plan if so required by Project phasing.

F. Certification for Examination of Site and Records: Before proceeding with the Work, submit certification in an acceptable form, signed by the Contractor, stating that careful examination has been made of the site, existing structures, existing adjacent structures, records of utility lines, test boring records, soil samples, subsurface exploration reports, the Drawings, and all other Contract Documents.

G. Pre-Construction Conditions Survey and Monitoring of Existing Structures: Existing landmark buildings Smallpox Hospital and Strecker Laboratory, as well as adjacent portions of Four Freedoms Park granite walls, shall be monitored for two weeks prior to start of construction and during construction in accordance with the requirements and criteria shown on the drawings for the Contractor's preparation of a Construction Protection Plan. Prepare and submit the proposed Construction Protection Plan before proceeding

with the work. Submit monitoring results as specified herein within two days after completing the monitoring work.

- H. All pertinent information relating to the transport of materials. The information submitted shall include, but not be limited to:
1. Name and address of all transporters
  2. All local, state and federal permits required for the transport of excavated materials resulting from the performance of the work. The licenses and permits that may apply include, but are not limited to: NYSDEC Part 364 permits, hazardous waste transporter permits issued under 6 NYCRR Part 372.3 (if applicable), vehicle and hauling permits
  3. USEPA and/or state identification number and license expirations date (if required).
  4. Proof of permit, license or authorization to transport waste in all affected states.
- I. The Contractor shall submit a site-specific HASP to the Owner or the Owner Consultant at least fourteen (14) days prior to the Contractor's mobilization to the Site. At a minimum, the HASP shall conform to the HASP and RAWP prepared by Langan and approved by NYSDEC.
- J. The Contractor shall submit the following to the CM promptly after completion of each task:
1. All manifests, bills of lading, weight tickets and analytical data for all soil/fill material exported from the Site.
  2. All manifests, bills of lading, weight tickets and analytical data for any borrow fill material imported to the Site.
- K. Obtain and submit all local, state, and federal permits required for the disposal of all excavated materials resulting from the work performed. This includes information on each USEPA and/or State approved off-site disposal facility that is proposed to receive contaminated materials and hazardous wastes (as required). For each proposed facility, the following information shall be submitted:
- Name, address, and location of the facility, including the owner's name, address, telephone number, and fax number and the contact person at the facility.
  - The USEPA identification number (if applicable)
  - Facility testing requirements and acceptance criteria.
  - Copies of valid, current, operating permits for the facility from the applicable regulatory agencies.
  - A letter from the facility owner granting permission to bring material to the facility throughout the life of the Contract
  - A listing of the number and types of analytical tests required for initial determinations of the material for each disposal facility. Also to be included are the testing requirements and frequency for testing of the material once the initial characterization has been made.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Fill and aggregate materials to be used for project are to be stockpiled separately at the producer's facility and shall be accessible to inspection and quality control (QC) testing.
- B. Stockpile material brought to the site prior to placing in order to allow for testing. Stockpile material in such a manner as to prevent erosion and dust. Provide silt curbs if necessary.
- C. Testing and certification of all imported environmentally clean fill are the responsibilities of the Contractor.

1.09 PROJECT/SITE CONDITIONS

## A. Existing Conditions

## 1. Site information

- a. The site is located in the southern end of Roosevelt Island, NYC, NY. The site is adjacent to a public park (Southpoint Park) and historic landmark buildings (Smallpox Hospital and Strecker Laboratory). The Park and the historic landmark buildings and any other structures to remain shall be protected at all times.
- b. RIOC makes no predictions or representations regarding the character or extent of soil, rock, or other subsurface conditions to be encountered during the work. The Contractor shall make its own deductions of the subsurface conditions that may affect the methods or cost of construction of the work hereunder, and agrees that it will make no claims for damages or compensations, except as are provided under the agreement should the Contractor find conditions during the progress of the work substantially different from those indicated on the borings. Additional borings and other subsurface exploratory operations may be performed by the Contractor, at the Contractor's option and following RIOC's approval. No change in the Contract Sum will be authorized for such additional exploration undertaken by the Contractor.
- c. The subsurface information (borings or other subsurface explorations) contained in the Contract Documents were obtained primarily for the use in preparing the foundation design and is included in the Contract Documents for the convenience of the Contractor and for excavated material disposal planning.
- d. Soil and/or groundwater data given on borings or other subsurface explorations supplied by the Owner are not intended as warranties of accuracy or continuity between soil stratum. Contractor is responsible for interpretations or conclusions drawn therefrom.
- e. The site is located in the southern end of Roosevelt Island adjacent to the East River. Deep excavations below water table will be required and comprehensive dewatering may be needed. Contractor is solely responsible to design, install, operate and maintain all needed dewatering facilities, i.e. wells, wellpoints, submersible pumps, sumps, etc., and take all necessary measures to perform work in dry environment. RIOC shall not pay for any change in dewatering system design and shall not pay for any additional dewatering equipments or methods.
- f. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other

limitations affecting transportation to, ingress and egress of the site of the work. The Contractor shall conform to all New York City and State, and Federal regulations in regard to the transportation of materials to and from and at the job site and shall secure in advance such permits as may be required.

2. Existing Utilities

a. Locate existing underground utilities:

1. Provide adequate means of support and protection for utilities to remain during Work.
2. Demolish and remove underground utilities designated to be removed. Coordinate with utility companies for shut-off of services if lines are active.

b. Consult immediately with the utility owner for directions should uncharted or incorrectly charted piping or other utilities be encountered during excavation. Cooperate with the utility owner, and the Owner in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.

B. Coordination: Examine drawings to determine sequence of operations and relation to work of other trades. Start of work will signify acceptance of field conditions and will acknowledge coordination with other trades.

C. Foundations and Other Changes: The Owner reserves the right to change slightly or radically at its discretion the design of the foundations and other related work.

1.10 ERRORS IN DEPTH

A. In the event that any part of the excavation be carried, through error, beyond the depth and the dimensions indicated on the drawings or called for in the specifications, then the Contractor, at own expense, shall furnish and install gravel or stone with which to fill to the required level, in all locations except beneath footings. At footing locations, Contractor shall be required to fill to level of bottom of footing with concrete mixed in the proportion of the footings bearing on them. Where established bottoms as shown on drawings have not been maintained or have been disturbed by operations under this contract, they shall be cleaned out and filled with concrete mixed in the proportion of the footings bearing upon them, without additional cost to RIOC.

1.11 ENVIRONMENTAL CONSIDERATIONS

A. Install erosion control measures in the sequence shown on the Contract Drawings or as directed by the Engineer or regulatory agencies to protect adjacent properties and water resources from erosion and sediment damage.

B. Certification that imported fill material is free of all contaminants above non-restricted use standards will be required.

C. Site soils and water may be contaminated. Contractor shall read the environmental reports, familiarize himself with the existing environmental conditions, and shall comply with the Soil Management Plan (SMP).

D. Excess materials (soil and/or geotechnically unsuitable materials) that are not re-used on site shall be disposed of in accordance with all applicable regulations. All fees associated with this activity (e.g. sorting co-mingled materials, load-out, transportation, disposal,

sampling, permits, etc.) are the responsibility of the Contractor. However, activities must be coordinated with the Environmental Consultant.

- E. The resident environmental engineer shall be responsible for the required testing for disposal classification of any contaminated materials including, but not limited to oil, sludge, water or water containing oil or separate phase product, soil, rock, concrete or concrete products, brick, and fill to be removed from the Site.

#### 1.12 SEQUENCING AND SCHEDULING

- A. Perform work in such a manner to ensure a minimum interference with roads, walks, adjacent properties, and facilities to remain open. Do not close or obstruct these items without obtaining permits from the agencies having jurisdiction or the permission of the adjacent owners.
- B. The Contractor may prepare segregated contaminated soil stockpile areas for storage pending testing by the Contractor and subsequent loading and off-site disposal by the Contractor provided proper erosion controls have been put into place to avoid intermixing of different soil types (i.e. secure polyethylene sheet covering, hay bales, etc).

#### 1.13 PROTECTION

- A. The work shall be executed so that no damage or injury will occur to the existing buildings (including Smallpox Hospital and Strecker Laboratory buildings), and adjacent structures, streets, pavements, utility lines or any other pipes. Should any damage or injury caused by the Contractor, or anyone in Contractor's employ, or by the work under this Contract occur, the Contractor shall, at own expense, repair such damage and shall assume all responsibility for such injury.
- B. Monuments, bench marks and other reference features on streets bounding this project, shall be protected. Should these be disturbed in any manner, the Contractor shall have them replaced.
- C. Existing buildings and their elements, excavation sides, existing foundations, slabs, walls, and utilities shall be protected by means adequate bracing, shoring, underpinning, anchoring and bolting at all times. Excavation shall not proceed until adequate support for excavation sides and existing building elements is provided. Contractor is solely responsible for the stability, safety and protection of excavation sides and the existing buildings.

### **PART 2 - PRODUCTS**

#### 2.01 MATERIALS

The Contractor shall make his own estimates of the quantities of on-site soils available for re-use and import off-site soils based upon available information and upon the construction documents. The contractor shall be solely responsible for estimates, quantities and variations.

- A. Structural Fill - On-Site Material
  - 1. The granular sandy on-site soils with less than 12% fine material passing the #200 sieve (by weight), free of any particle larger than 6 inches in any dimension, free of debris, waste, frozen materials, vegetation, and other deleterious matter can be used as structural fill. The material shall meet the requirements of ASTM D2487 soil classification groups GW, GP, SW and SP. Use of this material must be under the direction of the Geotechnical Engineer.

2. The on-site materials not meeting the above criteria may be screened and mixed with clean granular soils to meet the above given criteria.
3. On-site soil used as structural fill without the Geotechnical Engineer's approval shall be removed and replaced with suitable material at no cost to RIOG. On-site topsoil and soil material free of deleterious materials and not meeting the requirements of use as structural fill shall be removed and disposed of off-site.
4. The use of this material must also comply with the goals of the project Soil Management Plan, which generally requires that re-used soil can only be backfilled into the same zone of seawall foundation excavations from which the soil originated.

**B. Structural Fill - Imported Borrow Fill Material**

5. Contractor shall provide imported borrow fill, if any, when sufficient quantities of on-site material from excavations are not available.
6. Imported structural fill shall be well-graded sandy material with less than 12% fine material passing the #200 sieve (by weight), free of any particle larger than 4 inches in any dimension, free of debris, waste, frozen materials, vegetation, and other deleterious matter. The material shall meet the requirements of ASTM D2487 soil classification groups GW, GP, SW and SP.
7. Imported fill shall be free of hazardous substances, and shall adhere to the requirements in Section 203 of the New York State Department of Transportation Standard Specifications. Contractor shall test and submit a certification of compliance to the Geotechnical Engineer not less than fifteen days prior to its intended use.

**C. Crushed Stone Drainage Fill**

1. Crushed stone shall be washed, clean evenly graded mixture of crushed stone, or crushed or uncrushed gravel known in the industry as ¾-inch crushed stone meeting ASTM D448, coarse aggregate grading size 57 (recycled concrete aggregate shall not be acceptable) having the following gradations:

Sieve Size	Percent Passing by Weight
1 inch	100
¾ inch	25 to 60
No. 40	5 to 40
No. 200	0 to 5

**D. Imported Crushed Recycled Concrete Aggregate (if needed)**

1. Well-mixed, processed, recycled material consisting of Portland cement concrete smaller than 3 inches in diameter, and containing less than 12% fines, may be used as backfill in the utility trenches. The use of this material must be under the direction of the Geotechnical Engineer. All material shall be sufficiently mixed to create a well-graded material. No wood, metal, glass, cinders or other deleterious material will be permitted in any backfill.

- F. Geotextile Filter Fabric: The filter fabric to be placed in certain deep wall excavations, as shown on the drawings, and around the perimeter drainage pipe shall be Mirafi 140 NL or equivalent.
- G. Drainage Pipe: The drainage pipe for perimeter drainage system shall be perforated, 6-inch-diameter schedule 40 PVC pipe.
- H. Drainage Mat: The vertical composite drainage mat shall be Miradrain 9000 or equivalent.

## 2.02 EQUIPMENT

- A. Compaction equipment shall be vibratory plate compactor or a vibratory drum roller having static weight not less than ½ ton.
- B. Proofrolling Compactor – A single drum vibratory roller having a minimum 7-ton static weight drum.
- C. Provide necessary equipment for excavation of fill, soil and rock, and transportation of soil and rock on site and off site.
- D. Off-site materials shall be transported to project using well-maintained and operating vehicles. Once on site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.
- E. Provide all necessary tools, equipment and labor to perform the work at no cost to the Owner.

## PART 3 EXECUTION

### 3.01 PREPARATION

- A. Install erosion control measures to prevent erosion of displacement of soils and discharge of soil laden runoff or airborne dust to adjacent properties.
- B. Identify required lines, levels, contours, and datum.
- C. Locate and identify existing utilities that are to remain and protect them from damage.
- D. Coordinate removal or relocation of existing utilities with the Owner/utility companies. Existing utilities to remain serving facilities occupied by the Owner or others shall not be interrupted without prior approval from the Owner and then only after an acceptable temporary utility service has been provided.
- E. Demolish and completely remove from the site existing utilities indicated to be removed. Coordinate with the utility companies to shut off service lines if they are still active.
- F. Protect existing Project trees as shown; protect structures and paving already constructed; protect lawns, fences, and off-site etc from excavating equipment and vehicular traffic.
- G. Protect benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by licensed land surveyor and replaced, as necessary, by same.
- H. Remove from site, material encountered in grading operations that, in opinion of Geotechnical Engineer and RIOG, is unsuitable for backfilling, subgrade, or foundation purposes. Backfill areas with layers of suitable material and compact as specified herein.

### 3.02 PROTECTION AND MONITORING

- A. The work shall be executed so that no damage or injury will occur to the existing historic landmark buildings, adjacent structures and utilities. Should any damage or injury caused by the Contractor, or anyone in Contractor's employ, or by the work under this Contract occur, the Contractor shall, at own expense, repair such damage and shall assume all responsibility for such injury.
- B. The existing Park landmark buildings Smallpox Hospital and Strecker Laboratory, as well as adjacent portions of Four Freedoms Park granite walls, shall be monitored during construction in accordance a Construction Protection Plan to be the prepared and submitted by the Contractor's professional in accordance with the requirements and criteria shown on the drawings.

### 3.03 EXCAVATION FOR GRADING

- A. Classification of Excavation: By submitting bid, Contractor acknowledges that site has been investigated to determine type, quantity, quality, and character of excavation work to be performed. Excavation shall be considered unclassified excavation, except as indicated in Contract Documents.
- B. When performing grading operations during periods of wet weather, provide adequate drainage and ground water management to control moisture of soils and prevent surface water, subsurface water or ground water from entering excavation.
- C. Wells and pumps shall be made available during the deep excavations to maintain a dry condition as needed.
- F. Shore, brace, and drain excavations as necessary to maintain excavation as safe, secure, and free of water at all times.

### 3.04 ROCK EXCAVATION

- A. Significant rock excavation is not anticipated, with the exception of an outcrop identified in the existing stone seawall on the western shore.
- B. Comply with all applicable regulations for the breaking, excavation, removal, and disposal of any rock encountered.
- C. Rock shall be excavated by using hoe-rams or other means approved by the Owner. Blasting for rock excavation shall be avoided. Blasting shall not be permitted unless authorized by the Owner, Geotechnical and Structural Engineers and the City.
- D. Codes, Permits and Regulation
  - 1. Comply with all applicable laws, rules, and ordinances and regulations of the Federal Government, New York State, the City and other jurisdictions governing the transportation, storage, handling and use of explosives. All labor, materials, equipment, and services necessary to make the blasting operations comply with such requirements shall be provided without additional cost to the Owner.
  - 2. Obtain and pay for all permits and licenses required to complete the controlled blasting work.
  - 3. In case of conflict between regulations and specifications, the Contractor shall comply with the strictest applicable codes, regulations or specifications.

- E. Perform all rock chipping, drilling, blasting and excavation in a manner not to damage adjacent structures, streets and utilities. Peak Particle Velocities (PPV) and Airblast Overpressures (AOP) shall be maintained below the allowable limits.
- F. Upon completion of rock removal and general mucking of excavations in rock, the sides and bottoms of the excavations shall be cleaned of all loose, decomposed, fragmented, jointed, weathered and unsound rock to a depth and condition approved by the Geotechnical Consultant. Following rock removal, prepare subgrades as specified in these specifications.
- G. Protect the area surrounding the excavation, prevent "rockfly" during rock removal, and control airblast overpressure. Conduct rock removal, including approved controlled blasting, in a manner that will prevent damage to excavated earth slopes, and the work.
- H. Rock overbreak and over excavation shall be considered to be "Unauthorized Excavation" as specified herein and filling shall be conducted with the specified fill material (controlled fill or concrete) consistent with the associated construction, acceptable to the Architect and to the Geotechnical Engineer, at no additional cost to the Owner.

### 3.05 SHORING AND CUT STABILIZATION

- A. Inspect site, examine existing conditions and make all necessary preparations for the safe and proper sequence of work. Properly guard and protect excavations so as to prevent them from becoming dangerous to person or property.
- B. The proposed construction requires deep excavations near tidal East River. Properly slope sides of excavation or provide dewatering, shoring, sheeting and bracing to prevent caving, erosion, or gulying of sides of excavations.
- C. Brace, shore and protect existing structures, streets, utilities when excavations are made adjacent to the existing structures, streets, utilities or within a distance that they will be affected by the excavation.
- D. Maintain sides and slope of excavation in safe condition until backfilling or other work is complete. Maintain shoring and bracing in place until completion of work.
- E. Provide materials for work in good serviceable order.
- F. All shoring, bracing, sheet piling, etc. is to be removed upon completion of the work where they are installed, including any portion thereof, outside of street and lot lines. Within the lot, remove all wood and cut steel elements to a minimum of 4 feet below grade. Where they interfere with new work and utilities, remove in their entirety.
- G. Install appropriate temporary excavation support systems as required. All sheeting, shoring and underpinning shall be designed and inspected by a professional engineer retained and paid by the Contractor.
- H. All rock cuts shall be inspected by a qualified geotechnical engineer retained by the contractor. The engineer shall determine stabilization methods. Stabilization for cuts may consist of anchors, bolts, netting and benching.

### 3.06 DEWATERING

- A. The site is located in the southern end of Roosevelt Island adjacent to the East River. Deep excavations below water table will be required and comprehensive dewatering will be needed. Contractor is solely responsible to design, install, operate and maintain all needed dewatering measures (i.e. wells, wellpoints, submersible pumps, sumps, etc) and take all necessary

measures to perform work in dry environment. The owner shall not pay for any change in dewatering system design and shall not pay for any additional dewatering equipments or methods.

- B. The Contractor shall be entirely responsible for the design, implementation and maintenance of dewatering required to perform the work.
- C. Comply with the construction, maintenance, inspection, and cleaning, remedial and close-out measures per the project Storm Water Pollution Prevention Plan (SWPPP).
- D. Contractor shall utilize appropriate dewatering equipment and methods as necessary to perform the required work (excavation, preparation, proofrolling, backfilling, concreting, utility installation etc) in a dry environment. The contractor shall be responsible to maintain the work area dry at all times.
- E. Contractor shall remove all groundwater and surface water from the work areas. Maintain groundwater level at least 2 ft below the work areas, below the foundation/slab subgrades and below the invert of utilities until such time that work is complete.
- F. Contractor shall supply necessary equipments (wells, pumps and crushed stone, etc.) to maintain the work area dry at all times.
- G. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades, and from flooding project site and surrounding area. Protect subgrades and foundation soils from softening and damage by rain or water accumulation.
- H. No pipe, concrete or bedding shall be placed in water unless specific approval is obtained from the Engineer.
- I. Water removed from an excavation shall be disposed of in accordance with the project Storm Water Pollution Prevention Plan (SWPPP). It shall be the Contractor's responsibility to discharge the water in such a manner that mud and silt are not discharged into the River.
- J. It is the Contractor's responsibility to provide adequate dewatering of the site by means and methods approved by RIOC's Engineer. The Contractor shall review the Geotechnical Reports to obtain information regarding the depth of groundwater on-site.

### 3.07 SUBGRADE PREPARATION

- A. Finished subgrades shall be verified to ensure proper elevation and conditions for construction above subgrade.
- B. Proofrolling:
  - 1. Proofroll all soil subgrades which shall support foundations, slabs, pavements, walkways and roadways which are not supported on a tremie mat. Maintain groundwater level, if any, at least 2 ft below the subgrade during proofrolling.
  - 2. Proofroll the subgrade with a heavy vibratory drum roller having a minimum static weight as specified in Part 2 of this section. All proofrolling shall be a minimum of 6 passes carried out over the exposed subgrades.
  - 3. If any material exhibits instability (i.e. pumping, weaving or rutting) under the action of the roller, the unstable areas should be over-excavated to remove the unstable soil and should be backfilled with compacted clean structural fill. Backfilling and

compaction shall be performed in accordance with requirements of Backfilling and Compaction section below.

4. The Contractor shall establish operating procedures whereby uniform coverage of an area is obtained and the number of passes of the compaction equipment can be readily determined.
  5. Protect subgrade from excessive wheel loading during construction, including concrete trucks, dump trucks, and other construction equipment. Construct designated haul-roads as required to prevent damage to completed subgrades.
- C. Subgrade preparation for foundation-on-grade shall be as follows or as directed by the Geotechnical Engineer:
1. Excavate topsoil and surficial materials and any unsuitable loose/soft soils. Excavate to reach design elevations as shown on contract documents.
  2. Proofroll the entire subgrades in accordance with the requirements of "Proofrolling" section given above. Subgrades shall be inspected and approved by a qualified Geotechnical Engineer.
  3. On-site soils may contain significant amount of silt which are sensitive to moisture and are hard to work with when saturated. Protect the subgrades against the effects of weather and equipment. Appropriate surface drainage and protection methods such as trenching, sloping, and pumping should be implemented to maintain the subgrades in a dry and workable condition at all times.
  4. Soils placed loosely in the previous excavations performed during the subsurface investigation and demolition, if any, shall be removed to the level of the suitable undisturbed soils.
  5. Any areas that exhibit evidence of inadequate subgrade shall be removed to competent strata. Subgrade shall be protected against moisture and frost prior to placing concrete.
  6. Place a  $\frac{3}{4}$ -inch clean crushed stone, or gravel, layer underneath all slabs with the thicknesses indicated on the contract drawings.
  7. Placement and compaction of fill shall be in accordance with the requirements given below in the "Backfilling and Compaction" section.
- D. Subgrade preparation for foundations on rock shall be as follows or as directed by the Geotechnical Engineer:
1. Excavate and remove all unsuitable materials to reach sound rock (Class 1c) as determined by the Geotechnical Engineer. Contractor shall be responsible to take all necessary measures, including but not limited to shoring, stabilization, excavating, dewatering and disposal to reach competent bearing strata specified in the contract drawings.
  2. Foundations shall bear on sound rock (Class 1c or better rock) with an allowable bearing pressure of 20 tons per square foot, unless specified otherwise on the contract documents. Geotechnical Engineer shall have the sole authority to determine where the suitable competent bearing strata are. Qualified professional geotechnical engineer shall verify the quality and bearing capacity of the rock.

3. The anticipated top of rock elevations given in the geotechnical reports and contract documents are approximate and shall be verified in the field by the Geotechnical Engineer. Foundation subgrades shall be inspected and approved by a qualified geotechnical engineer.
  4. Foundation subgrades shall be level and free of loose materials, water, sedimentation and rock cuttings. Subgrades shall be cleaned with compressed air prior to inspection.
  5. All foundations shall be socketed at least 6 inches into sound rock or as specified in the drawings whichever is more stringent.
  6. Contractor shall excavate to required depth to reach the adequate bearing stratum as directed by the geotechnical engineer at no cost to the Owner.
- E. Subgrade preparation for seawall foundations on tremie-mat shall be accomplished as follows or as directed by the Geotechnical Engineer:
1. Excavate to design elevation as shown on contract drawings.
  2. Foundation tremie concrete pads shall not be poured until the contractor has demonstrated to the Geotechnical Engineer that sound bearing has been obtained and all pollution prevention means are in place.

### 3.08 FILL PLACEMENT

- A. Filling and backfilling shall not be performed until work has been inspected by the Geotechnical Engineer. All wood, paper and other deleterious materials shall be cleaned out from excavations before backfilling.
- B. General: Material for fill and backfill shall be Controlled Fill as herein specified under Part 2 of these specifications and obtained from the excavation on site, if acceptable, or from borrow sources. Suitable excavated material shall be approved by RIOC's Geotechnical Engineer.
- C. Placing: Fill areas to contours and elevations shown on Construction Drawings. Place fill in horizontal loose layers to produce a uniform thickness of material not exceeding 12 inches. Start placement in the deepest area and progress approximately parallel to the finished grade. Do not place fill where free water is standing, on frozen subsoil or on surfaces that have not been approved.
- D. Compacting: Compact each layer of fill with appropriate equipment listed below in this Article to achieve at least 95% of its maximum dry density determined by ASTM D 1557.
- E. Compaction Equipment: Granular fills (sand, gravel, friable earth) shall be compacted with a vibratory plate compactor not less than 0.5 ton in static weight to the extent possible. A jumping jack shall be used in and around penetrations, small restrictive areas, or any other areas not accessible to the roller or heavy plate compactor.
- F. Backfilling against Walls: After completion of walls and removal of forms, clean the excavation of all trash and debris before application of waterproofing and placement of backfill.
- G. Do not backfill against foundation or basement walls until completion of supporting floor construction to top of backfill or to first level above top of backfill. In placing backfill, take special care to prevent wedge action, eccentric loading or overloading of the structure by equipment used for compacting backfill material, and to prevent damage to waterproofing

on walls. Where subsoil drainage systems are installed, place backfill to prevent any damage to the systems.

- H. Additional backfilling required to bring fill to the finished subgrades shown, shall be done by the Contractor only after the concrete walls, against which the backfilling is done, have attained their full design strength, have been braced and the written permission to backfill is obtained from the Structural Engineer. If fill is required on both sides of a wall, it shall be brought up simultaneously and evenly on both sides.
- I. The Contractor shall do all filling necessary to bring the ground surfaces to the required levels for floors as shown on the drawings.
- J. Any surplus materials shall be removed from site and legally disposed of. Should additional material be required for the placing of backfill, other than material obtained from the site, the Contractor shall obtain, deliver and place accepted backfill material as required.

### 3.09 FIELD QUALITY CONTROL

#### A. RIOC's Responsibilities:

- 1. RIOC will hire an independent testing agency and a qualified geotechnical engineer to inspect the earthwork.
- 2. Independent testing agency shall perform field in-place density tests where required, using a nuclear densometer in accordance with ASTM D 2922.
- 3. Foundation: A qualified geotechnical engineer shall inspect and approve the foundation subgrades and preparation of subgrades.
- 4. Backfilling and Compaction: A qualified geotechnical engineer shall inspect and approve the backfilling operations behind walls and in trenches.

#### B. Contractor's Responsibilities:

- 1. Contractor shall retain a professional engineer who shall design and inspect installation of dewatering, excavation support systems, shoring, bracing and stabilization.
- 2. Contractor shall retain a qualified engineer who shall perform a preconstruction conditions survey of the Smallpox Hospital and Strecker Laboratory buildings.
- 3. Contractor shall retain a licensed surveyor who shall install and monitor lateral and vertical control points on the Smallpox Hospital and Strecker Laboratory buildings.
- 4. Contractor shall be also responsible for retaining qualified professional engineers, certified testing agencies and licensed surveyors to perform inspections not covered by RIOC.
- 5. Contractor shall assist, help and cooperate RIOC, the Engineer and regulatory agencies who will be performing inspections at the site.

### 3.10 FINISH GRADING AND CLEAN FILL CAP

- A. A cap of cover soil, consisting of imported environmentally clean fill shall be placed across the site from the seawalls to meet the limits of the existing cap to the park.

- B. Clean fill cap depth shall be no less than two feet, and shall be separated from other site soils by a geofabric layer.
- C. Grade areas where finish grade elevations or contours are indicated on Construction Drawings, other than paved areas and buildings, including excavated areas, filled and transition areas, and landscaped areas. Graded areas shall be uniform and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10-ft above or below established finished subgrade elevation. Ground surfaces shall vary uniformly between indicated elevations. Finished ditches shall be graded to allow for proper drainage without ponding and in manner that will minimize erosion potential.
- D. Correct settled and eroded areas within 1 year after date of completion at no additional expense to Owner. Bring grades to proper elevation. Replant or replace grass, shrubs, bushes, or other vegetation that appears dead, dying, or disturbed by construction activities.

### 3.11 DISPOSAL OF SURPLUS AND WASTE MATERIAL

- A. Remove surplus soil and waste material, including unsatisfactory soil, trash and debris and legally dispose of it off site.

END OF SECTION

**SECTION 312319****DEWATERING****PART 1- GENERAL**1.01 DESCRIPTION OF WORK

- A. Contractor shall be solely responsible to design and provide foundation and seawall construction dewatering measures as appropriate to its judgment of the project needs, and as per the selected means-and-methods of performing the work.
- B. Control of the East River waters is expected to be a significant task for foundation and seawall construction. The Contractor shall be deemed to have assessed these issues in the means-and-methods and to have priced the impacts of the East River environment into the bid.
- C. Foundation dewatering measures shown or inferred from these drawings are to establish regulatory permitting criteria and should be used for permitting compliance guidance only.
- D. Comply with the construction, maintenance, inspection, cleaning, remedial and close-out measures per the project Storm Water Pollution Prevention Plan (SWPPP).
- E. Comply with the excavation, backfill construction, remedial and close-out measures per the project Soil Management Plan (SMP).

1.02 RELATED SECTIONS

The Contact Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 031000 – Concrete Formwork
- B. Section 033000 – Cast in Place Concrete
- C. Section 312300 - Earthwork

1.03 RELATED DOCUMENTS

- A. Information regarding geotechnical subsurface conditions is given in the following geotechnical engineering report, copies of which are available for bid evaluation purposes from the office of the Construction Manager:
  - 1. Geotechnical Engineering Memorandum dated 22 May 2013 by Langan Engineering and Environmental Services (Langan).
- B. Information regarding environmental soil/subsurface conditions and soil management practices are given in the following environmental engineering report, copies of which are available for bid evaluation purposes from the office of the Construction Manager:
  - 1. Soil Management Plan (SMP) dated 8 January 2020 by Langan Engineering and Environmental Services (Langan).

- C. The project Storm Water Pollution Prevention Plan (SWPPP) has been prepared by Langan Engineering and Environmental Services (Langan), copies of which are available for bid evaluation purposes from the office of the Construction Manager.
  - 1. Storm Water Pollution Prevention Plan (SWPPP) dated 8 January by Langan Engineering and Environmental Services (Langan).

#### 1.04 REFERENCES

- A. The requirements of the Contract Documents, including the General and Supplementary General Conditions shall apply to the Work of this section.
- B. New York City Building Code.
- C. American Society for Testing and Materials (ASTM) standards.
- D. OSHA Regulations.
- G. All codes and standards apply to the Work shall be the latest version. In case of conflict the most stringent shall apply.

#### 1.05 EXISTING CONDITIONS

- A. Site information
  - 1. Contractor shall be solely responsible to design and provide foundation and seawall construction dewatering measures as appropriate to its judgment of the project needs, and as per the selected means-and-methods of performing the work.
  - 2. Control of the east river waters is expected to be a significant task for foundation and seawall construction. The east river is a tidal harbor with significant boat traffic. Tidal data have been provided on the drawings for average east river conditions; however, it is known that factors such as the natural channelization of the east river by the island, barometric pressure, wind speed and wind direction can increase the actual tidal range. In addition, factors such as the wakes from boat traffic and the impacts from storm events are likely to inconvenience shoreline work. The contractor shall be deemed to have assessed these issues in the means-and-methods and to have priced the impacts of the east river environment into the bid.
  - 3. Foundation dewatering measures shown or inferred from these drawings are to establish regulatory permitting criteria and should be used for permitting compliance guidance only.
  - 4. Where the contractor's engineer shall design shoring and bracing to maintain the safety of slope/excavations for foundation and seawall work during construction, the design of construction dewatering at this location shall be considered by the contractor's engineer as part of the shoring and bracing design and maintenance.
  - 5. The site is located in the southern end of Roosevelt Island adjacent to the East River. Excavations will be required and comprehensive dewatering will be needed. Contractor is solely responsible to design, install, operate and maintain all needed

dewatering measures (wells, wellpoints, submersible pumps, sumps, etc.) and take all necessary measures to perform work in dry environment. The owner shall not pay for any change in dewatering system design and shall not pay for any additional dewatering equipments or methods.

6. RIOC makes no predictions or representations regarding the character or extent of soil, rock, or other subsurface conditions to be encountered during the work. The Contractor shall make its own deductions of the subsurface conditions that may affect the methods or cost of construction of the work hereunder, and agrees that it will make no claims for damages or compensations, except as are provided under the agreement should the Contractor find conditions during the progress of the work substantially different from those indicated on the borings. Additional borings and other subsurface exploratory operations may be performed by the Contractor, at the Contractor's option and following the Owner's approval. No change in the Contract Sum will be authorized for such additional exploration undertaken by the Contractor.

The subsurface information (borings or other subsurface explorations) contained in the Contract Documents were obtained primarily for the use in preparing the foundation design and is included in the Contract Documents for the convenience of the Contractor and for excavated material disposal planning.

Soil and/or groundwater data given on borings or other subsurface explorations supplied by the Owner are not intended as warranties of accuracy or continuity between soil stratum. Contractor is responsible for interpretations or conclusions drawn therefrom.

The Contractor shall visit the site, examine the conditions and shall review the reports and contract documents to familiarize himself with the existing conditions.

The Contractor shall make his own assumptions of subsurface conditions that may affect methods of conducting of the Work. The locations of utilities shall be verified in the field by the Contractor prior to work. Protection of all utilities located on the site is the sole responsibility of the Contractor.

It shall be noted that the fill and sand materials overlying the bedrock contain significant amounts of obstructions including cobbles, boulders and shotrock. The Contractor shall take into account in his bid that all these obstructions can be encountered during the installation of the dewatering system.

#### 1.06 SUBMITTALS

- A. All submittals shall be submitted at least 4 weeks prior to start of work, unless otherwise noted. The approval of plans, methods, procedures and design submitted by the Contractor does not in any way relieve the Contractor's responsibility from errors, damage or from the Contractors entire responsibility for complete and adequate design and performance of the dewatering system.
- B. Qualifications: Contractor shall be one specializing in the installation and operation of different types dewatering systems and shall submit evidence substantiating a minimum of 5 years satisfactory experience in the installation and maintenance of such systems.
- C. All submitted design, plans, drawings, procedures, results, analyses by the Contractor shall be supported by calculations and shall be signed and sealed by a professional engineer retained by the contractor and licensed in the State of New York.

- D. Submit dewatering plans including locations, numbers and procedures for initial tests to estimate design parameters used in designing the proposed dewatering system. Submit construction and shop drawings of the proposed dewatering system and installation technique including arrangement, details, and sections. Show locations of dewatering facilities and observation wells and method of maintaining.
- E. Submit results and analysis of all performed laboratory and field tests showing method of estimating design parameters used to design the proposed dewatering system.
- F. Submit manufacturer's literature, show and describe type of the proposed dewatering system, general arrangement, procedures to be used, methods of installation, materials, equipment, methods of disposal of pumped water, and procedures for safely deactivating and closing the system.

Submit detailed design and procedures for the methods of control and disposal of construction and tidal waters. Submit procedures to minimize the effects of dewatering on adjacent structures.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. The Contractor shall deliver materials to the project site in such quantities and at such time to assure the continuity of operations as well as to maintain the project schedule.
- B. Carefully handle pumping units, pipes, fittings, screens, flow-meters and all other dewatering system components so as not to cause any damage to them, which may result in leakage problems after dewatering system installation and operation.

#### 1.08 PERMITS

- A. The Contractor shall be responsible for obtaining and paying for all necessary permits (including but not limited to discharge permit) from local authorities to perform the Work specified herein prior to Work start.
- B. Contractor shall follow all local and federal regulations enforced regarding conducting the Work.

#### 1.09 QUALITY ASSURANCE

- A. Perform all necessary laboratory and field testing to estimate the parameters needed to design the proposed dewatering system. Perform sieve analysis, on soil samples taken from the drilled holes, falling-head permeability and rising-head permeability tests, inside first installed piezometer, well or wellpoint, as directed by the Engineer.
- C. Prevent build-up of higher hydraulic gradients that may result in movement of fines or loss of ground from below the bearing level and shall not influence the stability of surrounding areas. Verify by conducting monitoring depressed groundwater water table and by controlling discharge rates.
- D. Insure achieving target depressed or drawdown groundwater table at all locations inside and on the perimeter of the dewatered area prior to start of excavation. Verify by conducting drawdown water table monitoring and controlling the discharge rates. No excavation shall be permitted before achieving required drawdown of groundwater table.
- E. Consider pre-construction groundwater elevation fluctuations and high permeability of local soils when developing dewatering plan.

**PART 2 - PRODUCTS****2.01 MATERIALS**

- A. All equipment and materials required for dewatering work shall be in perfect operational condition.
- B. Well, wellpoint and piezometer components and equipment including pipes, screens and fittings shall be of a type acceptable to the Engineer. All well, wellpoint and piezometers shall be installed as per manufacturer instructions and in a manner that it does not interfere with the operations of Work specified under other sections.
- C. Sand filters used in wells, wellpoints, piezometers and/or sumps shall be clean graded sand satisfying grading limits initially submitted by the contractor, which do not cause any fines migration during dewatering process.

**20.2 EQUIPMENT**

- A. All equipment and materials required for dewatering work shall be in perfect operational condition.
- B. All pumps used shall be of the same, or higher, discharge capacity as shown on Contractor's approved submittals. All pumps, flowmeters and groundwater table meter shall be in first-class working condition and shall be accepted by the Engineer.

**PART 3 - EXECUTION****3.01 GENERAL REQUIREMENTS**

- A. The Contractor shall be responsible for paying and obtaining all necessary permits from local authorities to perform the work specified herein prior to start of work. The Contractor shall follow all local and federal regulations enforced regarding conducting the work.
- B. Contractor shall be solely responsible to design and provide foundation and seawall construction dewatering measures as appropriate to its judgment of the project needs, and as per the selected means-and-methods of performing the work.
- C. Control of the East River waters is expected to be a significant task for foundation and seawall construction. The Contractor shall be deemed to have assessed these issues in the means-and-methods and to have priced the impacts of the East River environment into the bid.
- D. Foundation dewatering measures shown or inferred from these drawings are to establish regulatory permitting criteria and should be used for permitting compliance guidance only.
- E. The dewatering system shall be kept in operation for the period of excavation, formwork, placement and curing of concrete, and providing sufficient framing for any structural elements resisting hydrostatic pressures that would result from deactivating dewatering system.

3.02 PUMPING AND DRAINAGE

- A. It is the responsibility of the Contractor to furnish, operate and maintain sufficient drainage and pumping facilities to dewater the site and control tidal water influx so that the excavation can proceed while maintaining temporary excavation support and the designed lateral support for the perimeter walls, without disturbing the bearing subgrades for the structure or any of the adjacent structures.
- D. Contractor is solely responsible for discharging of the pumped water including taking all necessary measures to comply with the regulations and directives of the local authorities. Discharge of pumped water must be performed in strict accordance with the regulations and directives of the local authorities, as applicable.
- E. The dewatering system shall be installed and operated in a manner as to avoid the movement of fines or loss of ground from below the bearing level and shall not influence the stability of surrounding areas.

3.03 SURFACE RUNOFF

- A. Minimize surface erosion, ponding and softening of excavation sides. At the perimeter of excavation, surface water shall not be permitted to enter the excavation.

END OF SECTION

**SECTION 312500****SOIL EROSION & SEDIMENT CONTROL****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Install and maintain all temporary soil erosion and sediment control and permanent seeding/slope stabilization measures as specified herein.
- B. The control of construction water discharge shall be managed by the Contractor in a manner to be determined as part of his Means-and-Methods. Actual measures for this purpose shall comply all applicable laws and regulations.
- C. Comply with the construction, maintenance, inspection, cleaning, remedial and close-out measures per the project Storm Water Pollution Prevention Plan (SWPPP).
- D. Comply with the excavation, backfill construction, remedial and close-out measures per the project Soil Management Plan (SMP).
- E. The dewatering shall be the sole responsibility of the contractor as part of his means and methods. If necessary, construct measures such as temporary rock/diversion swales and /or dewatering sedimentation basins, coordinate with project phasing.
- F. The discharge of construction water from the foundation work, trenching, grading and other earthwork operations from non-stabilized areas, to off-site is not permissible.

**1.02 RELATED SECTIONS AND WORK**

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 029000 – Site Preparation
- B. Section 312300 – Earthwork
- C. Section 329000 – Landscape Planting
- D. Section 329100 – Soil Preparation and Mixes
- E. Section 329200 – Lawn and Grasses

**1.03 RELATED DOCUMENTS**

- A. Information regarding geotechnical subsurface conditions is given in the following geotechnical engineering report, copies of which are available for bid evaluation purposes from the office of the Construction Manager:
  - 1. Geotechnical Engineering Memorandum dated 22 May 2013 by Langan Engineering and Environmental Services (Langan).
- B. Information regarding environmental soil/subsurface conditions and soil management practices are given in the following environmental engineering report, copies of which are available for bid evaluation purposes from the office of the Construction Manager:

1. Soil Management Plan (SMP) dated 8 January 2020 by Langan Engineering and Environmental Services (Langan).
- C. The project Storm Water Pollution Prevention Plan (SWPPP) has been prepared by Langan Engineering and Environmental Services (Langan), copies of which are available for bid evaluation purposes from the office of the Construction Manager.
  1. Storm Water Pollution Prevention Plan (SWPPP) dated 8 January 2020 by Langan Engineering and Environmental Services (Langan).

#### 1.04 QUALITY ASSURANCE

##### A. Regulatory Requirements

Work of this section shall conform to all requirements of the New York Guidelines for Urban Erosion and Sediment Control, the project Storm Water Pollution Prevention Plan (SWPPP) and all applicable regulations of governmental authorities having jurisdiction including safety, health, and anti-pollution regulations. Where more severe requirements than those contained in the Guidelines are given in this section, the requirements herein shall govern.

##### B. NYSDEC Article 24 - New York State Conservation Law ACOE Section 404 U.S. Clean Water Act

##### C. Construction Inspection Requirements

Comply with SWPPP requirements for a Contractor-retained inspector.

### **PART 2 - PRODUCTS**

#### 2.01 MATERIALS

##### A. Filter Fabric (supplement as needed)

1. Filter fabric for the silt fence and sediment basin lining shall be Mirafi 100x or approved equal.
2. Filter fabric for the stabilized construction entrance shall be Mirafi 600x or approved equal.

##### B. Crushed Stone (supplement as needed)

1. Crushed stone for the construction entrance and on-site roadways shall be crushed stone to the requirements of NYSDOT Standard Specifications Table 703-4 size designation #3 or AASHTO size #1.

### **PART 3 - EXECUTION**

#### 3.01 STORM WATER POLLUTION PREVENTION PLAN

- A. Comply with the construction, maintenance, inspection, cleaning, remedial and close-out measures per the project Storm Water Pollution Prevention Plan (SWPPP).
- B. Notwithstanding the (SWPPP) document, the choice and execution of dewatering methods shall be the sole responsibility of the Contractor as part of his means and

methods. As necessary, construct measures such as temporary rock/diversion swales and /or dewatering sedimentation basins, coordinate with project phasing.

- C. The discharge of construction water from the foundation work, trenching, grading and other earthwork operations from non-stabilized areas, to off- site is not permissible. Roof-water connections and piped discharge will be allowable only upon stabilization of the areas served.

### 3.02 SEDIMENT CONTROL MEASURES

#### A. Reinforced Silt Fence (supplement as needed)

- 1. Set Woven Wire Fence between wood posts of sound quality hardwood with a minimum cross sectional area of 3 square inch or approved equal. Securely fasten Filter Fabric to Woven Wire with ties spaced every 24 inches at top and mid-section. Refer to Soil Erosion & Sediment Control Details – C-201.00.

#### B. Turbidity Curtain (supplement as needed)

- 1. A floating geotextile filter fabric skirt with PVC coated polyester flotation cover. End of the curtain shall be anchored securely at the shoreline at or above MHW elevation in accordance with manufacture specifications. Contractor shall deploy approximate anchors to sustain silt boom in place. Refer to Soil Erosion & Sediment Control Details – C-201.00.

#### C. Fibrous blankets by North American Green SC150BN, biodegradable

#### D. Stabilized Construction Entrance (supplement as needed)

- 1. The crushed stone vehicle wheel cleaning blanket will be maintained at the site construction entrances as shown on the Drawings.
- 2. The blanket shall have minimum dimensions 50 ft by 30 ft by 6 inches to prevent off-site tracking of sediment by construction traffic. The crushed stone and non-woven shall be placed over a subgrade free of loose or wet soils or standing water.
- 3. The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights-of-way. All sediment spilled, dropped, washed or tracked to public rights-of-way must be removed immediately. When washing is required, it shall be done on an area stabilized with stone which drains into an approved sediment trapping device. Periodic inspection and needed maintenance shall be provided after each rain.

#### E. Sedimentation Basins (if required)

- 1. The purpose of the Sedimentation Basins is to settle out suspended solids, organics and debris associated with dewatering efforts and storm water run-off from construction activities.
- 2. It shall be the contractor's sole responsibility to determine the amount, location and depth of sedimentation basins to maximize sediment of construction and stormwater run-off. Contractor to ensure all guidelines outlined in the Storm Water Pollution Prevention Plan are followed. Also Contractor shall relocate basins to maximize sedimentation of stormwater run-off and to prohibit interference with construction activity.

## F. Rock Pits (if required)

1. Minimum size of the pits shall be determined by Contractor.
2. The purpose of the Rock Pits is to trap suspended solids and debris associated with storm water run-off from construction activities, and to infiltrate the water into the strata below.
3. The discharge of construction water off-site is not permitted.
4. It shall be the contractor's sole responsibility to determine the amount, location and depth of rock pits required to maximize infiltration and to ensure all guidelines outlined in the Storm Water Pollution Prevention Plan are followed. Also contractor shall relocate rock pits to ensure infiltration of stormwater run-off and to prohibit interference with construction activity.

## G. Temporary Stabilization Measures

1. All disturbed areas left exposed for more than 7 days, exclusive of areas subject to construction traffic, shall immediately receive 2 passes with a 1 ton roller to seal the surface of each layer.
2. Prior to mulching, all erosion control measures and drainage systems within or adjacent to the area to be mulched shall be installed.
3. Slope, grade, and smooth the site if conventional equipment is to be used in applying and anchoring the seed mixture and mulch. Remove all undesirable stones and other debris. Compacted or crushed soil surface should be loosened to at least two inches by disking or other suitable methods.

3.03 MAINTENANCE OF SEDIMENT CONTROL MEASURES

## A. General

1. It shall be the responsibility of the Contractor to maintain the erosion and sediment control measures, as specified herein, for the contract period.

## B. Inspection/Repair

1. All erosion and sediment control measures will be checked for stability and operation by the Contractor following every runoff-producing rainfall but in no case less than once every week. Any needed repairs or maintenance will be done immediately to maintain all practices as designed.
2. Maintenance to the silt fence shall be performed as soon as 6" of sediment have accumulated behind the fence fabric, and upon completion of the contract.
3. Maintenance to the silt boom shall be performed after each rainfall event. The silt boom shall also be maintained, or replaced if necessary, following disturbance from wind-driven or vessel-driven waves.

3.04 DEWATERING & CONTROL OF CONSTRUCTION WATER DISCHARGE

- A. The control of construction water discharge shall be managed by the Contractor in a manner to be determined as part of his Means-and-Methods. Actual measures for this

purpose shall comply with all applicable laws and regulations. Refer to the project Earthwork specifications.

- B. Comply with the construction, maintenance, inspection, and cleaning, remedial and close-out measures per the project Storm Water Pollution Prevention Plan (SWPPP).

END OF SECTION

**SECTION 313700****RIP-RAP REVETMENT****PART 1 GENERAL****1.01 GENERAL REQUIREMENTS**

- A. Work of this section, as shown or specified, shall be in accordance with the requirements of the contract documents. The extent of work includes all project rip-rap as shown in the contract documents.
- B. Refer to project "Soil Management Plan" report approved by NYSDEC for optional re-use as rip-rap of seawall stones arising from demolition and excavation activities.
- C. The contractor shall study the drawings carefully to determine the extent of rip-rap to remain, and to determine the extent of rip-rap placement. The rip-rap contour elevations and extents shown refer to revetment surface void grades.
- D. Where disturbed, it is anticipated that the existing rip-rap may be re-used, provided that the required project aesthetic and stability goals are met.
- E. Contractor is responsible for all estimates of project material quantities. Rip-rap quantities shall account for initial losses during contract period, penetration of rocks into mud-line, and for a degree of early settlement due to increased load.

**1.02 SCOPE OF WORK**

- A. The extent of the armor stone revetment construction is shown on drawings.
- B. The work shall include but is not limited to the following:
  - 1. All appropriate regulatory controls prior to excavation, disturbance or material placement, as specified herein and elsewhere.
  - 2. Careful disturbance to existing Rip-Rap, including re-grading where possible, sorting and stockpiling for re-use as necessary.
  - 3. Placing a bedding/filtration layer of gravel.
  - 4. Placing armor stone on the embankment and at the toe.
  - 5. Integrating geotextile fabrics into the armor stone revetment to prevent undermining.

**1.03 RELATED SECTIONS**

- A. Section 312300 – Earthwork
- B. Section 312500 – Soil Erosion and Sediment Control
- C. The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.
- D. Information regarding geotechnical subsurface conditions is given in the following geotechnical engineering report, copies of which are available for bid evaluation purposes from the office of the Construction Manager:

1. Geotechnical Engineering Memorandum dated 22 May 2013 by Langan Engineering and Environmental Services (Langan).
- A. Information regarding environmental soil/subsurface conditions and soil management practices are given in the following environmental engineering report, copies of which are available for bid evaluation purposes from the office of the Construction Manager:
1. Soil Management Plan (SMP) dated 8 January 2020 by Langan Engineering and Environmental Services (Langan).
- B. The project Storm Water Pollution Prevention Plan (SWPPP) has been prepared by Langan Engineering and Environmental Services (Langan), copies of which are available for bid evaluation purposes from the office of the Construction Manager.
1. Storm Water Pollution Prevention Plan (SWPPP) dated 8 January 2020 by Langan Engineering and Environmental Services (Langan).

#### 1.04 QUALITY ASSURANCE

- A. Contractor Qualifications: The Contractor performing the work of this Section shall be a qualified contractor with at least 10 years of relevant field experience on projects of similar size, scope, and complexity.
- B. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract.
- C. Conflicts: Conform to requirements of above standard unless specified otherwise. In case of apparent conflict between standards, or between standards and the specifications herein, refer the matter to the Engineer, whose decision shall be final.
- D. Owner's acceptance: Owner reserves the right to reject or accept supplier of materials.
- E. Workmanship: The Contractor is responsible for correction of restoration work which does not conform to the specified requirements, including coverage, and stability. Correct deficiencies as directed by the Engineer and coordinated with the Engineer.
- F. Test for Stone Materials
1. Test bedding material by method of sampling and testing of ASTM C33.
  2. For armor stone, material is subject to testing in accordance with ASTM D4992, ASTM D5312, ASTM D5313, and ASTM D5519. Testing may be waived, or may be conducted by the Owner, under certain circumstances, including the Owner's potential finding of an appropriate borrow site for the rock.
  3. Certificates of material properties and compliance with specified requirements may be submitted in lieu of testing, when acceptable to the Engineer.
  4. Stone Testing Service: Employ at Contractor's expense a testing laboratory as directed by the Engineer to perform material evaluation tests.
  5. Materials and installed work may require testing and retesting, as directed by the Engineer, at anytime during progress of work. Allow free access to material

stockpiles and facilities. Tests, not specifically indicated to be performed, including retesting of rejected materials and installed work, shall be done at Contractor's expense

- G. Checking Layout of Revetment Profile
  - 1. Cooperate with Owner's inspecting engineers to check and double-check the emerging profile while rip-rap placement is ongoing. Deploy and confirm the validity of sighting techniques to ensure that the designed revetment profile is initiated, adjusted, sustained, and delivered.

#### 1.05 REFERENCE STANDARDS

##### A. US ARMY CORPS OF ENGINEERS

- 1. EM 1110-2-1100 USACE Coastal Engineering Manual
- 2. EM 1110-2-1614- "Design of Coastal Revetments, Seawalls, and Bulkheads."
- 3. EM 1110-2-1414 - "Water Levels and Wave Heights For Coastal Eng. Design"
- 4. EM 1110-2-1601- "Hydraulic Design and Flood Control Channels," Chapter 3.
- 5. EM 1110-2-2303 "Construction with Large Stone."
- 6. ETL 1110-2-286-"Use of Geotextiles Under Riprap."

##### B. AMERICAN SOCIETY FOR TESTING MATERIALS:

- 1. C33 - "Specification for Concrete Aggregates."
- 2. C127- "Specific Gravity and Absorption of Coarse Aggregate."
- 3. D4992 - "Evaluation of Rock to be Used for Erosion Control."
- 4. D5312 - "Evaluation of Durability of Rock for Erosion Control Under Freezing and Thawing Conditions."
- 5. D5313 - "Evaluation of Durability of Rock for Erosion Control Under Wetting and Drying Conditions."
- 6. D5519 - "Particle Size Analysis on Natural and Man-Made Riprap Materials."

#### 1.06 SUBMITTALS

- A. Samples: Submit samples of stone materials as specified and as otherwise requested by the Engineer, including names, sources and descriptions.
- B. Laboratory Test Reports: Submit laboratory test reports for stone materials as specified.
- C. Field Test Reports: Submit field test reports for stone materials as specified.
- D. Contractor's Responsibility: The Engineer's acceptance shall not relieve the Contractor of responsibility for any error or for furnishing material of the proper size, quantity, or quality.

- E. Material Certificates: Provide material certificates in lieu of materials laboratory test reports when permitted by the Engineer. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with, or exceeds, specified requirements.

#### 1.07 JOB CONDITIONS

- A. Site information data is made available for convenience of Contractor. Before stockpiling stone, existing subsurface structures, utilities, etc., which may interfere with, or be affected by the specified construction, shall be located by:
  - 1. Sufficiency of Site Information Data: Site information data and related records of subsurface investigation are not part of the contract documents and are made available for inspection solely for convenience, if available.
- B. Protection of Persons and Property: Contractor shall provide protection, which shall include, but not limited to:
  - 1. Installation and maintenance of fences, barricades, warning signs, warning lights as required.
  - 2. Protection of structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout and other hazards created by earthwork operations. Repair, replace, or otherwise restore such damaged services and/or construction to a condition as good as prevailed at the time work started, and without additional compensation.
- C. Stockpile of rip-rap shall be a maximum of 12 feet high and formed by a series of layers of truckload dumps where the rock essentially remains where it is placed. Subsequent layers shall be started 10 feet from the edge of the previous layer. Stockpiles should remain a minimum of 20 feet from the shore. However it shall be the Contractor's responsibility, dependent upon the nature of the rock to be received, to plan appropriate unloading and stockpiling operations in a manner that will not result in damage to or loss of imported rock.

### **PART 2 – PRODUCTS**

#### 2.01 STONE SALVAGE

- A. To the extent that smaller classes of stone meet the rip-rap gradation specifications, at the contractor's option, such stone may be re-used for rip-rap material.
- B. Approximately 350 cubic yards (800 tons) of these smaller classes of stone units exist within the stone seawalls; however, please refer to project Soil Management Plan (SMP) report for regulatory compliance as to on-site and in-water re-use provisions.
- C. Refer to section 312300 "Earthwork" for details on all stone salvage operations.

#### 2.02 BEDDING MATERIAL

- A. Bedding material shall consist of a clean gravel or crushed stone and shall be free of organic mater and/or objectionable particles. The aggregates shall consist of hard crystalline stone or gravel, free from shale or decomposed or thin, laminated pieces. It shall be uncoated and clean, and conform to the following gradation requirements.

bedding stone layer, 4"-6" size:

SIEVE	6"	5"	4"	3"	No. 4
% Passing	100	50-100	10-50	0-10	0

2.03 ARMOR STONE (RIP-RAP)

- A. Armor stone shall generally be sourced from ongoing New York City foundation or other deep excavations, consisting of Manhattan granite, gneiss or other wear-resistant stone to be sourced, inspected and approved prior to delivery to the site. To the extent possible, as limited by the aesthetic and functional requirements of the Project, existing on-site rip-rap may be re-used as described below. Should the Contractor demonstrate that no Manhattan source is available, then dolomite rock from New York State sources shall be acceptable.
- B. Armor stone shall be equal to quarried rock and shall be free of objectionable materials. Each piece of rock must be composed of hard strong durable materials that will not slake or deteriorate on exposure to the action of water or atmosphere, and shall conform to the following standards and gradation requirements:
  - 1. Unit Weight: All stone shall have a minimum unit weight of 175 lb/ft<sup>3</sup> based upon water having a unit weight of 62 lb/ft<sup>3</sup>, and in accordance with ASTM C127.
  - 2. Absorption: The stone shall have an absorption less than 2 percent unless other tests and service records show that the stone is satisfactory.
  - 3. Petrographic Examination: Stone shall be evaluated according to the information required in ASTM D4992, Paragraph 10.
  - 4. Resistance to Freezing and Thawing: Stones shall have a maximum loss of 10 percent after the number of cycles specified by ASTM D5312.
  - 5. Resistance of Rock to Wetting and Drying: Stone shall have a maximum loss of 1 percent when determining the durability when subject to wetting and drying in accordance with ASTM D5313.
  - 6. Size and Shape: Stones shall be angular to rounded in shape; the least dimension of any stone shall not be less than one-third the greatest dimension of the fragment.
- C. Stones that fail to meet one or more of the material requirements stated above may be accepted only if similar rock from the same source has been demonstrated to be sound after five (5) years or more of service under conditions of weather, wetting and drying, and erosive forces similar to those anticipated for the rock to be installed under this specification.
- D. Rock shall have the following characteristics:
  - a) "Lower" or "Tidal" Rip-Rap, generally defined as Rip-Rap on shores up to elevation +5.0 feet, shall consist of Granite, Gneiss, or her . Dolomite or other dull granite shall not be used except as an under-layer, or if no alternative is proven. Existing on-site rip-rap may be used, provided that the rock is cleaned and that it meets all other specifications.

- b) “Lower”, “Inter-Tidal”, or “Tidal” Rip-Rap gradations shall be greater than 1200lbs and less than 2,500lbs. Stone shall be properly graded and conform to the following gradation requirement:

Percent Greater by Weight	100%	50%	15%
Limits of Stone Weight	1200-1250	1785	2085

- c) “Upper” or “Other” Rip-Rap, generally defined as Rip-Rap above elevation +5.0 feet shall consist of Granite, Gneiss, or wear-resistant stone. Dolomite or other dull granite shall not be used except as an under-layer, or if no alternative is proven. Existing on-site rip-rap or shot-rock shall not be used, except with Owner’s approval that the rock meets all other specifications.

- d) “Upper” or “Other” Rip-Rap gradations shall be greater than 400lbs and less than 1200lbs. Stone shall be properly graded and conform to the following gradation requirement:

Percent Greater by Weight	100%	50%	15%
Limits of Stone Weight	400-450	860	1000

- e) Rip-Rap in level areas shall generally meet Tidal Rip-Rap standards, with gradations between 700lbs and 900lbs. In these level areas, smaller rocks of gradations between 100lbs and 300lbs shall be chinked into each layer of rip-rap such that no void greater than 8 inches deep remains in the layer and in the finished surface.

2.04 RIP-RAP VENDORS

- A. NY Sand and Stone (Tilcon):  
800-789-7625  
411 Bergen Ave #3920  
Kearny, NJ 07032
- B. Rock Tech Inc.  
Steve Wulforst – 516-375-9991  
38B Allen Rd.,  
Farmingdale, NY 11735
- C. Shark Transportation Inc.  
Mark Veneiro – 973-390-3555  
127-178 Passaic Ave.  
Belleville, NJ 07109

PART 3 – EXECUTION

### 3.01 PREPARATION

- A. The Contractor's attention is directed to the plans and cross sections provided in the Contract Drawings. Coordination between drawings, with existing site and edge conditions, and with tidal fluctuations, shall be the entire responsibility of the Contractor.
- B. The Contractor shall examine conditions at this elevation, plan the excavation and removals work, and perform the work in a precise controlled manner so as to deliver a stable and aesthetic revetment per the Project drawings and specifications.
- C. Grading and geotextile base preparation to be performed in accordance with contract specifications and shall conform to the cross sections shown on the Contract Drawings within +/- 4 inches of elevations shown on or inferred from coordination of the Drawing plans and cross-sections.

### 3.02 PLACEMENT OF BEDDING LAYER

- A. Where required, a bedding layer shall consist of consisting clean stone or gravel, as specified herein. The bedding layers shall be placed on the prepared base as described below, in accordance with the details and limits shown on the Contract Drawings.
  - 1. Bedding stone shall be comprised of an 18 inch thick layer of 4"-6" clean crushed stone.
  - 2. Bedding shall be spread uniformly on the geotextile on the slope and grades as indicated in the Contract Drawings and in such a manner as to avoid damage to the geotextile.
  - 3. Placing of the bedding layer by methods that tend to segregate the particle sizes within the layer will not be permitted.
  - 4. Placement shall begin at the bottom of the area to be covered and continue up-slope. Subsequent loads of material shall be placed against previously placed material in such a manner to ensure a relatively homogeneous mass.
  - 5. Any damage to the geotextile during placing of the material shall be repaired before proceeding with the work.
  - 6. Compaction is not required, however, the material surface shall be finished to present an adequately even surface free from mounds or windows.
- B. Upon completion of the placement, the first layer of geotextile fabric at the top of the revetment shall be unpinned and pulled over the bedding layer in accordance with the Contract Drawings. Temporary pins shall be installed to ensure that the fabric remains in place until placement of the armor stone. The remaining layer of geotextile extending past the toe shall remain pinned.

### 3.03 PLACEMENT OF RIP-RAP ARMOR STONE

- A. Armor stone shall be machine placed within specified tolerances, as described below and to the lines and grades shown on the Contract Drawings.
  - 1. Armor stone shall be placed in a manner that will produce a poorly graded mass of rock with minimum practicable percentage of voids.

2. Armor stone shall be placed to its full course thickness in one operation, and in such a manner as to avoid displacing the bedding material. The large stones shall be well distributed and the entire mass of stones in their final position shall be graded to conform to the gradation specified herein.
  3. The minimum Rip-Rap layer thickness is 2.5 feet thick.
  4. In all reveted or sloped areas, placement shall begin at the bottom of the revetment and continue up-slope. Subsequent loads of material shall be placed against previously placed material in such a manner to ensure a relatively homogeneous mass.
  5. Armor Stone Placed in the Wet: Shall be done during periods of low water.
    - a. The stones shall be placed in two passes, with the second pass perpendicular to the first pass to achieve the layer thickness as specified in the Contract Drawings.
    - b. Where applicable, the remaining layer of geotextile fabric extending past the toe shall be unpinned and pulled over the first pass of stone, and the second pass of stone placed over the fabric.
    - c. As shown on the drawings, mechanically install a toe of rock into the mud-line at the revetment base by applying long-reach backhoe bucket pressure.
  6. The finished armor stone shall be free from objectionable pockets of small stones and clusters of large stones.
  7. As shown on the drawings, flat areas of Rip-Rap shall be chinked with smaller stones such that voids shall be reduced in frequency and size according to the directions therein provided.
- B. During placement, in order to provide adequate protection of the bedding layer and the geotextile fabric, no stone shall be dropped through the air from a height greater than 2 feet for stones heavier than 400 pounds and 1 foot for stones heavier than 1000 pounds.
- C. Stones required to be placed over or adjacent to drains, outfalls, and subsurface pipes shall not be dropped, but gently lowered and placed in their final position by material handling equipment.
- D. Equipment used to place armor stone shall be truck, crane-operated skip-pan, dragline bucket, clamshell, rock-bucket, hydraulic excavator, trackhoe, or other approved equipment.
- E. No equipment shall be operated directly on the completed stone protection system.
- F. The following methods of placement will not be permitted:
1. Placing the armor stone in layers, except where specified.
  2. Placing armor stone by methods likely to cause segregation of the various sizes.
  3. Placing armor stone by dumping it at the top of the slope and pushing it down the slope.

3.04 TOLERANCES

A. Bedding Layer

1. Slope Lines and Grade: plus 2 inches or minus 1 inch.
2. Layer Thickness: plus 3 inches or minus 1 inch.

B. Armor Stone

1. Slope Lines and Grade: plus or minus 6 inches.
2. Layer Thickness: plus or minus 6 inches.

END OF SECTION

**SECTION 314100****SHORING AND BRACING****PART 1 - GENERAL**1.01 **SUMMARY**

- A. The work of this Section includes, but is not limited to, the following:
1. All engineering, surveying, layout, monitoring, and submittals in connection of the work of this Section.
  2. Filing, obtaining approvals and permits for the work of this Section from the NYC Department of Buildings and authorities having jurisdiction.
  3. Sheeting, shoring, bracing, underpinning, and soil and rock cut support necessary to protect existing building, structures, streets, walkways, utilities, other improvements and excavation against loss of support.
  4. Maintenance of sheeting, bracing.
  5. Removal of sheeting, bracing, and underpinning as required.
  6. Monitoring of the existing building and adjacent structures.
- B. Related Sections:
1. Section 310913 – Monitoring of Adjacent Structures
  2. Section 312300 – Earthwork
  3. Section 312319 – Dewatering
  4. The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

1.02 **CODES, STANDARDS AND REFERENCES**

All work shall be done in accordance with all applicable codes and regulations having jurisdiction. Unless specifically specified otherwise herein or by local ordinance, all work shall be done in accordance with the following codes, standards and specifications, and such requirements shall be binding as if specified directly herein. Only the latest editions (at bid date) of the following codes, standards and specifications shall form part of this Specification to the extent indicated by the reference thereto:

1. New York City Building Code (edition prior July 2008) – Subchapter 11 and other relevant sections.
2. OSHA - 29 CFR 1926 Subpart P
3. American Society for Testing and Materials (ASTM) standards.
4. ACI-318 -Building Code Requirements for Structural Concrete
5. Geotechnical Engineering Memorandum dated 22 May 2013 by Langan Engineering and Environmental Services (Langan)

### 1.03 SCOPE OF WORK

- A. All labor, materials, equipment and accessories necessary for or incidental to the completion of all shoring, bracing, and underpinning work as shown on drawings, as specified herein, and as required by the conditions at the site, are a part of the Contract.

### 1.04 SUBMITTALS

- A. Unless otherwise indicated, transmit all submittals to the Construction Manager for review by the Owner's Geotechnical and Structural Engineers before proceeding with ordering, fabricating, or any other work of this Section. Transmit all submittals at least 3 weeks prior to start of work, unless otherwise noted.
- B. Submittal review will be of the concept only and shall not in any way diminish or limit the Contractor's responsibility for the design, performance, and quality of the work of this section and for the protecting of existing structures. Contractor shall be solely responsible and liable for the work described herein.
- C. Professional Engineer: Submit name of Contractor's Professional Engineer engaged and assigned to supervise sheeting, bracing, underpinning, and soil and support design and installation. Consultant and field supervisor shall be professional engineers licensed in the State of New York.
- D. The Contractor's Professional Engineer shall prepare an outline of the Contractor's construction methods and step-by-step procedures together with plans and details of any proposed sheeting, bracing and underpinning required. This shall be coordinated with the relevant submittals identified in Section 02200 - Earthwork, and shall be submitted and reviewed prior to submittal of the more detailed shop drawings. This will include and shoring or underpinning required during the construction of the piles, pile-caps and grade beam for the existing building.
- E. Shop Drawings and Calculations.
1. Prepare and submit shop drawings of all items (including but not limited to shoring, sheeting, underpinning, monitoring) in this Section, in accordance with the Contract Documents. The shop drawings and calculations shall be submitted signed and sealed by Professional Engineer licensed in the State of New York engaged by the Contractor.
  2. Shop drawings shall show in detail the various portions of the work, kind of materials and methods of securing same together and the work of other trades. Drawings shall show in the elevations and sections the manner and sequence proposed for all work of this Section. Details for temporary needles, shores, etc., shall be included on the shop drawings.
  3. Calculations shall show all design loads upon which the sheeting, bracing, underpinning, and soil support measures are based along with design calculations for the sheeting and bracing supports.
- F. Submit qualification data for firms and persons specified herein, to demonstrate their capabilities and experience. Include list of completed projects with project names addresses, telephone numbers, and names of Architects and Owners.

### 1.05 QUALITY ASSURANCE

- A. Contractor Qualifications: The Contractor performing the work of this Section shall demonstrate that they have at least 10 years of recent field experience on projects of similar size, scope, and complexity.

- B. Design Supervision: The Contractor shall retain the services of a Professional Licensed Engineer licensed in the State of New York, acceptable to the Engineer of Record, who shall design and supervise installation of all work of this Section and perform all required inspections. The Contractor's Professional Engineer shall sign and file all relevant NYC Building Department controlled inspection forms.
  
- D. Pre-Construction Meeting:
  - 1. Before commencing work of this Section, meet with representatives of the governing authorities, RIOC, Engineer, and other concerned entities. Review the earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 5 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.
  - 2. All work of this Section shall be subject to quality control inspection, which will be done by the RIOC's Geotechnical Engineer.

#### 1.06 PROJECT CONDITIONS

- A. Contractor shall note that the project construction requires significant excavations for seawall demolition and foundation construction work.
- B. Contractor is responsible to coordinate all project drawings, site conditions and other contract documents in his planning and execution of the work. Regardless of the extent, depth and slope of excavations shown or inferred from the drawings, contractor shall be solely responsible for the means and methods of performing the work in a safe and expeditious manner, including the construction approach to excavation and foundations work.
- C. Contractor shall take all necessary measure to prevent undermining or damaging adjacent structures, walls, seawalls, pavements, fences, trees, signs, poles, etc.
- D. Should any other shoring, bracing or underpinning be required as defined by the nyc building code, preparation of details of shoring, bracing or underpinning, or other excavation support system, shall be the sole responsibility of the contractor.
- E. The Contractor's professional engineer shall be solely responsible for the special inspections, including building department filings if any, associated with the excavation support, shoring, bracing or underpinning aspects of the work.
- F. Where internal braces are used as part of the excavation support system, the internal braces shall not be removed until backfilling operations have been completed to safe elevations.
- G. Where excavation support system is required to withstand earth pressures resulting from backfill placement, the backfill shall not be placed until after the excavation support system has been completely installed.
- H. The site is adjacent to a public Park and historic landmark buildings. The Park, historic landmark buildings and any other structures to remain shall be protected at all times.
- I. Protect and monitor existing structures in accordance a Construction Protection Plan to be the prepared and submitted by the Contractor's professional in accordance with the requirements and criteria shown on the drawings.
- J. Geotechnical investigation reports prepared by RIOC's Engineer are made available to the Contractor for information only. Conditions are not intended as representations or warranties of accuracy or continuity between test pits or between borings. RIOC shall not be responsible for interpretations or conclusions drawn from this data by the Contractor.

- K. RIOC makes no predictions or representations regarding the character or extent of soil, rock, or other subsurface conditions to be encountered during the work. The Contractor shall make his own deductions of the subsurface conditions which may affect the methods or cost of construction of the work hereunder. Additional borings and other exploratory operations may be performed by Contractor, at the Contractor's option and following the Owner's approval. No change in the Contract Sum will be authorized for such additional exploration undertaken by the Contractor.
- L. The Contractor, by careful examination, shall inform himself as to the nature and location of the work; the conformation of the ground, the nature of the subsurface conditions; the locations of the groundwater table; the character, quality and quantity of the materials to be encountered; the character of the equipment and facilities needed preliminary to and during the execution of the work; and all other matters which can be in any way affect the work.
- M. The Contractor shall be held to have visited the site and to have familiarized himself with the existing conditions of adjoining properties, utilities and buildings.
- N. The Contractor shall investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the site of the work. The Contractor shall conform to all New York City and State, and Federal regulations in regard to the transportation of materials to and from and at the job site and shall secure in advance such permits as may be required.
- N. Existing Utilities: Locate existing underground utilities in and beyond the areas of work. If utilities are indicated to remain in place, provide adequate means of support and protection during the work.
1. Should uncharted, or incorrectly charted, piping or other utilities be encountered during excavation, consult utility owner and RIOC immediately for directions. Cooperate with RIOC and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.
  2. Do not interrupt existing utilities serving facilities occupied by others during occupied hours, except when permitted in writing by the RIOC and then only after acceptable temporary utility services have been provided. Provide minimum of 48-hour notice to the RIC, and receive written notice to proceed before interrupting any utility.
  3. Demolish and completely remove from site existing underground utilities. Coordinate with utility companies for shutoff of services if lines are active.
- O. Examine drawings to determine sequence of operations, and relation to work of other trades. Start of work will signify acceptance of field conditions and will acknowledge coordination with other trades.

## **PART 2 – PRODUCTS**

### **2.01 GENERAL**

- A. Provide all required suitable sheeting, bracing, underpinning, and soil support materials, which will withstand loads imposed without any movement.
- B. Materials shall be kept in serviceable condition at all times.

## **PART 3 – EXECUTION**

### **3.01 GENERAL**

- A. The Contractor shall provide, erect and maintain all necessary sheeting, bracing, underpinning, and soil and rock support when and where required. Locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces.

- B. Sheeting, bracing, and underpinning shall be erected and maintained to the entire satisfaction of any City and State authorities having jurisdiction. Systems on which the support or stability of existing building and structures is dependent must be left in place at completion of work. In other areas, maintain system until structural elements are replaced by other bracing or until permanent construction is able to resist lateral earth, rock, surcharge, and hydrostatic pressures.
- C. The construction and performance of the sheeting, bracing, underpinning, and soil support work for the purpose of which it is erected shall be the entire responsibility of the Contractor.
- D. Should any subsidence or any other damage occur due to the inefficiency of the work, the damage shall be made good by the Contractor at his own expense.
- E. The Contractor shall make use of such methods of work as are best adapted to preserve the safety and stability of foundations, walls, and other parts of affected buildings or structures.

### 3.02 PROTECTION

- A. The work shall be executed so that no damage or injury will occur to the existing buildings, structures, and adjacent structures, streets, pavements, utility lines. Should any damage or injury caused by the Contractor, or anyone in Contractor's employ, or by the work under this Contract occur, the Contractor shall, at own expense, repair such damage and shall assume all responsibility for such injury.
- B. The above shall also include the protection of all existing elements (footings, walls, beams, slabs, utilities to remain in use within and adjacent to the area affected by the work of this project.
- C. Existing building and its elements, excavation sides, existing foundations, slabs, walls, and utilities shall be protected by means adequate bracing, shoring, underpinning, anchoring and bolting at all times. Excavation shall not proceed until adequate support for excavation sides and existing building elements is provided. Contractor shall be solely responsible for the stability, safety and protection of excavation sides and the existing building.

### 3.03 SHEETING AND BRACING

- A. Contractor shall be solely responsible for performing the work in a safe manner in accordance with OSHA and NYC Building Code. Provide all labor, material to shore, brace excavations Protect all structure to remain.
- B. Sheeting and bracing shall be designed and constructed in accordance with the New York City Building Code requirements. It shall be adequate to resist earth, rock, and hydrostatic pressures and any other design load; to prevent displacement of adjacent ground; and to prevent loss of support or damage to existing foundations, buildings, utilities, sidewalks and streets. Lateral loads created from adjacent foundations, buildings, cranes and/or street loads shall be included in the design. Contractor's professional engineer shall be solely responsible for the design and installation inspection of the sheeting, shoring and bracing systems.
- C. During the excavation work specified in Section 312300 - Earthwork, if additional locations may require sheeting, bracing and/or underpinning based on the Contractor's construction methods and procedures, then the Contractor shall provide such additional supports at no additional cost to the Owner. Such additional supports shall be designed and constructed in accordance with the requirements of this Section.

- D. All the above work shall be carried on in such a manner as not to interfere with the progress of the work under this Contract.
- E. Where sheeting and bracing is required to withstand earth pressures resulting from backfill placement, the backfill shall not be placed until after sheeting and bracing has been completely installed. Materials shall not be removed until the supporting structure has attained adequate strength.
- G. Support of Cuts:
  - 1. Temporary excavation walls shall be provided along the sides of excavations in soil and any other material not self-supporting as determined by the Contractor's Professional Engineer.
  - 2. Excavation adjacent to the temporary wall shall not exceed a depth of 2 ft below the point of lateral support to be installed. Lateral support shall be installed and preloaded prior to continuing excavation.
  - 3. Provide adequate safe slopes if open cuts are performed. Follow OSHA rules for safe slopes. Dewater as necessary.

#### 3.04 MONITORING OF ADJACENT STRUCTURES

- A. Contractor shall prepare a Construction Protection Plan in accordance with the criteria shown on the drawings. Contractor's Plan shall also include making shop drawing submittals showing designed measures (e.g. shoring, bracing or underpinning) to prevent undermining or damaging the following structures:
  - 1. Adjacent seawall segments at north end of project, and to include adjacent pavements, fences, gates, signs, etc.
  - 2. Adjacent Four Freedoms Park (FFP) walls with shallow foundations at south end of project.
  - 3. Adjacent Four Freedoms Park (FFP) trailers, security poles and guardhouse, all with shallow foundations, at south end of project, and to include adjacent pavements, benches, fences, trees, etc.

The design of these shoring, bracing or underpinning measures shall be the sole responsibility of the Contractor and shall be under the direct supervision of, and bear the signature and seal of, a licensed professional engineer of the state of New York experienced in the design of such work, who shall be retained by the Contractor and shall be responsible for construction supervision of this work.

- B. Control (monitoring) points shall be established by the Contractor employing a Professional Land Surveyor licensed in the State of New York. Monitoring, reporting, criteria for allowable movements of the adjacent structural elements shall be per the notes referencing the Construction Protection Plan on the drawings.
- C. The Contractor shall restore, to the satisfaction of RIOG, by repair or otherwise, the portions of adjacent structures, altered by the Contractor in furtherance of his sheeting, bracing, and underpinning work. Restoration shall be completed to the conditions, which existed prior to the start of work.

END OF SECTION

**SECTION 321400****UNIT PAVERS****PART 1- GENERAL****1.01 SCOPE OF SERVICES**

- A. Work of this section shall be performed in accordance with the Contract Drawings and shall generally include providing the necessary materials, labor and equipment to construct the following pavements:

1. Concrete unit pavers set in bituminous setting bed on concrete slab

**1.02 RELATED SECTIONS AND DOCUMENTS**

- A. The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

**1.03 REFERENCE STANDARDS**

- B. ASTM C936 - Concrete Pavers
- C. ASTM D-36-84 – Softening Point of Bitumen

**1.04 QUALITY ASSURANCE**

- A. **Installer Qualifications**  
Engage an experienced installer with a minimum of 10 years' experience in unit paver installations similar in material, design, and extent to that indicated for the Project.
- B. **Single Source Responsibility**  
Obtain each color, type and variety of unit pavers, joint materials and setting materials from a single source with resources and setting materials from a single source with resources to provide products and materials of consistent quality in appearance and physical properties.
- C. **Field-Constructed Mock-Up**
1. Prior to installation of unit pavers, erect 100 sf mock-up for each type and pattern of unit pavers required to verify selections made under sample submittals.
  2. Build mock-ups using the same base construction including special features for expansion joints and contiguous work as indicated for the Project.
  3. Obtain Engineer's/Landscape Architect's acceptance of mock-ups before start of the project unit paver installation.
  4. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed work.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Protect unit pavers and aggregate during storage and construction against wetting, soilage or contamination from earth and other materials.
- B. Protect grout and mortar materials from deterioration by moisture and temperature.

1.06 PROJECT CONDITIONS

- A. Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
- B. Apply asphalt primer coat when ambient temperature is above 50°F and when temperature has not been below 35°F for 12 immediately prior to application. Do not apply when base is wet or contains excess moisture.
- C. Install bituminous setting bed only when atmospheric temperature is above 40°F and when base is dry.
- D. Protect Portland cement or mortared installations against freezing when atmospheric temperature is 40°F and falling. Heat materials and provide temporary protection for completed portion of unit paver work.
  - 1. Comply with International Masonry All-Weather Council's "Guide Specification for Cold-Weather Masonry Construction".
  - 2. Refer to ACI 503R for temperature and humidity conditions that could have deleterious effects on Portland cement mortar and grout.
- E. Protect Portland or mortared installations when temperature and humidity conditions produce excessive evaporation of setting beds and grouts. Do not apply mortar to substrates with temperature of 100°F and above.

1.07 SUBMITTALS

- A. Submit product data, testing and material analysis for the following products in accordance with Conditions of Contract and Division 1 Specification Sections.
  - 1. Concrete pavers
  - 2. Edge restraints
  - 3. Polymeric sand
  - 4. Bituminous setting bed material
  - 5. Subslab concrete
  - 6. Filter fabric
- B. Submit samples for verification purposes of each type of unit paver indicated, in sets to illustrate the full range of color and texture expected.

- C. Submit qualification data for installer specified in "Quality Assurance" to demonstrate their capabilities and experience. Include list of completed projects with project names, addresses, names of Architects and Owners.
- D. Submit physical product sample of specified paver to Landscape Architect.

**PART 2- PRODUCTS**

**2.01 GENERAL**

Provide products and materials as called for in the Drawing or specified herein. Alternates may be reviewed and approved at the discretion of the Engineer. Alternates shall be submitted with manufacturer's data and samples to illustrate compliance with the performance requirements, specified sizes, color and finishes.

**2.02 CONCRETE UNIT PAVER**

- A. The following pavers shall be used as supplied by the following manufacturer(s) {OR APPROVED EQUAL}:

Unilock Pavers  
 51 International Blvd  
 Brewster, NY 10509  
 845-278-6700

Description	Size	Model No./Color
Hexagonal Concrete Paver	7.875"x7.875"x2.75"	Standard color and finish; contractor to submit physical samples for review prior to purchase and installation

**2.03 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
  - a. Unit Pavers: Furnish quantity of full-size units for each shape and thickness equal to 10 percent of amount installed.

**2.04 BITUMINOUS SETTING BED AND TACK COAT**

- A. Primer for base: ASTM D 2028, cutback asphalt, grade as recommended by unit paver manufacturer (use when paving intended for vehicular traffic).
- B. Setting Bed Mixture: Dried fine aggregate combined with hot asphalt cement. The fine aggregate shall be clean, hard sand with durable particles free from adherent coating, lumps of clay, alkali salts, and organic matter. It shall be uniformly graded from 'coarse' to 'fine' and all passing the No. 4 sieve and shall meet the gradation requirements of fine and coarse aggregates ASTM C-136-81. Asphalt cement to be used in the bituminous setting bed shall conform to ASTM D-3381, viscosity grade AC-10 or AC-20.

- C. Neoprene tack coat shall consist of paving manufacturer's standard neoprene-modified asphalt adhesive consisting of oxidized asphalt combined with 2 percent neoprene and 10 percent long-fibered mineral fibers containing no asbestos.

### **PART 3- EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine surfaces to receive paving compliance with requirements for installation tolerances and other conditions affecting the performance of unit pavers. Do not proceed with installation until unsatisfactory conditions have been corrected.
- B. Proof roll prepared subgrade to check for unstable areas and areas requiring additional compaction. Correct all areas with deficient subgrades before proceeding with unit paver installation.
- C. Contractor to confirm that all three plantings and subsurface tree pit technologies including aeration, drainage and irrigation is installed properly. Contractor shall not proceed with installation of paving if any of these items are not completed.

#### **3.02 GENERAL**

- A. Cut pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Hammer cutting is not acceptable.
- B. Lay unit pavers in joint pattern indicated in the Drawings and matching field-constructed mock-up.
- C. Install edge restraint prior to setting pavers.

#### **3.03 BITUMINOUS SETTING BED INSTALLATIONS**

- A. Apply asphalt primer to concrete slab or binder course where paving will be subject to vehicular traffic.
- B. Locate 3/4 inch deep control bars approximately 11 feet apart and parallel to one another to serve as guides for striking board (12 feet long, 2 inch by 6 inch board). Adjust bars to subgrades required for accurate setting of paving units to finished grades indicated.
- C. Place bituminous setting bed where indicated, in panels between control bars, pulling bed with striking board several times to produce a smooth, firm and even setting bed not less than 3/4 inch thick. After each panel is completed, advance control bar to next position in readiness for striking adjacent panels. Carefully fill up any depressions that remain after removing depth control bars.
- D. Roll setting bed with paver roller to a nominal depth of 3/4 inch. Under no circumstances shall the setting bed exceed 1 inch.
- E. Apply neoprene tack coat to cold setting bedding squeegeeing or troweling over the top surface of the bituminous setting bed as a skim coat to a 1/16 inch maximum so as to provide a bond under the pavers. Setting bed shall be free of all foreign matter. Allow neoprene tack coat to flash off but not dry before embedding the pavers.
- F. Place unit pavers by hand in straight courses with hand tight joints and uniform top surface.

- G. Fill hand tight joints with dry pack mixture by sweeping mixture over paved surface until joints are filled. Follow by fogging lightly with water.
- F. Clean cement stains that remain from exposed paver surfaces.

END OF SECTION

**SECTION 321500**

**STABILIZED CRUSHED STONE PAVING**

**PART 1- GENERAL**

1.01 DESCRIPTION OF WORK

A. Work included in this section.

1. Open-graded ¼" minus aggregate paving with Stabilizer binder additive.

1.02 SYSTEM DESCRIPTION

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

A. Section 321300 – Unit Pavers

1.03 SYSTEM DESCRIPTION

A. Open-graded ¼" minus aggregate paving with Stabilizer binder additive

1.04 SUBMITTALS

- A. Products: Five lb. sample and sieve analysis for grading of open-graded ¼" minus aggregate.
- B. Product data for stabilizer binder additive

1.05 TESTS

A. Perform gradation of open-graded ¼" minus aggregate paving with Stabilizer additive at location as directed by owner's representative.

1.06 ENVIRONMENTAL CONDITIONS

A. Do not install paving during rainy conditions.

1.07 QUALITY ASSURANCE

A. Installer – provide evidence to indicate successful experience in providing open-graded ¼" minus aggregate paving containing Stabilizer binder additive.

1.08 EXCESS MATERIALS

A. Provide owner's authorized representative with the following excess materials for use in future ¼" crushed aggregate paving repair:

- 40 – 50 lb. bags of the aggregate paving
- 1 – 40 lb. bag of the Stabilizer additive

**PART 2 - PRODUCTS****2.01 1/4" CRUSHED AGGREGATE SCREENINGS**

- A. Crushed Stone Sieve Analysis Percentage of Weight Passing a Square Mesh Sieve AASHTOT11-82 and T27-82.

<b>1/4" MINUS AGGREGATE GRADATION</b>	
<b>Sieve Designation</b>	<b>Range of % Passing</b>
3/8"	100
No. 4	95-100
No. 8	75-80
No. 16	55-65
No. 30	40-50
No. 50	25-35
No. 100	20-25
No. 200	5-15

- B. Acceptable local supplier – list to be provided.

**2.02 STABILIZER BINDER**

- B. Patented, non-toxic, organic binder that is a colorless and odorless concentrated powder that binds 1/4" minus aggregate together to produce a firm surface, as supplied by the following manufacturer (or approved equal):
- a. Provided by Stabilizer Solutions, Inc., 1-800-336-2468.

**PART 3- EXECUTION****3.01 BLENDING STABILIZER**

- A. Blend 12 – 16 lbs. of Stabilizer per ton of 1/4" minus aggregate screenings. It is critical that Stabilizer be thoroughly and uniformly mixed throughout aggregate screenings.
- B. Refer to manufacturer's current specifications for detailed installation instructions.

**3.02 PLACEMENT OF 1/4" MINUS AGGREGATE SCREENINGS**

- A. Upon thorough moisture penetration, compact aggregate screenings to 95% relative compaction by compaction equipment such as: double drum roller (2-4 ton) or single drum roller (1000 lbs.) vibratory plate tamp. Do not begin compaction for 6 hours after placement and up to 48 hours.
- B. Take care in compacting 1/4" minus aggregate screenings when adjacent planting and irrigation systems.

**3.03 REPAIRS AND PROTECTION**

- A. Remove and replace 1/4" minus aggregate paving that is damaged, defective or does not meet requirements of this section.

3.04 MAINTENANCE

- A. Remove debris, such as paper, grass clippings, leaves or other organic materials by mechanically blowing or hand raking the surface as needed.
- B. During the first year, a minor amount of loose aggregate will appear on the surface (1/16 to ¼ inch). If this material exceeds a ¼ of an inch, redistribute the material over the entire surface. Water thoroughly to the depth of 1". Compact with power roller of no less than 1000 lbs. This process should be repeated as needed.
- C. If cracking occurs, simply sweep fines into the cracks, water thoroughly and hand tamp with an 8" to 10" hand tamp late.

3.05 REPAIRS

- A. Excavate damaged area to the depth of the Stabilized aggregate and square up side walls.
- B. If area is dry, moisten damaged portion.
- C. Pre-blend the dry required amount of Stabilizer. Thoroughly moisten mix with 25 to 35 galls per ton of pre-blended material or to approximately 10% moisture content.
- D. Add water to the pre-blended aggregate and Stabilizer. Thoroughly moisten mix with 25 to 35 gallons per ton of pre-blended material or to approximately 10% moisture content.
- E. Apply moistened pre-blended aggregate to excavated area to finish grate.
- F. Compact with an 8" to 10" hand tamp or 250 to 300 pound roller (if area is high traffic such as, cart path, driveway, parking lot, use a larger 1000 lb. roller). Keep traffic off areas for 12 to 48 hours after repair has been completed.

END OF SECTION

**SECTION 323001****SITE STONEWORK****PART 1 - GENERAL**1.01 DESCRIPTION OF WORK

- A. General: Provide stonework in accordance with requirements of the Contract Documents.

1.02 RELATED SECTIONS

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 312310 – Earthwork  
B. Section 033000 - Cast-in-Place Concrete  
C. Section 321313 - Concrete Paving

1.03 REFERENCES

- A. General: Comply with the applicable provisions of the referenced standards except as modified by governing codes and the Contract Documents. Where a recommendation or suggestion occurs in the referenced standards, such recommendation or suggestion shall be considered mandatory. In the event of conflict between referenced standards, this specification or within themselves, the more stringent standard or requirement shall govern.
1. ASTM test procedures: C97, C99, C170, C241, and C880 for each sample submitted.

1.04 SUBMITTALS

- A. Shop Drawings: Prepare shop drawings to scale for fabrication, installation and erection of all parts of the work after receiving Landscape Architect's review of material samples. Provide plans, elevations, and details of anchorage, connections and accessory items for approval by the Landscape Architect for the following:
1. Stone Path  
2. Stone Walls
- B. Mockups: Prepare 50 sf (min) mockups of the following installations as detailed in drawings to demonstrate materials, finish and workmanship to be used throughout project. Mockups to be approved by Landscape Architect prior to commencing construction of these elements on project site:
1. Stone Path  
2. Stone Walls

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs experienced stonemasons and stone fitters installing stone systems similar in material, design, and extent to that indicated for this Project and a demonstrated minimum of five years' experience on similar projects.

- B. Fabricator Qualifications: Fabricator that employs skilled workers who custom-fabricate stone dimension stone systems similar to that required for this Project.
- C. Source Limitations for Stone: Stone salvaged from site stone wall shall be the primary source of stone. If the quantity of salvaged stone is not sufficient, obtain local stone to match salvaged stone. Obtain each variety of stone, from one quarry with resources to provide materials of consistent quality in appearance and physical properties.
- D. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- E. Pre-installation Conference: Conduct conference at Project site with the Landscape Architect Contractor and Installer.

#### 1.06 COLLECTION, DELIVERY, STOCKPILING STORAGE, AND HANDLING

- A. Collect stone from site walls in areas to be disturbed and protect stone walls beyond disturbance areas.
- B. Collected stone shall be carefully stockpiled to avoid damage and breakage.
- C. If additional stone is required, deliver stone to project site in undamaged condition.
- D. Store and handle stone and related materials to prevent deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, and other causes.
  - 1. Lift stone with wide-belt slings; do not use wire rope, ropes that might cause staining or chains. Move stone, if required, using dollies with cushioned wood supports.
  - 2. Store stone on wood skids or pallets with non-staining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to stone
  - 3. Do not use pinch or wrecking bars
  - 4. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones
- E. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- F. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- G. Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 degrees F or when joint substrates are wet due to rain, frost, condensation or other causes.

#### 1.07 PROJECT CONDITIONS

- A. Protection: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Stain Prevention: Immediately remove mortar and soil to prevent them from staining the face of stone.
  1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on the ground and over the wall surface.
- C. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace stone masonry damaged by frost or freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
  1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 degrees F and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.
- D. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

## **PART 2 - PRODUCTS**

### 2.01 RECLAIMED SITE STONE

- A. Use stone stockpiled on site.

### 2.02 STONE FABRICATION

- A. Fabricate dimension stonework in sizes and shapes required to comply with requirements indicated, including details on Drawings and final shop drawings. Comply with recommendations of National Building Granite Quarries Association, Inc. as published in Specifications for Architectural Granite.
- B. Cut and drill holes in stones for anchors, fasteners, supports and lifting devices as indicated or needed to set dimension stonework securely in place.
- C. Chisel Cut stones to produce pieces of size, and shape indicated to comply with fabrication and construction tolerances recommended by applicable stone association or if none by stone source for faces, edges, beds and backs.
  1. Size as indicated
  2. Cut stones to produce joints of uniform width and in locations indicated.
  3. Joint width:
    - a. Stone path – as noted in drawings; cut or chiseled irregular pattern with level mortared joints to comply with ADA smoothness requirements.
  4. Wetting cutting methods must be employed to minimize silica dust emissions during cutting operations.
- D. Contiguous work: Provide reveals, reglets, openings and similar features as required to accommodate contiguous work.
- E. Finish exposed faces and edges of stones to comply with requirements indicated for finish

under each type and application of stone required and to match approved samples.

- F. Exposed saw cuts will be deemed unacceptable.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine surfaces indicated to receive stone material, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Examine stone sub-base on which stone seating is to be set for evenness, levelness and compaction suitable to support the blocks of stone.

#### **3.02 PREPARATION**

- A. Clean dirty or stained stone surfaces by removing soil, stains, and foreign materials before setting. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.

#### **3.03 SETTING OF STONE, GENERAL**

- A. Execute stone work by skilled mechanics, and employ skilled stone fitters at the site to do necessary field cutting as stones are set.
  - 1. Do not cut reclaimed wall stone with power saws, use chisels and traditional tools to shape stones with cleft edges. Use power saws only to cut stone that is fabricated with saw-cut surfaces.
- B. Sort stone before it is placed in structure to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication or that is otherwise unsuitable for intended use.
- C. Set stones to comply with requirements with requirements indicated on Drawings and final shop drawings. Install anchors, supports, fasteners and other attachments indicated or necessary to secure stone work in place. Shim and adjust anchors, supports and accessories to set stones accurately in locations indicated with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.
- D. Arrange stone with color and size variations uniformly dispersed for an evenly blended appearance.
- E. Set stone to comply with requirements indicated on Drawings. Install supports, fasteners, and other attachments indicated or necessary to secure stone in place. Set stone accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.
- F. Maintain uniform joint widths except for variations due to different stone sizes and where minor variations are required to maintain alignment.

#### **3.04 CONSTRUCTION TOLERANCES**

- A. Variation from Plumb: For vertical lines and surfaces, do not exceed 1/4 inch in 10 feet.
- B. Variation of Level: For grades indicated for conspicuous lines, do not exceed 1/2 inch in 20 feet maximum

- C. Variation in mortar-Joint Thickness: Do not vary from joint size range indicated.

### 3.05 PROTECTION

- A. During construction, cover top of stone structures with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.
  - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Protect base of stone constructions from rain-splashed mud and mortar splatter by means of covering spread on ground and over stone surface.
- C. Staining: Prevent mortar or soil from staining the face of fieldstone to be left exposed. Remove immediately any mortar in contact with stone material.
- D. Protect stone construction from damage and displacement during subsequent backfilling, compacting and grading operations.

### 3.06 ADJUSTING AND CLEANING

- A. Remove and replace stone of the following description:
  - 1. Broken, chipped, stained, or otherwise damaged stone. Stone may be repaired if methods and results are approved by Landscape Architect.
  - 2. Defective joints.
  - 3. Stone not matching approved mockups.
  - 4. Stone not complying with other requirements indicated.
- B. Replace in manner that results in dimension stonework's matching approved samples, complying with other requirements and showing no evidence of replacement
- C. In-Progress Cleaning: Clean stone as work progresses. Remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Protect adjacent stone surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
  - 3. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
  - 4. Clean stone by bucket and brush hand-cleaning method described in BIA Technical Note No. 20 Revised II, using job-mixed detergent solution.

END OF SECTION

**SECTION 323100****SEAWALL RAILINGS****PART 1 - GENERAL**1.01 DESCRIPTION OF WORK

A. Work in this section shall include all labor, materials, supervision, equipment, tools, supplies and all other miscellaneous items deemed necessary to furnish and install metal fabrication as indicated on the contract drawings and specified herein. This work includes but is not limited to:

1. Fabrication and assembly of steel seawall railing panels
2. Preparation of bare steel
3. Thermal sprayed metal coating (hot-dipped galvanizing is not an acceptable substitute)
4. Shop-applied powder-spray painting (liquid paint is not an acceptable substitute)
5. Miscellaneous stainless steel bolts, anchors and inserts to be set in concrete
6. Stainless steel washers, bolts, jam-nuts, angle supports and associated hardware
7. Stainless steel seawall joint cover-plates, including hardware
8. Prepare and submit structural calculations demonstrating load capacity for steel seawall railings, including size and layout variations, by a professional engineer retained by the Contractor or fabricator
9. Provide shop drawings, by a professional engineer retained by the Contractor or fabricator, and submit same to the NYC Department of Buildings (Division of Small Business Services) as part of the Waterfront Permit (construction code) compliance and process for the Project

1.02 RELATED SECTIONS AND WORK

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 031000 – Concrete Formwork
- B. Section 036000 – Grouting

1.03 REFERENCES

- A. New York City Building Code
- B. “Minimum Design Loads for Buildings and other Structures” (ANSI/ASCE 7-05), American Society for Civil Engineers.

- C. AWS D1.1, Structural Welding Code Steel
- D. American Society for Testing and Materials ASTM A 500, Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
- E. American Society for Testing and Materials ASTM A 501, Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
- F. America Welding Society ANSI/AWS C2.18, Guide for the Protection of Steel with Thermal Spray Coatings of Aluminum, Zinc, and Their Alloys and Composites
- G. America Welding Society AWS C2.23M/ SSPC-CS 23.00/NACE No. 12, Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and their Alloys and Composites for the Corrosion Protection of Steel
- H. SSPC-QP 6, Standard Procedure for Evaluating the Qualifications of Contractors Who Apply Thermal Spray (Metallizing) for Corrosion Protection of Steel and Concrete Structures
- I. AISC "Specification For Structural Joints" latest edition
- J. NYS Department of Transportation Standard Specifications.

#### 1.04 SUBMITTALS

##### A. Shop Drawings

1. Furnish complete layout of railings, giving post spacing, and other pertinent information, for approval prior to erection.
2. Indicate all dimensions thereon, and show compliance everywhere with the NYC gap code.
3. Indicate all methods and hardware for connecting, anchoring, fastening, bracing and attaching work of all other trades.
4. Do not fabricate before approval of Shop Drawings.
5. Paint: Provide manufactures' products literature for all materials specified and material manufacture's printed directions and recommendations for environmental conditions, surface preparation, priming, mixing, reduction, spreading rate, application, and storage, as applicable for each of the materials specified.

##### C. Quality Control Submittals

1. Furnish materials list indicating the ASTM for each item supplied and certification stating that fencing materials installed comply with the requirements of ASTM Specifications referred to herein.

## D. Mock-Up

Prior to proceeding to production fabrication, assemble and finish one railing panel and install as a Mock-Up on the seawall. Coordinate and obtain the acceptance of RIOC and the Engineer for the Mock-Up.

## E. Quality Control Plans

1. For each fabrication and coating shop, submit a Quality Control Plan specific to the project. List the names of qualified personnel to be involved with performing the work and supervising the work; list the procedures including check-points in order of sequence of performance; and list the tests to be performed as part of quality control.

1.05 QUALITY ASSURANCE

## A. Qualifications

1. Installer: Company specializing in the installation of the type of railing work specified herein shall have a minimum of 3 years successful experience.
2. Manufacturer: Company specializing in the manufacture of the type of railing work specified herein shall have a minimum of 5 years successful experience.
3. Shop applicators of metalizing and powder-coating: Performance of the metalizing and powder-coating work should be under the one roof - by the same same shop, or by a collaboration of shops working in close coordination and close proximity to each other. For other qualifications, refer to Project Technical Specifications Section 323200 and Section 323300.

D. Coordinate with Licensed Surveyor to check dimensions of seawall conditions and current construction by accurate field measurements before fabrication to insure proper rail fit-up. Incorporate final dimensions into field-use shop drawings, clearly numbering and identifying locations for use of panel layout variations. Coordinate fabrication lead times with construction progress to avoid delaying the work.

E. Holes in panel support base-plates shall be slotted or enlarged by an added 1/8" over and above the bolt diameter as tolerance to allow for thermal expansion within the handrail.

F. Top-rails and other panel elements shall have a maximum 1/8" deflection.

G. Railing posts shall be plumb to within 1/8" over full railing height.

H. Qualify welders and procedures per AWS standard qualification procedures.

1.06 GUARANTEES

A. The Contractor shall provide a general twenty (20) year guarantee for the powder-coated/painted steel railings in their finished condition. The guarantee shall be in written form, and shall warrant against the following:

1. There shall be no evidence of emerging or underlying corrosion.

2. There shall be no evidence of blistering, peeling, crazing, alligatoring, streaking, staining, or chalking of the railings painted surface.
- B. In addition to the foregoing general twenty (20) year guarantee, the Contractor shall provide a ten (10) year guarantee for the painted steel railings color. The ten (10) year guarantee shall be in written form and shall warrant against the following:
    1. Color of surface shall remain free from serious fading; the variation, if any, shall be uniform.
  - C. Correct all defects, appearing within the above-stated guarantee periods, by removal of the defective work and replacement as directed.
  - D. All corrective measures shall be the Contractor's responsibility, and shall be made at no extra cost to the Owner.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Railing panels shall come pre-welded with shop-applied coatings, and shall be protected from scratching or nicking.
- B. Before shipment to the job, all finishes shall be adequately protected for transportation and placement operations.
- C. Replace damaged items, with the approval of RIOC's representative, and at no additional cost to RIOC.
- D. Extra Materials: At completion of work, furnish to RIOC two (2) additional standard railing panels, fully prepared, treated and painted, along with sufficient connection hardware; and furnish also five (5) Gallons of each type and color of paint used in the work. Furnish paint in manufacturer's original sealed container marked with color names and/or paint numbers specified herein.

### **PART 2 - PRODUCTS**

#### 2.01 RAILINGS

- A. Material
  1. Steel Railings and Posts: Steel railing panels shall consist of solid pickets with steel tubular frame and top-rail with closure end-caps, and with dimensions as shown by the design drawings, and shall be schedule 40 carbon steel.
  2. Welding shall be done by competent mechanics and all welds shall be ground smooth.
- B. Corrosion Resistant Treatment

1. All rail assemblies shall be metalized (thermally sprayed) with a 85% zinc / 15% aluminum by weight mix, and sealed with a urethane sealer-coat prior to powder-coating. Refer to Project Technical Specifications Section 323300.
2. All coatings shall be shop-applied prior to delivery. Panels upon delivery shall be in condition for erection without touch-up, field fitting or cutting.
3. Metal pieces shall be cleaned of all weld spatter, mill scale, varnish, rust, grease, and the like and the surface mechanically or chemically prepared to receive the coating.
4. All welds must be performed, and the railing unit fully assembled, before applying the sprayed metalizing.

#### 2.02 SEALER COAT

- A. All posts, rails and fittings shall be coated with a factory applied sealer-coat primer, recommended by the powder-spray paint manufacturer as being compatible to the top-coat and to the marine environment. Coat shall be no less than 2.5 Mills DFT.
- B. Metalizing of all components shall provide an acceptable substrate for applied coatings.
- C. Product shall be one specifically recommended by the approved manufacturer for the conditions of the project. The Tiger-Drylac product Series 09 Zinc Free OGF Primer is the project basis of design. Equivalent paints, recommended by the manufacturer for this application, shall be acceptable.

#### 2.03 SURFACE OVER-COATING

- A. All posts, railing panels shall be coated with an over-coat of factory applied powder-coat paint. Refer to Project Technical Specifications Section 323300.

#### 2.04 FIELD TOUCH-UP

- A. Where field operations and handling result in the need for touch-up of the top-coat, use Polane touch-up paint by Sherwin-Williams, mixed to provide exact color-match to the powder-coat, for this purpose.
- B. Provide manufacturer's instructions for use, and provide a list of steps appropriate to each type of top-coat defect to be addressed.

#### 2.05 STAINLESS STEEL HARDWARE

- A. All fittings and hardware to be marine grade stainless steel type 316 or higher, compliant to ASTM A193 (bolts), ASTM A194 (nuts), and ASTM A380 (passivation). Dowels shall be hilti-type threaded anchor-bolts. Stainless steel type 304 shall not be accepted
- B. Provide all stainless steel angles, hardware and all other miscellaneous metal work as indicated on the drawings. Drill all holes required to secure metal, wood and other materials to the framing.

- C. Provide all other miscellaneous metal work. All work to be embedded in concrete work or in connection with bolts, anchors, and inserts shall be furnished at the proper time for setting.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Make all required measurements in the field to ensure proper and adequate fit.

#### **3.02 RAILINGS FINAL DESIGN**

- A. Concept designs of railing panels and general railing system, including foundation connections to the seawall and the new concrete posts, have been provided on the Drawings.
- B. The Contractor shall prepare finalized railing designs, to be based upon site dimensional control and the structural calculations prepared by its professional engineer, confirming the railing system capacity to resist the applied design loading, and shall submit same to RIOC for review.
- C. Contractor's professional engineer shall sign and stamp the railings fabrication shop drawings, and shall file these drawings, along with required Technical Responsibility (TR) forms, in a timely manner to the NYC Department of Small Business Services as part of the construction code procedure for the Project.
- D. The Contractor shall be held solely accountable for the timely preparation of the structural calculations, the finalized railing designs, and the filing of these materials for processing of the construction permit.

#### **3.03 DIMENSIONAL CONTROL PLAN AND RAILING SHOP DRAWINGS**

- A. Contractor's NY state licensed surveyor shall prepare a dimensional control plan that will extend to cover all site areas within the scope of work awarded. The Contractor may obtain the electronic autocadd files of the project plan and profile views from RIOC's Engineer for this purpose; however the Contractor must certify on the dimensional control plan drawing that sufficient local control work has been placed to check and support the Project design.
- B. In general, the dimensional control plan shall consist of a system of coordinate geometry that connects all major longitudinal elements, such as seawall corners, seawall joints, foundation steps, concrete rail posts and steel railing supports. Other elements, such as fences and gates shall be located by means of perpendicular offsets to defined stations along the centerlines.
- C. The Contractor shall submit, and obtain approval for, the dimensional control plan in both hard copy and electronic autocadd form, to the Engineer as a shop drawing.
- D. The dimensional control plan shall serve to determine the Contractors' final location of seawall pour limits at construction joints, to be determined in coordination with planned locations of the railing concrete posts and steel supports.

- E. Upon completion of the concrete work, the dimensional control plan shall be updated as an as-built dimensional plan, upon which the Contractor shall base the shop drawings, including fully stationed layout plans, for the concrete posts and railings. No railing or concrete posts shall be placed pending approval of the steel railing shop drawings.
- F. In the vicinity of seawall construction joints, the placement of concrete posts and steel railing supports shall maintain the indicated minimum separation distances from joints in order to prevent stress cracking to the concrete at these locations. The Contractor shall place additional steel rebar should it be determined that these minimum separation distances would be exceeded.
- G. Should any aspect of either the dimensional control or the as-built seawall concrete repair work require additional cast lengths of railings with dimensions not shown on the contract drawings, the Contractor shall incur all associated costs of the necessary remedial work.
- H. Field identification and confirmation of survey layout control, consist with the drawing information, shall be the responsibility of the Contractor. Exact stationing shall be determined by survey layout in the field.

#### 3.04 DISCREPANCIES

- A. Immediately notify RIOC's Engineer.
- B. Do not proceed, and do not accumulate errors that will require larger corrective work, until the discovered discrepancy is fully corrected.

#### 3.05 FABRICATION

- A. Welding -  
Comply with requirements of the American Welding Society (AWS).
- B. All Welding: By licensed welder.
- C. Welding Electrodes  
E60XX classification of AWS A5.1.
- D. Grind welds smooth. Remove all burrs.
- E. Shop Assembly: Fitting and assembly of work shall be done in shop. Shop assembled work in largest practical sizes to minimize field work. It is the responsibility of the metal work subcontractor to assure himself that the shop-fabricated metal items shall properly fit the field condition. In the event that shop-fabricated metal items do not fit the field condition, the item shall be returned to the shop for correction.
- F. Cutting: Cut metal by sawing, shearing, or blanking. Frame cutting will be permitted only if cut edges are ground back to clean, smooth edges. Make cuts accurate, clean, sharp and free of burrs, without deforming adjacent surfaces or metals. All exposed metal surfaces must be coated with paint before applying hardware.

- G. Holes: Drill or cleanly punch holes; do not burn. All exposed metal surfaces must be coated with paint before applying hardware.
- H. Meeting – Schedule a meeting with fabrication supervisor and paint company representative at fabricator's plant before any metalizing work or painting has commenced to finalize recommendations and discuss project procedures.
- I. Metalizing – shall be applied to the complete railing assembly. Do not apply to the individual posts before assembly. See related Specifications section. Hot-Dip Galvanizing shall not be acceptable.
- J. Primer/sealer clear-coat shall be a high solids, low VOC product applied per manufacturer's specifications, as further described herein.
- K. Top-coat paint – apply over-coat per manufacturer's specifications, as further described herein.

### 3.06 PAINTING

- A. Meeting – Schedule a meeting with fabrication supervisor and paint company representative at fabricator's plant before any metalizing work or painting has commenced to finalize recommendations and discuss project procedures.
- B. Preparation of Metalized Surface
  - 1. Remove dust and oil with mineral spirits and wipe dry with clean cloth. Repair welded and abraded surfaces with a 2 mil (dry) minimum thick coating of cold galvanizing compound in conformance with ASTM A 780; comply with manufacturer's application instructions.
- C. Application
  - 1. Apply paint materials to produce smooth finished surfaces, free of brush or rollers marks, drops, runs, or sags.
  - 2. Paint materials shall be kept at a proper and uniform consistency.
  - 3. Allow at least 48 hours for enamels and exterior oil paint to dry.
  - 4. Apply no paint to operating units where sliding contact of metals is necessary for proper functioning of unit.
- D. Cleaning
  - 1. Remove spots or defacement resulting from Work of this Section.
  - 2. Retouch all damaged surfaces to leave Work in Prefect finished conditions.
  - 3. If spots or defacement cannot be satisfactorily removed and retouched, re-finish the surface as directed.

### 3.07 PROTECTION

- A. At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces painted as directed by RIOC and per the paint manufactures written recommendations for a marine environment. Only a minimum of such damage shall be acceptable.

### 3.08 ERECTION

- A. Coordinate with other trades involved. Confirm locations of all seawall construction joints before placing any railing assembly.
- B. Pre-drill holes for posts and bolts as shown on the drawings. Advance holes with care to avoid cracking of concrete. Stop and advise Engineer should any crack appear.
- C. Secure and anchor railing assemblies using epoxy non-shrink grout in the pre-drilled holes.
- D. Set all railing assemblies plumb and true. Maintain required maximum horizontal distances, less than 4 inches, to adjacent precast concrete posts.
- E. Bolts shall be tightened by the turn-of-the-nut method in accordance with AISC "Specification for Structural Joints" latest edition.

### 3.09 RAILINGS AT TERMINAL LOCATIONS

- A. In locations where railings meet terminal locations, such as the existing Four Freedoms Park walls and finishes, and the existing seawalls and railings at the northern limits of Southpoint Park, the Contractor shall modify either or both of the railings and ornamental fencing, at that location to provide closure or gated access as appropriate to meet the new seawall railing.
- B. Observe at a minimum the appropriate protocols for work in proximity to the Four Freedoms Park walls and finishes, as shown on the drawings, including pre-construction photographs, plywood barriers and under-pinning where necessary.

END OF SECTION

**SECTION 323200**  
**THERMAL SPRAYED METAL COATING**

**PART 1 - GENERAL**

1.01 DESCRIPTION OF WORK

- A. Work in this section shall include all labor, materials, supervision, equipment, tools, supplies and all other miscellaneous items deemed necessary to provide Thermal Sprayed Metal Coating, also known as Metallizing, to the project seawall railings.
- B. Hot-dipped galvanizing shall not be an acceptable substitute to Thermal Sprayed Metal Coating.

1.02 RELATED SECTIONS

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 032000 – Concrete Reinforcement

1.03 REFERENCES

- A. ASTM B 833, Standard Specification for Zinc Wire for Thermal Spraying (Metallizing).
- B. ASTM C 633, Test Method for Adhesive/Cohesive Strength of Flame Sprayed Coatings.
- C. ASTM D 4285, Method for Indicating Oil or Water in Compressed Air.
- D. ASTM D 4417, Test Method for Field Measurement of Surface Profile of Blasted Steel.
- E. NACE Standard RP0287, Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape.
- F. ASTM D 4541, Test Method for Pull-Off Strength of Coating Using Portable Adhesion Testers.
- G. ANSI/AWS C2.18, Guide for the Protection of Steel with Thermal Spray Coatings of Aluminum, Zinc, and Their Alloys and Composites.
- H. AWS C2.23M/ SSPC-CS 23.00/NACE No. 12, Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and their Alloys and Composites for the Corrosion Protection of Steel.
- I. SSPC Publication, The Inspection of Coatings and Linings: A Handbook of Basic Practice for Inspectors, Owners, and Specifiers.
- J. SSPC-AB 1, Mineral and Slag Abrasives.

- K. SSPC-AB 2, Specification for Cleanliness of Recycled Ferrous Metallic Abrasives.
- L. SSPC-AB 3, Ferrous Metallic Abrasives.
- M. SSPC-PA 1, Shop, Field, and Maintenance Painting of Steel.
- N. SSPC-PA 2, Measurement of Dry Coating Thickness with Magnetic Gages.
- O. SSPC-QP 3, Standard Procedure for Evaluating Qualifications of Shop Painting Applicators
- P. SSPC-SP 5/NACE No. 1, White Metal Blast Cleaning
- Q. SSPC-QP 6, Standard Procedure for Evaluating the Qualifications of Contractors Who Apply Thermal Spray (Metallizing) for Corrosion Protection of Steel and Concrete Structures
- R. SSPC-SP 1, Solvent Cleaning
- S. SSPC-SP 10/NACE No. 2, Near-White Blast Cleaning.
- T. SSPC-SP 11, Power Tool Cleaning to Bare Metal
- U. SSPC-VIS 1, Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning.
- V. NYS Department of Transportation Standard Specifications.

#### 1.04 QUALITY ASSURANCE

- A. Qualification of metalizing shop and fabricator
  - 1. The metalizing applicator and fabricator executing the metalizing work shall have a minimum of five (5) years of documented previous experience in providing surface preparation for metalizing and metalizing application services in the shop and field, with a minimum history of three (3) successfully completed projects of the same size and scope as that covered by this specification.
  - 2. The metalizing applicator shall be certified per the requirements of SSPC-QP 3. Contractor shall submit experience and qualification of personnel executing the metalizing work.
  - 3. The metalizing applicator/fabricator's credentials, qualifications, staff experience, and suitability of the applicator's metalizing process, submitted according to these specifications, shall be evaluated as part of the bid/award process.
  - 4. Contractor shall coordinate with and shall submit reports from its on-site Quality Control personnel, as described further herein.
- B. Qualification of thermal spray technicians and personnel

1. The thermal spray technicians must have a minimum of five (5) years of experience in the operation of thermal spray equipment, preferably in bridge application, shall be qualified in accordance with ANSI/AWS C2.16 ANSI/AWS C2.16 Guide for Thermal-Spray Operator Qualification, and must hold a certificate of satisfactory completion of training from the equipment manufacturer.
2. An SSPC certified Quality Control Supervisor shall be on the thermal spray company's staff and provide a Quality Control Plan to the DCES prior to the onset of work. The Quality Control Supervisor shall meet the requirements of Thermal Spray Supervisor as per SSPC-QP 6. Additionally, the Quality Control Supervisor shall have a minimum of five (5) years' experience with satisfactory performance in abrasive blast cleaning of steel surfaces according to SSPC-SP 5 (contract target standard) and SSPC-SP 10 (contract absolute minimum standard), and shall have performed similar duties on two successful metalizing projects of the same size and scope as that covered by this specification.

#### 1.05 QUALITY CONTROL

1. Quality Control Plan - The Contractor will provide a written quality control plan that will be submitted to RIOC for approval. The plan shall include the procedure to be followed and equipment to be used for all processes outlined herein, including surface preparation and metalizing and seal coat application. Such a plan shall include a method of adhesion testing, thickness measuring, bend test protocol, testing frequency, and MSDS sheets for materials utilized on the project. The Plan shall outline the quality assurance procedures and any safety precautions that must be followed by workers and inspectors.
2. Job Reference Standard (JRS) - A job site pass/fail reference standard (JRS) shall be prepared by blast cleaning, metalizing. The JRS shall be used as a comparator or visual reference to evaluate the acceptability of the contractor's application process and the metalized coating.

The JRS shall be metalized with the same actual equipment and process parameters and procedures for surface preparation, metalizing, sealing, and testing that shall be used for the contracted work.

The JRS shall be blast cleaned, metalized and sealed in similar environmental conditions as those in which the contracted work is to be performed. Thickness measurements and adhesion tests shall be performed on the JRS per this specification. The JRS will be deemed unsatisfactory if any of the measurements or test results is less than the values indicated herein.

3. Job Control Record (JCR) - The Contractor shall keep a Job Control Record, detailing the essential job information, the in-process quality control checkpoints required by this standard, and the results of the regular testing procedures specified herein. The JCR shall include information on safety precautions, and the equipment, parameters, and procedures for surface preparation, thermal spraying, and sealing.

**1.06 GUARANTEES**

- A. Adherence of workmanship and materials to Specifications requirements shall be maintained for the ten-year Contract guarantee period. These requirements shall include the following:
  - 1. The Thermal-Spray Coating (TSC) shall be uniform without blisters, cracks, loose particles, or exposed steel as examined with a 10x magnification in accordance with JRS requirements.
  - 2. There shall be no evidence of blistering crazing, alligating, streaking, or chalking of any painted surface.
- B. Correct all defects, appearing within the guarantee period, by removal of the defective work and replacement of the coating as directed.
- C. All corrective measures shall be the Contractor's responsibility, and shall be made at no extra cost to RIOC.

**1.07 SUBMITTALS**

- A. The metalizing applicator shall submit the detailed procedures for surface preparation, metalizing application, and application of sealer coat, conforming to these specifications. The procedures shall detail the equipment, application process, in-process quality control, and Job Control Record to be used for the contract work. The information shall include:
  - 1. Procedures. Detailed procedures for surface preparation, thermal spraying, seal coating, and the in-process quality control checkpoints shall be submitted as part of the bid/award process.
  - 2. Equipment List. Provide type and make of all surface prep, thermal spray, seal/paint spray and in-process quality control equipment. This information shall be submitted as part of the bid/award process.
  - 3. Blasting media, thermal spray feedstock materials, and seal coat product.
  - 4. Job Reference Standard (JRS).
  - 5. Job Control Record (JCR).

**PART 2 – PRODUCTS****2.01 ABRASIVE FOR BLAST CLEANING**

- A. Angular blast media shall be steel grit, evaluated per SSPC-AB 3 for new abrasive material, and shall be capable of producing an angular anchor tooth profile of 2.0 to 3.5 mils.

**2.02 METALIZING**

- A. The metalizing wire shall be composed of 85% zinc and 15% aluminum by weight and shall meet the requirements of ASTM B-833 Standard Specification for Zinc and Zinc Alloy Wire for

Thermal Spraying (Metallizing) for the Corrosion Protection of Steel. The Contractor shall obtain written certification from the manufacturer of the alloy and will provide the certifications for each lot of wire a minimum of five business days prior to commencement of metallizing. The 85/15 alloy coating shall have a minimum tensile bond of 700 psi (AWS C2.23 Table 3, p 7 "Minimum Tensile Bond Requirements" – 85/15 bond strength 700 psi).

### 2.03 SEALER AND OVERCOAT

- A. Sealer shall be a urethane or epoxy polyamide type penetrating sealer, as recommended by the supplier for use on metalized surfaces and in conjunction with powder-coating.
- B. Over-coat (top-coat) shall be powder-coated paint.
- C. Refer to the Project specification section 323100 Seawall Railings and Project specification section 323300 Powder-Coat Paint for material description of the railings sealer-coat and over-coat.

## **PART 3 - EXECUTION**

### 3.01 GENERAL

- A. A pre-metallizing meeting shall be held at the coating facility prior to surface preparation and application of metallizing. The meeting shall review the process and approved submittals. Attendees shall be determined by the Engineer. A five day notice shall be provided for scheduling this meeting.
- B. Conduct all activities associated with the coating work described and specified herein in accordance with Federal (OSHA), EPA, State Regulations and local safety regulations, SSPC-PA Guide 3, and SSPC-CS 23.
- C. Provide at no additional expense to RIOC a minimum of three NIOS/MESA approved respirators for the intended purpose and other safety equipment needed to permit proper inspection of on-going work by RIOC, Engineer and Inspector.
- D. The Contractor shall notify RIOC, Engineer and Inspector 24-hours in advance of beginning surface preparation operations.
- E. The Contractor shall not construe Engineer acceptance to imply approval of any particular method or sequence for conducting the work, or for addressing health and safety concerns. Acceptance does not relieve the Contractor from the responsibility to conduct the work according to the requirements of Federal, State, or Local regulations and this specification, or to adequately protect the health and safety of all workers involved in the project. The Contractor remains solely responsible for the adequacy and completeness of the programs and work practices, and adherence to them.

### 3.02 SURFACE PREPARATION

- A. All surface preparation shall be performed in the same facility as the metallizing and coating work.

- B. Solvent Cleaning. Prior to blast cleaning, steel surfaces shall be Solvent Cleaned in accordance with SSPC-SP 1, Solvent Cleaning, to remove all visible oil, grease, dirt, salt, and other contaminants. Surface finish and cleanliness shall be confirmed according to SSPC-VIS 1 standards. In the event of a dispute, the written SSPC SP-10 standard will take precedence.
- C. Hardened Flame Cut Surfaces. Flame cut surfaces shall be ground with a disk wheel grinder to remove the hardened or carburized steel prior to abrasive blasting.
- D. Abrasive blast clean all surfaces to be metalized to SSPC-SP 5 White Metal Blast Clean as a target standard and to an absolute minimum standard of SSPC-SP 10, Near-White Blast Cleaning.
- E. Angular Surface Profile. The substrate shall have an angular anchor tooth profile of 2.5 to 4.0 mils. Surface Profile measurements shall be made using X-course profile tape and a micrometer, as outlined in ASTM D4417. "Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel/NACE Standard RP0287, Field Measurement of Surface Profile of Abrasive Blast Cleaned Steel Surfaces Using a Replica Tape." Spot measurements shall be made approximately every 2000 ft<sup>2</sup> for automated blasting or 200 ft<sup>2</sup> for manual blasting. Take three measurements for each spot in an area approximately 1.5 in<sup>2</sup>. Average the measurements and record in the JCR.
- F. Utilize a compressed air system capable of delivery at the nozzle of 125 cfm at 120 psi. Maintain proper compressed air to ensure the proper atomization of the molten wire to produce the optimum spray pattern. Compressed air shall be free of oil and water and shall meet the requirements of ASTM D4285, Standard Test Method for Indicating Oil or Water in Compressed Air. To minimize any contamination use an oil/water separator on the airline.
- G. The suitability of the blasting, media, procedures, and equipment shall be validated in Job Reference Standard application and evaluation at article 1.05 2 above.

### 3.03 SYSTEM REQUIREMENTS - METALIZING

- A. Only 85% zinc/15% aluminum wire certified to meet the requirements of ASTM B833 shall be used in this project.
- B. The metalizing equipment shall be set up, calibrated, and operated according to the manufacturer's instructions and technical manuals and/or with the metalizing applicator's refinement thereto and as validated by the Job Reference Standard application and evaluation at Para. 1.05 2 above.
- C. Spray parameters shall be set for spraying the specified thermal spray material and, at a minimum, shall be validated with the bend test and compared with the JRS for approval. A bend test shall be satisfactorily performed at the beginning of crew and shift change or as required by the inspector.
- D. A copy of the spray parameters used shall be attached to the Job Control Record (JCR).

### 3.04 SUBSTRATE CONDITION

- A. The steel surface temperature shall be at least 5°F above the dew-point.
- B. Time between the completion of the final anchor-tooth blasting (or final brush blasting) and the completion of the thermal spraying should be no greater than six hours for steel substrates. In high-humidity and damp environments, shorter holding periods shall be used. If rust bloom or a degraded coating appears at any time within the six-hour window, the procedure outlined in Section 3.08, Surface or Coating Degradation shall be followed.

### 3.05 EXTENSION OF TIME OF APPLICATION

- A. In low-humidity environments or in enclosed spaces using industrial dehumidification equipment, it will be possible to retard the oxidation of the steel and hold the surface finish for more than six hours. The metalizing applicator can validate a holding period greater than six hours by determining the acceptable temperature-humidity envelope for the work enclosure by spraying and analyzing bend coupons and tensile-bond coupons.
- B. A 1-mil to 2-mil flash coat of the metalizing may be applied within six hours of completing surface preparation to extend the holding period for up to four further hours beyond the complete application of the flash coat. The final metalizing thickness, however, shall be applied within four hours of the completion of the application of the flash coat provided the metalizing can be maintained free of contamination.
- C. Validate use of flash TSC holding period with tensile-bond measurement and bend test.
  - Clean and abrasive blast a representative job area and three bend-test coupons.
  - Apply a flash metalizing to the representative job area and the three bend coupons.
  - Wait the delay period in representative environmental conditions and apply the final metalizing thickness.
  - Perform adhesion test and bend test on coupons.
  - Flash metalizing and holding period are acceptable if the tensile bond and the bend test are satisfactory.

### 3.06 METALIZING

- A. The applied 85/15 alloy metalizing thickness shall be 12 mils +/- 2 mils with a minimum of 10 mils. . For each coated component, the applied thickness shall be measured using a SSPC PA2 type 2 fixed probe gauge properly calibrated per certified coating thickness calibration standards, and measurements shall be recorded in the Job Control Report (JCR). Use a measurement line to measure the peaks and valleys of the metalizing, taking the average value of five readings along a line at 1.0 in. intervals. For complex geometries and geometric transitions, use a measurement spot approximately 1.5 square inches, and do not measure the peaks and valleys of the metalized coating. Record all measurements in the JCR. If upon inspection, and prior to sealer application, the metalizing thickness is less than the above stated requirements, the applicator shall apply additional metalizing to meet the thickness requirements.

- B. No coating shall be applied unless the following conditions are met:
- The surfaces to be metalized shall be clean and absolutely dry.
  - The surface temperature and ambient air temperature are as recommended by the coating equipment manufacturer.
  - The surface temperature of the steel to be coated shall be at least 5°F above the dew point.
  - The relative humidity shall not exceed 85%.
- C. All coating applied in violation of these conditions shall be completely removed, or if removal is not achieved in the judgment of the inspector or RIOC, the affected railing panels shall be discarded, and the affected surface cleaned and recoated in accordance with the stated requirements at no additional cost to RIOC.
- D. Maintain the gun as close to perpendicular as possible and within +/- 45° to the substrate. Use the manufacturer's recommended standoff distance. The deposited coating shall be uniform without blisters, cracks, loose particles, or exposed steel as examined with 10x magnification.
- E. Steel that will be welded shall be masked with high temperature resistant materials, tapes, etc. suitable for used with thermal spray. All residue of the masking materials shall be removed prior to welding.

### 3.07 SEALER

- A. Sealer shall be applied and cured according to the paint manufacturer's instructions for use with metalizing.
- B. Sealer should be applied as soon as possible after thermal spraying, but shall be applied within eight hours after application of metalizing. If a sealer cannot be applied within eight hours, it shall be verified that the metalizing (a) has not been contaminated by visual inspection, and (b) is dust-free using the clear cellophane tape test per ISO 8502-3 before applying the sealer.
- C. The sealer shall be spray applied to the metalized coating until absorption is complete. Typically the seal coat is applied at a spreading rate resulting in a theoretical 2.0 mil dry-film thickness.
- D. If moisture is present or suspected in the pores of the metalizing, the steel should be heated to 250 °F to remove the moisture prior to seal coat application. When possible, the steel shall be heated from the reverse side of the metalizing to minimize oxidation and contamination of the metalizing prior to sealing.
- E. Companion steel coupons positioned near the metalizing shall receive a seal coat as well. The dry film thicknesses of the seal coat on these companion coupons shall be used to verify that the correct thickness of seal coat is being applied to the metalizing. Measurements shall be recorded in the JCR.

### 3.08 SURFACE OR COATING DEGRADATION

- A. If rust bloom, blistering or a degraded coating appears at any time during the application of the metalizing, the following procedure applies:
1. Stop spraying
  2. Mark off the satisfactorily sprayed area.
  3. Call the Thermal Spray Inspector/Foreman to observe and evaluate the error.
  4. Report the deficiency to the purchaser and record the deficiency in the JCR.
  5. Repair the unsatisfactory area by removing the degraded metalized coating by blast cleaning to a minimum SSPC-SP 10 Near White Metal finish and angular surface profile of 3 to 5 mils.
  6. Recoat the blasted area as per this specification.
  7. Record the actions taken to resume the job in the JCR.

### 3.09 FIELD REPAIRS TO METALIZING

- A. Field repairs to damaged metalizing shall not be acceptable. Panels found to have damaged metalizing shall be removed for sand-blasting and re-working in the Shop.

### 3.10 ADHESION TEST

- A. Random adhesion testing shall be performed for each coated component, utilizing self-aligning portable pull-off adhesion testing equipment, in accordance with ASTM D 4541 standards. The minimum tensile bond value shall be 700 psi per AWS C2.23-2016 Table 2, p 6 "Minimum Tensile Adhesion Requirements.
- B. Use adhesive recommended by the instrument manufacturer, or equivalent. Attach adhesive manufacturer's instructions to the job control record.
- C. One portable tensile-bond measurement shall be made every 500 ft<sup>2</sup>. If the tensile bond is less than the contract specification, additional tensile bond measurements shall be made to identify the boundaries of the degraded metalizing. Any degraded metalizing shall be removed and reapplied as per Section 3.08, Surface or Coating Degradation.
- D. All tensile adhesion tests shall be done on bare, unsealed metalized coating.

### 3.11 BEND TEST

- A. Conduct a bend test at the beginning of each work shift or crew change or as required by the inspector:
1. Use carbon steel coupons of approximate dimensions 2 in. x 4 in. to 8 in. x 0.050 in.

2. Surface preparation according to contract specification.
  3. Spray 10-mil to 12-mil thick metalizing in crossing passes, laying down approximately 3 to 4 mils for each pass.
  4. Bend coupons 180° around a 0.5-in. diameter mandrel.
    - a. Bend test passes if there is no cracking or only minor cracks with no spalling or lifting (by a knife blade) from the substrate.
    - b. Bend test fails if the coating cracks with lifting (by a knife blade) from the substrate.
- B. Bend test shall be performed without sealant coats.

3.12 WEATHER CONSIDERATIONS

- A. Thermal spraying in low-temperature environments (below freezing):
1. Substrate shall meet the surface temperature and holding period specified for the Substrate Condition. No moisture or condensation is permissible on the surface during surface preparation and thermal spraying.
  2. Qualify metalizing period with a tensile-bond measurement and a bend test.
  3. Meet the tensile bond and metallographic requirements specified herein.

END OF SECTION

**SECTION 32300**

**POWDER COAT PAINT**

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Powder coating applied to metal surfaces.

1.02 RELATED SECTIONS AND WORK

- A. The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

1.03 REFERENCES

- A. American Society for Testing and Materials (ASTM)
  1. ASTM B117 – Practice for Operating Salt Spray (Fog) Apparatus.
  2. ASTM D522 – Test Methods for Mandrel Bend Test of Attached Organic Coatings.
  3. ASTM D523 – Test Method for Specular Gloss.
  4. ASTM D714 – Test Method for Evaluating Degree of Blistering of Paints.
  5. ASTM D968 – Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
  6. ASTM D1400 – Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a nonferrous Metal Base.
  7. ASTM D1654 – Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
  8. ASTM D2247 – Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
  9. ASTM D2794 – Test Method for Resistance of Organic Coatings to the Effect of Rapid Deformation (Impact).
  10. ASTM D3359 – Test Methods for Measuring Adhesion by Tape Test.
  11. ASTM D3363 – Test Method for Film Hardness by Pencil Test.

12. ASTM D3451– Practices for Testing Polymeric Powders and Powder Coatings.
  13. ASTM D4214 – Test Method for Evaluating Degree of Chalking of Exterior Paint Films.
  14. ASTM D5382 – A Guide to Evaluation of Optical Properties of Powder Coatings.
  15. ASTM D5861 – Guide to Significance or Particle Size Measurements of Coating Powders.
  16. ASTM D6441 – Test Methods of Measuring the Hiding Power of Powder Coatings.
- B. International Organization for Standardization (ISO)
1. ISO 1519 – Paints and varnishes – Bend test (cylindrical mandrel).
  2. ISO 1520 – Paints and varnishes – Cupping test.
  3. ISO 2409 – Paints and varnishes – Cross-cut test.
  4. ISO 2815 – Paints and varnishes – Buchholz Indentation test.

#### 1.04 SUBMITTALS

- A. Submit product data in accordance with Section 01330 – Submittal Procedures.
- B. Submit full records of all products used. List each product in relation to finish formula and include the following:
  1. Product type and use.
  2. Manufacturer's product number.
  3. Color numbers or descriptions.
  4. Manufacturer's Material Safety Data Sheets (MSDS).
- C. Submit manufacturer's application instructions for each product specified.
- D. Submit certification that all materials have been applied in accordance with the coating manufacturer's recommendations.

#### 1.05 SAMPLES

- A. Submit samples in accordance with Project Technical Specifications Section 323100.
- B. Submit [duplicate] [300 x 200] mm sample panels of each finish [type,] [color,] and texture] specified.

- C. Submit full range of available colors where color availability is restricted.

1.06 QUALITY ASSURANCE

- A. Standard of Acceptance:

1. Final coat to exhibit uniformity of color and uniformity of gloss across full surface area.
2. Quality of coated products to conform to specified requirements.

1.07 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, handle and protect coated materials in accordance with Project Technical Specifications Section 323100.
- B. Deliver and store materials in original packaging, sealed, with labels intact. (see Product Descriptions)
- C. Indicate on containers or wrappings:
  1. Manufacture's name and address
  2. Type of Coating.
  3. Color number in accordance with established color schedule.
  4. Batch number.
- D. Provide and maintain dry, temperature controlled, secure storage.

1.08 ENVIRONMENTAL REQUIREMENTS

- A. Maintain substrate and ambient temperature limits required by coating manufacturer. .
- B. Apply coating only when surface to be coated is dry and adequately pre-tested.

1.09 SCHEDULING

- A. Submit work schedule for various stages of coating application.
- B. Submit schedule minimum 48 hours in advance of operations.

**PART 2 - PRODUCTS**2.01 MANUFACTUER

- A. TIGER Drylac® U.S.A., Inc., 3855 Swenson Ave., St. Charles, Illinois 60174; Phone (800) 243-8148, Fax (877) 926-8148; E-mail: [TAS@tiger-coatings.us](mailto:TAS@tiger-coatings.us). Website: [www.tiger-coatings.us](http://www.tiger-coatings.us).

2.02 MATERIALS

- A. Powder Coating: Super Durable Polyester resin-based thermosetting powder, Series 38 High Performance Architectural Coating.

2.03 COLORS

- A. Yuma Green (powder-spray paint), matte finish, by Tiger Drylac

2.04 COATING FINISHES

- A. Shop primed ferrous metal surfaces:
  - 1. Thermosetting Polyester Resin-based Powder. Finish coat: [smooth glossy.] [smooth matte]
- B. Metalized (zinc/aluminum)
  - 1. Thermosetting Polyester Resin-based Powder. Finish coat: [smooth glossy.] [smooth matte]

**PART 3 - EXECUTION**3.01 PREPARATION

- A. Conduct all activities associated with the coating work described and specified herein in accordance with Federal (OSHA), EPA, State Regulations and local safety regulations, SSPC-PA Guide 3, and SSPC-CS 23.
- B. Grind fabrication welds smooth.
- C. Clean surfaces prior to pretreatment coating.
- D. Surfaces to Receive Finishes: Dry and free of debris, oils, dust or other deleterious materials.
- E. As a minimum standard, Prepare and Clean surfaces per Project Technical Specification Section 323100.

3.02 CLEANING

- A. Clean sources to be coated as follows:
  - 1. Remove all dust, dirt, and other surface debris by vacuuming, wiping dry with clean

clothes or compressed air.

2. Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
  3. Allow surfaces to drain completely and allow to thoroughly dry.
- B. If the above procedure do not clean the substrate surfaces, clean the surfaces with high pressure water washing.
- C. Apply pretreatment as soon as possible after cleaning and before surface deterioration occurs.
- D. Pre-treat phosphate for steel, zinc phosphate metalized.
- E. As a minimum standard Prepared and Clean surfaces per Project Technical Specification Section 323100.

### 3.03 APPLICATION

- A. Apply coating to requirements of coating manufacturer's written application instructions.
- B. Spray application:
- i. Provide and maintain equipment that is suitable for intended purpose, capable of properly fluidizing powder coating to be applied.
  - ii. Apply coating materials to clean surfaces to minimum 2.5-3.5 mil dry film thickness or as specified by manufacturer.
  - iii. Ensure coating adheres to internal corners and recessed areas.
- C. Allow surfaces to cure for minimum time period as required by manufacturer.
- D. Cure in accordance with manufacture's cure curves.

### 3.04 SHOP QUALITY CONTROL

- A. A pre-painting meeting shall be held at the coating facility prior to start of the powder-spray work. The meeting shall review the process, approved submittals and shop quality control procedures. Attendees shall be determined by the Engineer. A five day notice shall be provided for scheduling this meeting.
- B. No paint shop work shall be performed on each batch of railing panels until the Contractor's quality control manager has reviewed the shop quality control data for the metalizing work, including the surface adhesion data, bend test data and profile roughness data, and has accepted these metalized panels as meeting the specifications of the project.
- C. Copies of the surface adhesion data, bend test data and profile roughness data reports, bearing the sign-off of the Contractor's quality control manager for each batch of railing panels, shall be provided to the paint-shop superintendent and to the Engineer before paint application work shall proceed.

- D. As part of shop quality control, the tests listed in section 1.03 of this specification shall be performed as appropriate.
- E. Should power-spray work prove unsatisfactory upon curing of panels, immediately summon a technical representative of the powder manufacturer to visit the shop, review all operations, and give guidance as to corrective measures.
- F. Quality Control Plan - The Contractor will provide a written quality control plan that will be submitted to RIOC for approval. The plan shall include the procedure to be followed and equipment to be used for all processes outlined herein.. Such a plan shall include a method of adhesion testing, thickness measuring, bend test protocol, testing frequency, and MSDS sheets for materials utilized on the project. The Plan shall outline the quality assurance procedures and any safety precautions that must be followed by workers and inspectors.
- G. Painting Quality Control Record (QCR) - The Contractor shall keep a Painting Quality Control Record at all times of paint operations, detailing the essential job information, the in-process quality control checkpoints required by this standard, and the results of the regular testing procedures specified herein. The QCR shall include information on safety precautions, and the equipment, parameters, and procedures for surface preparation, powder-praying, curing, and shop inspection and acceptance of the painted panels.
- H. The QCR reports, in particular the tabulated daily data for adhesion and thickness testing of both metalizing and power-spray coating, for each batch of painted panels shall be provided to the Engineer before batch shipment to the field.
- I. Panels shall be delivered to the field bearing numbered identification tags for tracking purposes.

### 3.05 FIELD QUALITY CONTROL

- A. Field inspection of final coating, and patch repair operations if any, to be performed by the engineer.
- B. Contractor shall submit a list of proposed repair measures, such as putty and paint drop for pinholes, or paint drop for surface divots, or buff, paint and polish for chip or deep scrape, as appropriate to each kind of coating defect, for which photographs shall be provided with an explanation how each selected repair type is most advantageous.
- C. If directed by the Engineer, perform mockups showing each type of proposed repair before widescale implementation.
- D. Cooperate with direction of Engineer as to inspection of punch list repairs to the railings final coating, including implementation of repairs, and advise when each applied repair is ready for review

END OF SECTION

SECTION 323343

SITE FURNISHINGS

**PART 1 – GENERAL**

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract apply to this Section.

1.02 SCOPE OF WORK

- A. Section Includes:
  - 1. Benches
  - 2. Bollards
- B. Related Requirements
  - 1. Construction Drawings and Documents

1.03 SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each product and for each color and texture specified.
- C. Samples for Verification: For each type of exposed finish, not less than 6-inch long linear components and 4-inch square sheet components.

1.04 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For site furnishings.

1.05 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. Refer to drawings for material specifications.

2.02 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

**PART 3 - EXECUTION**

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with Installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required. Contractor is responsible for concrete footing as well as bolt assembly as necessary to secure final selected furnishings.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored at locations indicated on Drawings.

END OF SECTION

**SECTION 328400****IRRIGATION****PART 1 - GENERAL****1.01 DESCRIPTION OF WORK**

- A. Where indicated on the Drawings, provide an underground, automatically controlled lawn and shrub bed irrigation system, complete, including electrical connections, connections to water mains, and necessary accessories, constructed to the grades and conforming to the areas and locations as shown on the drawings and as described herein.
- B. Provide a guarantee period of 12 months, in which certain maintenance tasks are to be performed as described herein.

**1.02 RELATED SECTIONS**

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 312300 – Earthwork
- B. Section 329000 – Landscape planting
- C. Refer to local governing authority and code requirements regarding the connection of this system to a potable water system, including any requirements for backflow prevention.

**1.03 SUBMITTALS**

- A. Required for items specified herein. Provide 3 copies of each to the Owner's Representative for review. Do not proceed with purchase or installation of materials prior to receipt of approved submittals from the Owner's Representative.
  - 1. Irrigation Plan
    - a. Submit detailed Irrigation Plan showing layout of proposed lines, nozzles, valves, and zones of operation, accompanied by calculations showing flow rates and pressure losses.
  - 2. Owner's Instruction and Maintenance Data
    - a. General: Furnish the following instructions and maintenance data as required herein. Final Acceptance will not be made until items have been reviewed and approved by the Owner's Representative.
    - b. As-built drawings: 2 sets, noting exact locations of elements and changes to the drawings in red.
    - c. Operation Manual: 2 copies, bound in 1 inch diameter three ring binders, indexed and tabbed for easy reference, and labeled on spine and cover. Manual to include:

- i. Approved submittals (refer to paragraph 1.04 above)
- ii. Installation instructions, including mounting details for control valves.
- iii. Operating Instructions, including:
  - a. Winterization procedures.
  - b. Recommended operation sequence, frequency, and length of operation cycle, as per relationship to estimated absorption rate, evaporation rate and anticipated GPM.
- iv. Maintenance Instructions:
  - a. Items requiring manufacturer's product data, installation, and maintenance instructions.
  - b. Complete warranty information, mail to manufacturer, and provide copies to the Owner.
- d. Controller Chart: Prepare a color coded chart, reduced in size, containing the same plan information as the As-Built drawings, and laminated in plastic (both sides), with the following specific information:
  - i. Note routing of control wires,
  - ii. Identify valves as to size, station number (on controller), and type of irrigation head on each valve.
  - iii. Delineate each station's limits of coverage by color coding, with each station having a different color noting its areas of coverage.

#### 1.04 ADDITIONAL INFORMATION

##### A. Field Investigations

- 1. Contractor to visit the job site and familiarize himself with the nature and location of the work, existing conditions and conditions that will exist under which he will be obligated to operate in the performance of the work.

### **PART 2 - PRODUCTS**

#### 2.01 MATERIALS

##### A. General

- 1. Materials shall be new and without flaws or defects, and of quality and performance as specified. Overages at completion are property of the Contractor, to be removed from the site.
- 2. Materials and equipment specified by "Proprietary Specification" as manufactured by a particular company, etc., shall be for the express purpose of establishing minimum acceptable performance requirements. Acceptable manufacturer shall be:

- a. Rain Bird Sales, Inc. - Turf Division
  - b. Toro Irrigation
- B. Pipe, Fittings, and Joints
- 1. Pipe
    - a. Main line to be schedule 40 ASTM-D-2241 polyvinyl chloride pipe.
      - 1. Pipe up to and including 2-1/2 inches in diameter shall have bell and socket joints.
    - b. Utilized for laterals in areas where the ground is subject to freezing for extended periods of time each year, subject to approval of the Owner's Representative: Flexible polyethylene (PE) pipe SDR-11.5, PE23, rated at 100 PSI, National Sanitation Foundation (NSF) approved, conforming to ASTM D 2239.
  - 2. Sleeves: Minimum diameter of 2 times larger than the pipe or pipe(s) scheduled to pass through them. Sleeves shall be a minimum of 2 inch diameter and shall be Schedule 40 PVC pipe.
  - 3. Plastic Fittings (and Risers where required):
    - a. Utilized throughout the system (mains and laterals) in warm climates and main lines in colder climates: Schedule 40 or Schedule 80 PVC.
    - b. Utilized for laterals of flexible polyethylene (PE) pipe, Type 1 PVC insert fittings designed for used with this type of pipe conforming to ASTM D 2609.
      - i. Pipe and fittings shall be joined with stainless steel pinch clamps or wormgear clamps (including stainless steel screw).
    - c. Risers above finished grade shall receive two (2) coats of black exterior semi-gloss enamel paint.
  - 4. PVC Solvent Cement: As per ASTM specification D 2564-67
  - 5. Swing Joint connections between heads and laterals:
    - a. Thick wall, flexible, polyethylene pipe, with fittings that have male barbs on one end and either male or female screw ends opposite (glue fittings and female barb adapters not allowed). Pipe and fittings shall be either:
      - i. Rain Bird SP swing pipe with SB spiral barb fittings.
- C. Valves and Valve Boxes
- 1. Manual valves:
    - a. Globe Valve for use as cut off or isolation valve on lines up to 3 inches in diameter shall be as manufactured by Red-White Valve Corporation, Carson, CA., or approved equal.



- ii. Toro 570 Series plastic nozzles with 570C Series sprinklers having Pressure Compensating Devices (PCD) and optional check valve unit, or approved equal.
      - iii. Rain Bird SAM features and Toro optional check valve units shall not be provided on systems using PE pipe for laterals or when heads are to be raised above grade having part of the sprinkler body exposed.
    - 2. Full or Part Circle Pop-up Gear Driven Rotor Sprinkler shall be:
      - a. Rain Bird Turf Bird Rotor Pop-up Sprinkler Series R-50C Commercial, with Seal-A-Matic (SAM) check valve, or approved equal, or as otherwise indicated on the irrigation plans.
  - E. Drip Irrigation Lines, Fittings and Accessories
    - 1. Acceptable Products shall include:
      - a. Toro DL-2000 Series, or approved equal.
        - i. Flexible ¼ " Microline tubing featuring Dripln PC self cleaning emitters with 12" emitter spacing, part number MCRG-212, and Microline ¼" fittings
          - a. Bury four to eight inches below the surface for optimal root zone irrigation.
        - ii. Optimal operating pressure of 30 psi and maximum operating pressure of 60 psi.
        - iii. 0.53 GPH per emitter flow rate at 30 psi
        - iv. Rootguard/Treflan root-intrusion protection
        - v. Able to withstand acids down to pH 2 as well as fertilizers, chemicals and chlorine.
        - vi. Approved fertilizers and chemical can be added at a central inlet and flow directly to root zones.
      - b. Toro Drip Zone Accessories, or approved equal.
        - i. Kit to include Toro Y-Filter, YD-500-34 air release and vacuum relief valve, control valve, PMR25-LF low flow pressure regulator and ball valve for maintenance.
- F. Low Point Drains
  - 1. Required on all zones. Automatic drain valves shall be Rain Bird Model Number 16A, FDV, or approved equal.
  - 2. Provide two (2) at lowest points of each zone, with each atop a 1 cubic foot (12 inches<sup>3</sup>) area of coarse gravel.

**G. Automatic Controller**

1. For systems with 1 to 12 zones, controller shall have a wall mount weatherproof lockable cabinet with internal transformer and shall be either:
  - a. Rain Bird ESP-LX Series Controller, or approved equal.
  - b. Toro Vision II Series Controller, or approved equal.
2. For systems greater than 12 zones, controller shall have a wall mount weatherproof lockable cabinet with internal transformer as the Rain Bird RC Series Controller, or approved equal.

**H. Control Wire**

1. Number 14 size (minimum) copper wire, U. L. approved for underground direct burial.
  - a. Colored wire shall have color coding as shown on the controller.
  - b. Provide a single wire from the controller to each valve.
  - c. Provide a common neutral from the controller to each valve.

**I. Backflow Preventer**

1. General: Contractor shall comply with the requirements and codes of the local governing authority regarding backflow prevention. In addition, the Contractor shall provide the necessary materials, insulation/draining capabilities, and acceptable concealment to satisfy the requirements and codes of the local authority and aesthetic needs of the Owner's Representative.
  - a. Concealment techniques may range from painting of exposed piping to providing a plant material screen, or providing a painted metal enclosure around the unit.
  - b. In the absence of local codes or requirements, a double check assembly backflow preventer installed in strict accordance with the manufacturer's written instructions shall be considered as a minimum requirement.
2. Backflow Preventers shall be a type suitable for use in a high hazard cross connection to a potable water system as manufactured by Watts Regulator Company, Lawrence, MA, or approved equal:
  - a. If reduced pressure backflow preventers are required - No. 909 series Reduced Pressure Principle Backflow Preventer, or approved equal.
  - b. If reduced pressure backflow preventers are not required - No. 709 series Double Check Valve Assembly, or approved equal.

**J. Rainfall Sensor**

1. Provide a rainfall sensor to cancel the operation of the controller during substantial rainfall. Sensor shall be by the same manufacturer as the controller provided and shall be either:

- a. Rain Bird Rain Check Automatic Rain Shutoff, or approved equal.
  - b. Toro Rainswitch model 850-74, or approved equal.
- K. Meter
- 1. With meter box, shall meet or exceed the requirements set forth by the local Water Department/Water Utility.

## 2.02 DELIVERY, STORAGE, AND HANDLING

- A. Damaged materials will not be accepted.
- B. Deliver packaged materials to the site in the original, unopened containers.
- C. Store materials delivered to site prior to actual usage in a place not to interfere with other trades or construction operations and protect from damage by weather or other elements as needed.

## **PART 3 - METHOD OF CONSTRUCTION**

### 3.01 GENERAL

- A. Pressure/Flow Test: Immediately after Contract award, conduct tests at the beginning tap or meter and note as such on the written results provided to the Owner's Representative of the following:
  - 1. Static Pressure
  - 2. Dynamic Pressure
  - 3. Gallons per minute
- B. Layout of sprinkler heads: Stake locations of each sprinkler in accordance with the drawings.
  - 1. If discrepancies in drawings become apparent, notify Owner's Representative of discrepancies.
- C. Receive approval from the Owner's Representative to proceed with construction along with proposed revisions, if required due to test results or discrepancies with the drawings, prior to installation.

### 3.02 EXCAVATION AND TRENCHING

- A. Excavate trench to pipe grade depth.
- B. Make width of trench at least 3 1/2 in.
- C. Backfill and hand tamp over-excavation prior to installing piping.
- D. Excavate trenches deeper than required in soils containing rock or other hard material that might damage pipe. Backfill to pipe grade with selected fine earth or sand.
- E. Keep trenches free of obstructions and debris that would damage pipe.

- F. Avoid heating trenches, electric ducts, storm and sanitary sewer lines, water and gas mains, each of which has right-of-way.
- G. Do not cut walks, drives, or curbing when trenching for piping.
  - 1. Provide sleeves under paving prior to installation of paving.
  - 2. Under existing paving, auger bore or tunnel.

### 3.03 PIPING SYSTEM

- A. General
  - 1. Do not lay pipe on unstable material or blocking, or when in the opinion of the Owner's Representative, conditions are unsuitable.
  - 2. Rest full length of pipe section on bed of trench, excavating recesses to accommodate joints.
- B. Cover:
  - 1. Lawn and planting areas:
    - a. Mains and Control Valves - minimum 18 inches below finish grade.
    - b. Laterals - minimum 12 inches below finish grade.
  - 2. Roadways or parking areas: minimum 24 inches below finish grade.
- C. Clearances: Minimum of 3 inches between parallel lines in the same trench or vertical clearance between lines crossing at angles.
- D. Special Requirements - PVC and PE pipe:
  - 1. Snake in trench at least 1 foot per 100 feet of pipe to allow for thermal expansion.
  - 2. Pipe laterals to drain to low point drains located at the lowest elevations of each zone.

### 3.04 SLEEVING

- A. Provide sleeves for both piping and control wiring where each passes under paved surfaces:
  - 1. Depths of sleeves shall be the same as that required for piping per location/condition.
  - 2. Extend sleeves 12 inches beyond paving at each end.
  - 3. Install permanent benchmark at top of curbs for reference to sleeve locations.

### 3.05 PIPING ERECTIONS

- A. Hold pipe securely while joints are being made.
- B. Threaded Plastic Pipe:

1. Do not use solvent cement on threaded joints.
  2. Wrap joints with teflon tape or utilize virgin teflon lubricant.
  3. When threaded pipe is used, material shall be Schedule 80 PVC.
- C. Cemented joints for PVC bell end pipe and PVC pipe with socket fittings: ASTM D 2855-70.

### 3.06 VALVES

- A. Do not locate beneath paved surfaces.
- B. Install plumb to within 1/16 inch.
- C. Locate within a valve box with a 6 inch (deep) layer of washed gravel below the bottom of the valve.
1. Top of quick coupler valves shall be as close to the top of the valve box as possible. Top of gravel layer shall be 3 inches below top of valve.
- D. Master Valve:
1. Locate immediately behind backflow preventer.
  2. Valve shall be energized by the master valve circuit on the automatic controller.

### 3.07 SPRINKLERS

- A. Sprinklers: Install plumb to within 1/16 inch, with top collar (not nozzle) flush with finish grade.
- B. Provide swing joint with each sprinkler.
1. Swing joint not required where entire head is raised above grade and/ or where rigid riser piping is required.
- C. Heads adjacent to paving and curbs: Locate between 1 inch and 4 inches from edge of paving or back of curb.

### 3.08 ELECTRICAL CONNECTIONS/ CONTROL WIRING

- A. Shall be in strict accordance with the latest edition of National Electrical Code and local electrical codes.
- B. Provide the electrical connection to the system as designated on the drawings and as specified herein.
- C. General:
1. Do not run control wiring and power supply wiring in the same conduit.
  2. Provide continuous runs of wire between the controller and valves. Should splices be necessitated, they shall be either:
    - a. Made within water tight below ground electrical junction boxes, or

- b. With water-tight connectors (as utilized for valves) and located within a valve box for ease of locating.
  3. Bury control wire beside pipe in same trench and bundle and tape together at not more than 10 foot intervals.
- D. Expansion Loops: Constructed by wrapping wire around a 1/2 inch diameter pipe to create a coil. A 3 foot section of wire shall be used to create a 12 inch coil, and a 6 foot section is required to create a 24 inch coil.
  1. Provide 12 inch expansion loops at each wire splice (not including valves) and at each change of wire direction.
  2. Provide 24 inch expansion loops at each control valve and where each valve enters the conduit for the automatic controller.

### 3.09 BACKFILL

- A. Sand or fine grained soils should be used for cover to a sufficient depth to prevent damage to the pipe from rocks or other debris in backfill during the compacting operation.
- B. Fill trench to within 3 in. of top with excavated soil and compact.
- C. Fill top 3 in. with existing topsoil in planting or turf areas and wheel roll until compaction of backfill is same as surrounding soil.
- D. Grade backfilled trench uniform with surrounding grades.

### 3.10 BACKFLOW PREVENTER

- A. Comply with local codes for the installation of the backflow preventer. In the absence of local codes, minimum requirements shall be to set in accordance with the manufacturer's written instructions.
- B. Provide a combination of drains and quick coupler valves to accommodate winterization of the entire system by forced air.
  1. Contractor shall submit materials/ methods to the Owner's representative for consideration and receive approval prior to installation of work.

### 3.11 AUTOMATIC CONTROLLER

- A. Location and installation shall be as per drawings, and approved by Owner's Representative PRIOR to installation.
- B. Provide separate, rigid conduits for both power supply and control wiring.
  1. Control wire conduit shall extend to 18 inches below grade.
  2. Secure conduit to wall in a manner acceptable to Owner's Representative.
- C. Provide electrical grounding for the controller in accordance with the manufacturer's written instructions.

### 3.12 TESTING AND FLUSHING

- A. Following installation, make final adjustments of lawn irrigation system prior to Owner's Representative's final inspection.
  - 1. Flush system completely to remove debris, with nozzles removed.
  - 2. Verify sprinkler operation and alignment for direction of throw.
  - 3. Check pop-up spray nozzling for proper arc of spray.
  - 4. Determine whether uniform distribution exists over all areas.
- B. Following final adjustment, operate the entire installation to demonstrate the complete and successful operation of equipment.

### 3.13 GUARANTEE AND MAINTENANCE PERIOD

- A. Guarantee Work for one year from date of final acceptance:
  - 1. Against defects in material, equipment and workmanship.
  - 2. Repair of damage to the premises resulting from leaks or other defects in material, equipment and workmanship to the satisfaction of the Owner.
- B. Repairs, if required, shall be done promptly at no cost to the Owner.
- C. Maintenance work in this period should include:
  - 1. Spring start-up of the system as soon as weather permits making the system fully operational including opening of valves, setting controller operation, and checking the operation of the complete system.
  - 2. Monthly checks of the system during the operation season, including on-site consultation with Owner's Representative.
  - 3. Winterization of the system during the fall or when the season demands, including draining of the system, clearing piping (including supply line to backflow preventer) with forced air, and the shut down of the automatic controller.

### 3.14 FINAL ACCEPTANCE

- A. Contractor shall provide an on-site walk through of the system and fully describe its operation with the Owner's Representative.
- B. Contractor shall achieve final acceptance when:
  - 1. Systems are fully operational, and
  - 2. Approved by both the Owner's Representative and Owner, and
  - 3. As-built drawings and project manuals have been accepted and approved.

END OF SECTION

**SECTION 329000****LANDSCAPE PLANTING****PART 1- GENERAL****1.01 SCOPE OF WORK**

- A. The Contractor shall furnish all materials and perform all work in accordance with these specifications, drawings, and instructions provided by the Landscape Architect or Owner's representative hereafter also referred to as Landscape Architect.
- B. The work shall include everything shown on the drawings and required by the specifications and everything to which in the judgment of the Landscape Architect is incidental to what is shown on the drawings or required by the specifications.

**1.02 RELATED SECTIONS AND DOCUMENTS**

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 312300 - Earthwork
- B. Section 022050 – Protection of Existing Utilities
- D. Section 329100 – Soil Preparation and Mixes
- E. Section 329200 – Lawns and Grasses

**1.03 REFERENCES**

- A. Plant material shall in all cases conform with requirements of the American Standard for Nursery Stock latest versions of rules and grading adopted by the American Association of Nurserymen, Inc., but upgraded to meet the following additional requirements.

**1.04 QUALITY ASSURANCE**

- A. All work completed and materials furnished and installed shall be of the best quality and shall be in strict accordance with the intention of the drawings, specifications and samples. The Contractor shall cooperate with the Landscape Architect so that no error or discrepancy in the drawings or specifications shall cause defective or inappropriate materials to be used or poor workmanship to be allowed and so that the work may proceed in the most efficient and effective manner. If there is a discrepancy between the graphic count of plants and the plant list count of plants on the Landscape Plan, the graphic count shall govern.
- B. Work must be carried out only during weather conditions favorable to landscape construction and to the health and welfare of plants. The suitability of such weather conditions shall be determined by the Landscape Architect.
- C. Before commencing work, all trees and shrubs which are to be saved must be protected from damage by the placement of fencing flagged for visibility or some other suitable

protective procedure approved by the Owner's Construction Manager. No work may begin until this requirement is fulfilled.

- D. In order to avoid damage to roots, bark or lower branches, no truck or other equipment shall be driven or parked within the drip line of any tree, unless the tree overspreads a paved way.
- E. The contractor shall use any and all precautionary measures when performing work around trees, walks, pavements, utilities, and any other features either existing or previously installed under this Contract.
- F. The Contractor shall adjust depth of earthwork and topsoiling when working immediately adjacent to any of the aforementioned features in order to prevent disturbing tree roots, undermining walks and pavements, and damage in general to any existing or newly incorporated item.
- G. Plants transported to the project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury to the plants. Closed vehicles shall be adequately ventilated to prevent overheating of the plants. Evidence of inadequate protection following digging, carelessness while in transit, or improper handling or storage shall be cause for rejection. All plants shall be kept moist, fresh, and protected. Such protection shall encompass the entire period during which the plants are in transit, being handled, or are in temporary storage.
- H. Where excavating, fill, or grading is required within the branch spread of trees that are to remain, the work shall be performed as follows:
  - 1. TRENCHING: When trenching occurs around trees to remain, the tree roots shall not be cut but the trench shall be tunneled under or around the roots by careful hand digging and without injury to the roots.
  - 2. RAISING GRADES: When the existing grade at tree is below the new finished grade, and fill not exceeding 16 inches (16") is required, clean, washed gravel graded from one to two inches (1" - 2") in size shall be placed directly around the tree trunk. The gravel shall extend out from trunk on all sides a minimum of 18 inches (18") and finish approximately two inches (2") above the finished grade at tree. Install gravel before any earth fill is placed. New earth fill shall not be left in contact with the trunks of any trees requiring fill. Where fill exceeding 16 inches (16") is required, a dry laid tree well shall be constructed around the trunk of any tree to be preserved. The tree well shall extend out from the trunk on all sides a minimum of three feet (3') and to three inches (3") above finish grade or as indicated in the drawings. Coarse grade rock shall be placed directly around the tree well extending out to the drip line of the tree. Clean, washed gravel graded from one to two inches (1" - 2") in size shall be placed directly over the coarse rock to a depth of three inches (3"). Approved backfill/topsoil material shall be placed directly over the washed gravel to desired finished grade.
  - 3. LOWERING GRADES: Existing trees in areas where the new finished grade is to be lowered shall have regrading work done by hand to elevation as indicated. Roots as required shall be cut cleanly three inches (3") below finished grade.
  - 4. Trees marked for preservation that are located more than six inches (6") above proposed grades shall stand on broad, rounded mounds and be graded smoothly into the lower level. Trees located more than 16 inches (16") above proposed grades shall have a dry laid stone wall, or other retaining structure as detailed on the plans, constructed a minimum of five feet (5') from the trunk. Exposed or

broken roots shall be cut clean and covered with topsoil immediately to prevent desiccation.

- I. The Landscape Architect reserves the right to inspect and reject plants at any time and at any place, and reserves the right to inspect plants at the growing nursery.
- J. The Landscape Architect shall have the final approval for acceptance of the landscape planting work.

#### 1.05 SAMPLES

- A. It is the responsibility of the Contractor, before ordering or purchasing materials, to provide samples of those materials to the Landscape Architect for approval, if so requested.
- B. The Contractor is to submit certification tags from trees, shrubs and miscellaneous materials verifying type, quality and purity.

#### 1.06 QUALITY OF PLANTS

- A. Plant shall in all cases conform with requirements of the American Standard for Nursery Stock latest versions of rules and grading adopted by the American Association of Nurserymen, Inc., but upgraded to meet the following additional requirements.
- B. Unless specifically noted otherwise, all plants shall be of selected specimen quality, exceptionally heavy, symmetrical, tightly knit, so trained or favored in their development and appearance as to be superior in form, number of branches, compactness and symmetry. All plants shall have a normal habit or sound, healthy, vigorous plants with well-developed root system.
- C. Plants shall be free of disease, insect pests, eggs or larvae.
- D. Plants shall not be pruned before delivery.
- E. Trees with abrasion of the bark, sunscalds, disfiguring knots or fresh cuts of limbs over one and one-fourth inches (1-1/4") which have not completely calloused shall be rejected.
- F. 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. All plants shall have been grown under climatic conditions similar to those in the locality of the site of the project under construction or have been acclimated to such condition for at least two (2) years.
- G. The root system of each shall be well provided with fibrous roots. All parts shall be sound, healthy, vigorous, and well-branched.
- H. All plants designated ball and burlap (B&B) must be moved with the root systems as solid units with balls of earth firmly wrapped with burlap. The diameter and depth of the balls of earth must be sufficient to encompass the fibrous root feeding systems 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. The balls shall remain intact during all operations. All plants that cannot be planted at once must be heeled-in by setting in the ground and covering the balls with soil or mulch and then watering. Hemp burlap and twine is preferable to treated. If treated burlap is used, all twine is to be cut from around trunk and all burlap is to be removed.

- I. The trunk of each tree specified as 'tree form' shall be a single trunk growing from a single unmutilated crown of roots. No part of the trunk shall be conspicuously crooked as compared with normal trees of the same variety.
- J. The thickness of each shrub shall correspond to the trade classification "No.1". Single stemmed or thin plants shall not be accepted. The side branches must be generous, well twigged, and the plant as a whole well branched to the ground. The plants must be in healthy condition, free from dead wood, bruises or other root or branch injuries.
- K. Plants shall be measured when branches are in their normal position.
- L. Shrubs shall meet the requirements for spread, height or container size stated in the Plant List. The measurements are to be taken from the ground level to the average height of the shrub and not to the longest branch. Height and spread dimensions specified refer to the main body 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.
- M. Caliper measurements shall be taken at a point on the trunk six inches (6") above natural ground line for trees up to four inches (4") in caliper, and at a point 12 inches (12") above the natural ground line for trees exceeding four inches (4") in caliper.
- N. If a range of size is given, no plant shall be less than the minimum size, and not less than 50% of the plants shall be as large as the upper half of the range specified.
- O. The measurements specified are the minimum size acceptable and, where pruning is required, are the measurements after pruning.

#### 1.07 MAINTENANCE OPERATIONS BEFORE APPROVAL

- A. Plant care shall begin immediately after each plant is satisfactorily installed and shall continue throughout the life of the contract until final acceptance of the project.
- B. Care shall include, but not be limited to, replacing mulch that has been displaced by erosion or other means, repairing and reshaping water rings or saucers, maintaining stakes and guys as originally installed, watering when needed or directed, and performing any other work required to keep the plants in a healthy condition.
- C. Contractor shall remove and replace all dead, defective and/or rejected plants as required before final acceptance.

#### 1.08 NOTIFICATION OF DELIVERY

- A. Unless otherwise authorized by the Landscape Architect, the Contractor shall notify the Landscape Architect at least 48 hours in advance of the anticipated delivery date of any plant materials. A legible copy of the invoice, showing kinds and sizes of materials included for each shipment shall be furnished to the Landscape Architect.

#### 1.09 GUARANTEE

- A. The condition of all new plant materials is the responsibility of the Contractor and shall be approved by the Landscape Architect.
- B. Until final approval, any replacement of plant materials that may be necessary shall be at the expense of the Contractor.

- C. In addition to other standard provisions, the Contractor's bid amount shall also provide for the following:
1. Maintenance necessary during Establishment Period, through final acceptance.
  2. Replacement in kind, or with a substitute acceptable to the Landscape Architect, of all plant materials not in a healthy growing condition or that has died back to the crown or beyond normal pruning limits.
  3. The Contractor shall also be responsible for any damage caused by his operations and shall dispose of all rubbish and excess soil as directed.

## **PART 2 - PLANTING MATERIALS**

### 2.01 TOPSOIL

- A. Work included – Topsoil incidental to landscape planting operations. Refer to section 329100 Soil Preparation and Mixes.

### 2.02 MULCHES

- A. Shredded Hardwood Bark Mulch:

1. Shredded hardwood bark mulch or approved equal shall be used as a four inch (4") top dressing in all plant beds and around all trees planted by landscape contractor. Single trees or shrubs shall be mulched to the outside edge of the saucer. Mulch shall be of sufficient character as not to be easily displaced by wind or water runoff.

### 2.03 TREE STABILIZATION MATERIALS

- A. Staking and Guys:

1. Stakes shall be 2" x 2" x 8' pressure treated wood. Three (3) staked per tree.
2. Wire tree staking shall be pliable No. 12 galvanized soft steel wire.
3. Hose shall be two-ply fiber-bearing rubber garden hose, not less than one-half inch (½") inside diameter, black or green, and of suitable length.

### 2.04 WATER

On-site water shall be furnished by the Owner. Hose and other watering equipment shall be furnished by the Contractor.

### 2.05 WEED-CONTROL BARRIERS

- A. Composite Fabric: Woven (Model No. Polyfelt PP10), needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.0 oz./sq.yd. as supplied by the following manufacturer(s) or approved equal:

Tencate  
365 South Holland Drive  
Pendergrass, GA 30567  
Phone: (800)-685-9990

Local Distributor: Ragen Associates  
20 Larsen Road  
Iselin, NJ 08830  
Phone: (732)-602-9500

## 2.06 LANDSCAPE EDGINGS

- A. Steel Edging: Standard commercial-steel edging, rolled edge, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Basis-of-Design Product: Subject to compliance with requirements, provide Border Concepts, Inc.; Border Line comparable product by one of the following:
    - a. Collier Metal Specialties, Inc.
    - b. Russell, J. D. Company (The).
    - c. Sure-Loc Edging Corporation.
  3. Edging Size: 1/8 inch wide by 6 inches deep
  4. Stakes: Tapered steel, a minimum of 15 inches long.
  5. Accessories: Standard tapered ends, corners, and splicers.
  6. Finish: Standard paint
  7. Paint Color: Black
  8. Recycled content: Steel edging shall have a minimum 30% recycled content.

## 2.07 ANTI-DESICCANT SPRAY

- A. Spray shall be an emulsion which will provide a protection film over plant surfaces. It shall be permeable enough to permit transpiration such as "Wilt-Pruf", manufactured by Nursery Product Specialties Company, Croton Falls, New York, or other approved equal. It shall be delivered in the manufacturer's containers and mixed according to the manufacturer's instructions.

## **PART 3- PLANTING PROCEDURES AND EXECUTION**

### 3.01 PLANTING COORDINATION

- A. The Contractor shall inform the Landscape Architect of the date when the planting shall commence and of the anticipated delivery date of the material.
- B. Failure to notify the Landscape Architect in advance of order to arrange proper scheduling may result in loss of time or rejection of a plant or plants not installed as specified or directed.

### 3.02 DIGGING AND HANDLING

- A. Bare rooted shrubs shall be dug with adequate fibrous roots. Roots of these plants shall be covered with a uniformly thick coating of mud by being puddled immediately after they are dug, or packed in moist straw, or moss.

- B. Balled and burlapped plants shall be dug with firm natural balls of earth of sufficient diameter and depth to include most of the fibrous roots.
- C. Roots or balls of all plants shall be adequately protected at all times from the sun and from drying winds.
- D. All balled and burlapped plants which cannot be planted immediately upon delivery shall be set on the ground and shall be well protected with soil, wet mulch or other acceptable material. Bare rooted plants, which cannot be planted immediately, shall be heeled-in upon delivery. All shall be kept moist.
- E. Bundles of plants shall be opened and the plants separated before the roots are covered. Care shall be taken to prevent air pockets among the roots. During planting operations, bare roots shall be covered with canvas, hay or other suitable material. No plant shall be bound with wire or rope at any time so as to damage the bark or break the branches.

### 3.03 TREES AND SHRUB PLANTING OPERATIONS

- A. Planting operations shall be performed at a steady rate of work unless weather conditions make it impossible to work. No plant material shall be planted in frozen ground.
- B. The Contractor shall provide sufficient tools and equipment required to carry out the planting operation.
- C. All plants too large for two men to lift in and out of holes shall be placed with a sling. Do not rock trees in holes to raise.
- D. For soil mix for plant holes, see Materials - 2.01 Topsoil.
- E. If rock or other underground obstruction is encountered, the Landscape Architect may require plant pits to be relocated, the pits enlarged or the plants deleted from the contract.
- F. Locations containing unsuitable subsoil shall be treated in one of the following manners:
  - 1. Where unsuitability within the construction site is deemed by the Landscape Architect to be due to excessive compaction caused by heavy equipment or by the presence of boards, mortar, concrete or other construction materials in sub-grade, and where the natural subsoil is other than A.A.S.H.T.O. classification of A6 or 7, the Contractor shall loosen such areas with spikes, discing, or other means to loosen the soil to a condition acceptable by the Landscape Architect. The Contractor shall also remove all debris and objectional material. Soil should be loosened to a minimal depth of 12 inches (12") with additional loosening as required to obtain adequate drainage. Contractor may introduce sand or organic matter into the subsoil to obtain adequate drainage as directed by the Landscape Architect. All such remedial measures shall be considered as incidental to the work and no extra payment shall be made for this part of the work.
  - 2. Where sub-grade is deemed by the Landscape Architect/ Engineer to be unsuitable because the natural subsoil falls into an A.A.S.H.T.O. classification of A6 or 7 and contains moisture in excess of 30%, then such a condition shall be rendered suitable by installation of a sub-drainage system or by other means described elsewhere in these specifications. Where such conditions have not been known or revealed prior to planting time and where they have not been recognized in the preparation of plans and specifications, then the Landscape Architect shall issue a change order to install the proper remedial measures, all of which shall be in addition to the contract sum.

- G. Adjustments in locations of planting beds and bed outlines shall be made as directed. In the event that pits or areas for planting are prepared and backfilled with topsoil to grade prior to commencement of lawn operations, they shall be so marked that when the work of planting proceeds, they can be readily located. In case underground obstructions such as ledges or utilities are encountered, location shall be changed under the direction of the Landscape Architect without charge, to the owner.
- H. Holes for trees shall be at least two feet (2') greater in diameter than the spread of the root system and of a depth that allows the tree to sit at the same elevation as grows in the nursery. Holes for shrubs and vines shall be at least 12 inches (12") greater in diameter than the spread of the root system and of a depth that allows the shrub and vines to sit at the same elevation as grown in the nursery.
- I. As the progress of work permits and if soil tests indicate it is needed, ground limestone and fertilizer shall be added to the topsoil backfilled in tree holes and shrub beds at the rate of three (3) pounds for tree up to three inches (3") in caliper, one (1) pound per one inch (1") in caliper for larger trees, six (6) ounces for small shrubs and eight (8) ounces for each shrub four feet (4') or over. Ground limestone shall be omitted in the case of acid soil plants. The limestone and fertilizer shall be thoroughly mixed with the topsoil in the planting operation.
- J. The plants shall be planted in the center of the holes and at the same depth as they previously grew. Topsoil shall be backfilled in layers of not more than eight inches (8") and each layer watered sufficiently to settle before the next layer is put in place. Topsoil shall be tamped under edges of balled plants. Enough topsoil shall be used to bring the surfaces to finish grade when settled.
  - 1. A saucer shall be provided around each plant as shown on the drawings.
  - 2. Plants shall be soaked with water twice within the first twenty-four (24) hours of time of planting. Water shall be applied with low pressure so as to soak in thoroughly without dislodging the topsoil.
  - 3. Approved weed mat shall be placed under all areas to be covered with mulch as indicated on the drawings. Secure weed mat in place with a soil anchor, then cover with mulch as directed.
  - 4. A four-inch (4") layer (after settlement) of mulch or approved equal shall be applied directly on top of weed mat to the entire area of each saucer or planting bed.

### 3.04 MAINTENANCE DURING CONSTRUCTION

- A. Maintenance shall begin immediately after planting. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated, and otherwise maintained and protected until provisional acceptance. Settled plants shall be reset to proper grade and position, planting saucer restored and dead material removed. Stakes and wires shall be tightened and repaired. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit.
- B. If a substantial number of plants are sickly or dead at the time of inspection, acceptance shall not be granted and the Contractor's responsibility for maintenance of all plants shall be extended until replacements are made or existing plants are deemed acceptable by the Landscape Architect.

- C. All replacements shall be plants of the same kind and size specified on the Plant List. They shall be furnished and planted as specified above. The cost shall be borne by the Contractor. Replacements resulting from removal, loss, or damage due to occupancy of the project in any part, vandalism, physical damage by animals, vehicles, etc., and losses due to curtailment of water by local authorities shall be approved and paid for by the Owner.
- D. Plants shall be guaranteed for a period of one (1) year after inspection and provisional acceptance.
- E. At the end of the Establishment Period, inspection shall be made again. Any plant required under this contract that is dead or unsatisfactory to the Landscape Architect or Owner shall be removed from the site. These shall be replaced during the normal planting season.

#### **PART 4- MAINTENANCE CONTRACT**

##### **4.01 GENERAL LANDSCAPING**

- A. Contractor shall provide the Owner with a written proposal due no later than the established possession date for landscape maintenance from an experienced local A.A.N. certified nursery business capable of performing the work outlined herein. The proposal shall be for a period of 1 year and be renewable in one-year increments. Maintenance will begin immediately after completion of substantial completion, the maintenance contract work shall not void the guarantee of the plant material for the first year after acceptance by the Owner. Replacement of dead plant material shall be covered under the warranty of the original installation, final approval and acceptance of the landscaping and irrigation by the Owner.
- B. Landscape maintenance shall include all necessary watering, cultivation, weeding, pruning, wound dressing, disease and insect pest control, protective spraying, straightening plants which lean or sag, adjustments of plants which settle or are planted too low, mowing of turf areas, replacement of mulch that has been displaced by erosion or other means, repairing and reshaping of water rings or saucers, re-placement of mulch that has been displaced by erosion or subsidence, and the reseeding or replanting of those areas affected. Removal of all rubbish, waste, tools, and equipment used in the execution of the contract at the end of each work day, and any other procedure consistent with good horticultural practice necessary to insure normal, vigorous and healthy growth of all plant material are also part of this maintenance contract.
- C. During the first year of the maintenance contract, any replacement of plant material shall be the responsibility of the installing contractor.
- D. Landscape maintenance contractor shall purchase and maintain Contractor's general liability insurance in the amounts of \$1,000,000 to protect him from the Contractor's operations under the maintenance contract. Certification of such insurance shall be filed with the Owner prior to the commencement of the work.

##### **4.02 WATERING**

- A. The irrigation system, if installed on the site, shall be used by the maintenance contractor for the watering program, but any failure of the system does not eliminate the Contractor's responsibility of maintaining the desired level of moisture necessary to maintain vigorous, healthy growth.

- B. The quantity of water applied at one time shall be sufficient to penetrate the soil to a minimum of eight inches (8") in shrub beds and six inches (6") in turf areas at a rate, which will prevent saturation of the soil.
- C. On-site water shall be furnished by the Owner. Hose and other watering equipment shall be furnished by the Contractor.

#### 4.03 WEEDING

Maintenance contractor shall keep all planting areas free from weeds and undesirable grasses by a method and by materials approved by the A.A.N.

#### 4.04 DISEASE AND INSECT PEST CONTROL

Inspect all plant material at least once a month to locate any disease or insect pest infestations. Upon the discovery of any disease or insect pest infestation, identify, or have identified, the nature or species of the infestation. A method of control in accordance with common A.N.A. standards shall be immediately implemented.

#### 4.05 FERTILIZING

Maintenance contractor is to fertilize plant material on a regularly scheduled program to fit the requirements of the plant material to maintain vigorous and healthy plant growth.

#### 4.06 PRUNING AND REPAIR

The amount of pruning shall be limited to the minimum necessary to remove dead or injured twigs and branches or to maintain safety in vehicular use areas. Pruning shall be done in such a manner as to not change the natural habit or shape of the plant. All cuts shall be made flush, leaving no stubs.

#### 4.07 MOWING

Mow all grass areas at regular intervals to keep the grass height from exceeding three inches (3"). Mow grass areas in such a manner as to prevent clippings from blowing on paved areas, and sidewalks. Cleanup after mowing shall include sweeping or blowing of paved areas and sidewalks to clear them of mowing debris.

#### 4.08 CLEAN UP

During the course of maintenance planting, excess and waste materials shall be continuously and promptly removed at the end of each work day.

#### 4.09 MAINTENANCE REPORT AND SCHEDULE OF ACTIVITIES

Maintenance contractor shall provide a schedule and report to store management and to the Property Owner that details his planned maintenance activities including any subcontractors.

#### 4.10 MAINTENANCE CONTRACT

These terms and conditions herein outlined shall be attached and made a part of a maintenance contract with the Owner.

#### 4.11 TERMINATION OF THE MAINTENANCE CONTRACT

- A. If the Owner fails to make payment for a period of ninety (90) days without written clarification, the maintenance contractor may, upon twelve (12) additional days' written notice to the Owner, terminate the contract and recover from the Owner, payment for all work executed and for any proven loss sustained upon any materials, equipment, or tools, including reasonable profit and damages applicable to the maintenance contract.
  
- B. If the maintenance contractor defaults or persistently fails or neglects to carry out the work in accordance with the maintenance contract, the Owner, after twelve (12) days' written notice to the maintenance contractor, and without prejudice to any other remedy they may have, may make good such deficiencies and deduct the cost thereof, including compensation for additional services made necessary thereby, from the payment then or thereafter due the contractor, or at their option, may terminate the contract.

END OF SECTION

**SECTION 329100****SOIL PREPARATION AND MIXES****PART 1- GENERAL**1.01 **SECTION SUMMARY**

- A. Testing off-site borrow soil, existing topsoil and amendment materials for approved use in planting soil mixes. Verification testing of on-site sub-soils.
- B. Furnishing material from approved off-site source(s) as a base component for planting soil mixes and furnishing other soil amendment materials.
- C. Amending, preparing, and mixing planting soils for plant areas.
- D. Placing, spreading, and fine grading pre-mixed planting soil material of the type(s) indicated for plant areas.
- E. Protecting all plant mix installations with snow fencing, filter fabric, or other approved means, over the surface area plant bed installations, until substantial completion.
- F. Protection of finished paving, light poles utility or other finished work by means of wooden protection boards, or other approved means, over the area of construction concurrent with any and all construction operations.

1.02 **RELATED SECTIONS**

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 329000 – Landscape Planting
- B. Section 329200 – Lawns And Grasses
- C. Section 312300 – Earthwork

1.03 **SUBMITTALS**

- A. Refer to and comply with Section 01300, Submittals, for procedures and additional submittal criteria.
- B. Product Data: Submit technical descriptive data for each manufactured or packaged product of this Section. Include manufacturers product testing and analysis and installation instructions for manufactured or processed items and materials.
- C. Locations: Submit locations of material sources. Submit location of mixing sites.
- D. Certificates:
  - 1. Submit certified analysis for each soil treatment, amendment, and fertilizer material specified and as used. Include guaranteed analysis and weight for packaged materials.

- E. Test Reports; Submit written reports of each sample tested. Each report shall include the following as a minimum and such other information required specific to material tested:
1. Date issued.
  2. Project Title and names of Contractor and supplier.
  3. Testing laboratory name, address and telephone number, and name(s), as applicable, of each field and laboratory inspector.
  4. Date, place, and time of sampling or test, with record of temperature and weather conditions.
  5. Location of material source.
  6. Type of test.
  7. Results of tests including identification of deviations from acceptable ranges. Identify any toxic substance(s) harmful to plant growth or life.
- F. Samples:
1. Leaf mold, each source, 5 lb. packaged.
  2. Base material, each source, 5 lb. packaged.
  3. Each mix type specified, 5 lb. packaged.
  4. Filter fabric, 12" x 12".
- G. Statement(s) of Qualifications: Submit within 45 days of notice to proceed to confirm qualifications as specified in Article 1.04, herein.
- H. Schedule and Protection Plan: Submit a detailed plan for scheduling and sequencing of all contract work and for protection of soil mixes and other completed work including coordination with contractors requiring access through the site. Indicate with schedules and plans the utilization of soil mix and subsoil protection measures (filter fabric and snow fencing) over the surface area of plant bed installations, until substantial completion. Indicate with schedules and plans the utilization of finished work protection measures (wooden protection boards or other approved methods) over the work area of construction operations concurrent with all construction operations until substantial completion.
- I. Soil Supply Plan: At least 60 days prior to placement or mixing of any planting or top soil, the contractor shall provide a comprehensive soil mixing and placement narrative to Landscape Architect for approval. Narrative shall include proposed suppliers of materials; their locations; mixing producers and locations. Narrative shall include a statement of acknowledgement that the proposed suppliers and mixing facilities can provide materials and mixing in a time frame which is not detrimental to proposed project scheduling. Should there be any question about the ability of the primary source to meet the demands of soil supply and mixing alternate sources, and their appropriate information, shall also be provided.

#### 1.04 QUALITY ASSURANCE

##### A. Qualifications:

1. Installation and maintenance foreman on the job shall be competent English-speaking supervisor(s), experienced in landscape installation and maintenance. Perform work with personnel totally familiar with planting soil preparation and planting installations under the supervision of a foreman experienced with landscape work.
2. Agricultural Chemist: Experienced person or persons employed by public or private soils testing laboratory, qualified and capable of performing tests, making soil recommendations, and issuing reports as specified. Testing Laboratory and Agricultural Chemist shall be as approved by the Landscape Architect.

##### B. References:

1. Association of Official Agricultural Chemists.
2. American Society for Testing and Materials (ASTM) using test criteria as specified or required by other references.

##### C. Pre-installation Conferences: Person(s) responsible for soil preparation and mixes of this Section shall attend Pre-installation Conference(s) to coordinate with work of other sections. Refer to and comply with review and Conference criteria in Sections 02200, 02930, and 02900.

##### D. Inspections and Testing

1. Soil, leaf mold, and other material testing and soil mix testing required in this Section or additionally required by Owner's Representative shall be furnished and paid for by Contractor.
2. Owner's Representative or Landscape Architect reserve the right to take and analyze at any time such additional samples of materials as deemed necessary for verification of conformance to specification requirements. Contractor shall furnish samples for this purpose upon request and shall perform testing as requested.

#### 1.05 REGULATORY REQUIREMENTS

- A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make work comply with such requirements without additional cost to Owner.
- B. Procure and pay for permits and licenses required for work of this section. Comply with the requirement of the Remedial Action Work Plan for the project.

#### 1.06 PROJECT/SITE CONDITIONS

##### A. Acquaintance With Existing Site Conditions

1. Through study of all Contract Documents and by careful examination of the site, become informed as to the nature and location of the Work, the nature of surface and subsurface soil conditions, the character, quality and quantity of the

materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work.

2. Investigate the conditions to public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of this work site. Conform to all governmental regulations in regard to the transportation of materials to, from, and at the job site, and secure in advance such permits as may be necessary.
3. Should the Contractor, in the course of Work, find any discrepancies between Contract Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Owner, it will be Contractor's duty to inform the Landscape Architect immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, shall be done at the Contractor's risk.
4. Contractor shall be familiar with the Remedial Action Work Plan for the project and be experienced in working on sites with historic fill.

B. Environmental Requirements:

1. Perform both off-site mixing and on-site soil work only during suitable weather conditions. Do not disc, rototill, or work soil when frozen, excessively wet, or in otherwise unsatisfactory condition.
2. Soil mixes shall not be handled, hauled, or placed during rain or wet weather or when wet near or above field capacity.

C. Sequencing and Scheduling: Adjust, relate together, and otherwise coordinate work of this Section with work of Project and all other Sections of Project Specifications.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Packaged Materials: Deliver packaged materials to the location where soils are to be mixed, in unopened bags or containers, each bearing the name, guarantee, and trademark of the producer, material composition, manufacturers' certified analysis, and the weight of the materials Retain packages for the Construction Manager or Owner's Representative.
- B. Soil or amendment materials stored on site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants and erosion. All temporary storage means and methods shall be approved by Owner's Representative.
- C. After mixing, soil materials shall be covered with a tarpaulin until time of actual use.

**PART 2- PRODUCTS**

2.01 PLANT MIX MATERIALS

- A. General:
  1. All plant mix materials shall fulfill the requirements for new plant mixes as specified, as supplied by the following (or approved equal):

- a. Jersey Soil Blending, P.O. Box 525, Nutley, NJ 07110
  - b. East Coast Mines & Materials, 41 Lewis Rd, East Quogue, NY
2. Samples of individual components of plant mixes and also blended plant mixes shall be submitted by the Contractor for testing and analysis to the approved testing laboratory. Include verification testing of on-site sub-soils. Comply with specific material requirements specified.
    - a. No base component material for plant mix shall be used until certified test reports by an agricultural chemist have been received and approved by Landscape Architect.
    - b. As necessary, make any and all soil mix amendments and resubmit test reports indicating amendments until approved.
  3. Owner's Representative may request additional testing by Contractor for confirmation of mix quality at any time until completion. See Article 1.04, herein for additional requirements.
- B. Base Component Material
1. Base Component Material shall be a mix of sand and sandy Loam. Base Component Materials shall not be site salvaged unless approved by Landscape Architect.
  2. Base Component Material shall be mixed by volume with 4 parts Sandy Loam to 5 parts Sand. The mix may need to be adjusted to reflect any slight variation of soils. Any and all modifications involving alternates must be approved by the Landscape Architect.
  3. Test Base Component Materials, both individual components and mixed materials, for compliance with material specifications. These test criteria and results, when approved, shall establish the standard to which all subsequent Base Component Material tests must conform.
  4. Prior to mixing Base Component Material with organic matter (leaf mold), have one (1) composite sample tested from each 500 c.y. of material intended for use in soil mixes of lawn and planting work.
    - a. Base Component Material shall meet specified requirements. The only allowable amendments to the Base Component Material will be for adjustment of nutrient levels and then only by means established by these specifications.
    - b. Perform the following tests and submit test reports. Failure to include any of the criteria stated below will be sufficient cause for rejection of the test reports.
      - 1) Particle size analysis/distribution as defined below as well as with a hydrometer method.
      - 2) Fertility analysis - pH, soluble salts, nitrate, phosphate, potassium, calcium and magnesium.

- 3) Organic matter content (% oven-dry weight of soil).
- 4) Toxic substance content.
- 5) Material drainage rate.

5. Material Requirements, Sand:

a. Physical Analysis (Soil Texture):

<u>Sieve Size</u>	<u>% Passing</u>	<u>Retained</u>	<u>Dimension Class</u>
1" 100.0	0.0		Gravel
1/4" 100.0	0.0		Fine Gravel
# 10 96.6	3.4		Very Coarse Sand
# 20 82.8	13.8		Coarse Sand
# 40 38.4	44.4		Coarse Sand
# 60 12.0	26.4		Medium Sand
# 80 5.5	6.5		Fine Sand
#100 3.7	1.8		Very Fine Sand
#200 1.4	2.3		Very Fine Sand
Pan	1.4		Silt/Clay

Test results must be submitted for per-cent (%) retained as well as for per-cent (%) passing for all sieve sizes. Failure to include any of the aforementioned criteria will be cause for rejection of the test report.

b. Chemical Analysis:

- 1) Organic matter content (% oven-dry weight of soil)
- 2) Soil reaction (pH) - 6.0 (±0.5)
- 3) Soluble salt content (conductivity) - Less than 0.5 mmhos/cm for a 1:2 soil to water ratio.
- 4) Toxic substance content harmful to plant growth.

c. Material Drainage at a rate of 55 to 70% of the total volume of water within 3 minutes. Soil should be saturated prior to conducting test.

6. Material Requirements, Sandy Loam:

a. Physical Analysis (soil texture):

<u>Sieve Size</u>	<u>% Passing</u>	<u>% Retained</u>	<u>Dimension Class</u>
1"	100.0	0.0	Gravel
1/4"	99.0	1.0	Fine Gravel
#10	97.9	1.1	Very Coarse Sand
#20	88.0	9.9	Coarse Sand
#40	58.2	29.8	Coarse Sand

#60	39.6	18.6	Medium Sand
#80	32.9	6.7	Fine Sand
#100	30.7	2.2	Very Fine Sand
#200	18.7	12.0	Very Fine Sand
Pan		18.7	Silt/Clay

Test results must be submitted for per-cent (%) retained as well as for per-cent (%) passing for all sieve sizes. Failure to include any of the aforementioned criteria will be cause for rejection of the test report.

b. Chemical Analysis:

- 1) Organic matter content (% oven-dry weight of soil)

Total content shall be within the range of 3 to 4%.

- 2) Soil reaction (pH) - 6.0 (±0.5)
- 3) Soluble salt content (conductivity) - Less than 3.1 mmhos/cm for a 1:2 soil to water ratio.
- 4) Toxic substance content harmful to plant growth.

c. Hydrometer Testing:

- 1) Sand - 63.8%
- 2) Silt - 23.2%
- 3) Clay - 13.0%

7. Before base component material is used for mixing with amendments, handle and pile Base Component Material in the following manner:

- a. Homogenize to make a uniform mix, free of subsoil lenses and other irregularities.
- b. Aerate the base material to make a friable planting medium.
- c. Separate out and remove all clay lumps, stones, stocks, roots, and other debris.

8. Material Requirements, Base Component Material (Combination of 5 parts Sand and 4 parts Sandy Loam) Material shall substantially conform to the following:

a. Physical Analysis (soil texture):

<u>Sieve Size</u>	<u>% Passing</u>	<u>% Retained</u>	<u>Dimension Class</u>
1"	100.0	0.0	Gravel
¼"	98.0	1.2	Fine Gravel
#10	96.0	2.8	Very Coarse Sand
#20	84.6	11.4	Coarse Sand

#40	42.1	42.5	Coarse Sand
#60	18.9	25.2	Medium Sand
#80	10.1	8.8	Fine Sand
#100	6.9	3.2	Very Fine Sand
#200	1.3	5.6	Very Fine Sand
Pan		1.3	Silt/Clay

b. Chemical Analysis:

- 1) Organic matter content (% oven-dry weight of soil): 1.6
- 2) Soil reaction (pH): 5.3
- 3) Soluble salt content (conductivity): 4 mmhos/cm.

c. Hydrometer Testing:

- 1) Sand - 84.8%
- 2) Silt - 10.0%
- 3) Clay - 5.2%

d. Percolation: 60% passing in 2 minutes, 40% retained.

C. Organic Matter

1. Leaf Mold: Shredded leaf litter, composted for a minimum of one year (12 months) and tested to confirm the following characteristics:

- a. The leaf mold must be free of debris such as plastic fragments, glass, and metal fragments.
- b. The leaf mold must be free of stones larger than 1/2", large branches, and large roots.
- c. Woodchips over 1" in length or diameter should be removed by screening.
- d. The leaf mold should have a pH value measured as a 1: 5 dilute in the range from 6.5 - 7.2.
- e. The soluble salts measurement (Electric Conductivity) should not exceed 0.5 millimhos/cm measured as a 1: 5 dilute.
- f. The organic matter content should be from 60 - 90% by weight.
- g. The carbon/nitrogen ratio should fall between 12: 1 and 25 :1.
- h. Heavy metal content not to exceed the following amounts:

<u>Element</u>	<u>Acetate Extract</u>	<u>HCL Extract</u>
Iron	0.5 ppm	3.1 ppm

Manganese	0.5 ppm	15.4 ppm
Molybdenum	0.4 ppm	0.8 ppm
Zinc	0.2 ppm	4.4 ppm
Aluminum	0.2 ppm	1.2 ppm
Boron	1.1 ppm	1.7 ppm
Copper	None	0.01 ppm
Lead	01 ppm	0.4 ppm
Selenium	None	0.4 ppm
Mercury	None	None
Chromium	None	None
Cadmium	None	0.02 ppm
Nickel	None	0.04 ppm
Cobalt	None	0.05 ppm

None = none detected = below detection limits of 0.01 ppm.

2. Leaf Mold Material: Test leaf mold material for compliance with material specifications including organic matter, pH, and heavy metal content. Have one (1) composite sample tested for each new source of supply, each variable pile within each source of supply, and each 500 c.y. of material or as directed by Owner’s Representative.

2.02 SOIL AMENDMENT MATERIAL

- A. Ground Limestone: Ground Limestone as a soil amendment material will only be used pending results of analysis.
  1. Provide a Ground Agricultural Limestone with a minimum of 88% of calcium and magnesium carbonates.
  2. Ground Limestone material shall have a total 100% passing the 10 mesh sieve, minimum of 90% passing the 20 mesh sieve, and a minimum of 60% passing the 100 mesh sieve.

2.03 HERBICIDES

- A. Herbicides: May be required for possible use if there is seed germination after sub-grade placement and prior to planting mix installation or after subsequent plant mix installation. Under no circumstances are materials to be applied without specific instruction from the Landscape Architect, or Owner’s Representative.
  1. Herbicides shall be approved before use for type and rate of application by the Landscape Architect and by local and state agencies with jurisdiction.
  2. Post emergent herbicide shall be Roundup, as manufactured by Monsanto Agricultural Products Company, C3NJ, St. Louis, MO 63166, or an approved equal.

2.04 PLANTING SOIL MIXES

- A. Adequate quantities of mixed planting soil materials shall be provided to attain, after compaction and natural settlement, all design finish grades. Verify quantities for placement as specified in Sections 02930 and 02950 to suit conditions.
- B. Uniformly mix ingredients as specified for each Mix Type (Base Component Material, leaf mold, and other ingredients deemed to be necessary as a result of testing) by wind rowing/tilling on an approved hard surface area. Organic matter shall be maintained moist, not wet, during mixing. Mixing of Amendments: Add leaf mold in proportions as specified and as confirmed by testing. Other amendments shall not be added unless approved to extent and quantity by Landscape Architect and Owner's Representative and additional tests have been conducted to verify type and quantity of amendment is acceptable.
- C. Testing of Plant Mixes:
  - 1. Perform initial tests to confirm compliance with base material and mix specifications. These test results, when approved, will establish the standard to which all other test results must conform.
  - 2. Follow-up Testing: Have one (1) composite sample tested prior to delivery and upon arrival to the site from each 500 c.y. of material or as required by Owner's Representative intended for use in each type of lawn and plant mix to include the following
    - a. Sieve Analysis: Use sieve sizes as specified for Base Component Material.
    - b. Composition Analysis: Use the hydrometer method and classify the soil.
    - c. Nutrient Analysis:
      - 1) Have nutrient levels (nitrate, nitrogen, phosphate, potassium, magnesium, calcium, ammonium, iron, and manganese) tested, and request testing laboratory recommendations for additional fertilizer requirements at both lawn and all plant areas if nutrient levels are below average.
      - 2) Nutrient deficiencies in soils of plant areas shall be corrected at time of installation.
      - 3) Nutrient deficiencies in soils of lawn areas shall be corrected both at time of lawn installations and during maintenance period as specified.
    - d. Test organic matter, pH, soluble salts, and percolation.
- D. Soil Mix Types: Provide the following planting soil mix types at the locations indicated. Percentages of components, unless otherwise noted, will be established upon completion of individual test results for components of the various mixes. The controlling factor will be the percent (%) organic matter as specified for each mix. Note that percent (%) by volume of components will be, in large part, determined by the leaf mold. Specifically the bulk density reading of the leaf mold will directly impact the organic matter readings which have been specified for each mix.

1. Planting Soil
  - a. Organic Matter: 5.5 to 6.5%.
  - b. Base Component Materials: 60-70%. (Exact percent to be identified through testing as previously specified)
  - c. Leaf mold: 30-40%. (Exact percent to be identified through testing as previously specified)
  - d. Other Amendments as required by test results and as approved.
- E. Stockpiling and Plant Mixes
  1. General: Stockpiling and Plant Mixes utilized for planting soil on-site, off-site and at source should be restricted to no more than the needs of what can be used in a 24-hr. period. Stockpiles should be no more than 6 feet in height to prevent anaerobic conditions within the pile(s). Stockpiles shall be sheltered from weather to prevent excessive water absorption and blowing by winds as approved by Owner's Representative.

### **PART 3- EXECUTION**

#### 3.01 VERIFICATIONS

- A. Prior to construction and soil placement operations at planting areas, ascertain the location of all electric cables, conduits, underdrainage systems and utility lines.  
  
Take proper precautions so as not to disturb or damage sub-surface elements. Contractor failing to take these precautions shall be responsible for making requisite repairs to damaged utilities at Contractor's own expense.
- B. Verify that required underground utilities are available, in proper location, and ready for use. Coordinate with other trades.
- C. Verify that all work requiring access through or adjacent to areas where plant mixes are to be placed has been completed and no further access will be required. In the event that access will be required, this must be coordinated with the Owner's Representative.

#### 3.02 PREPARATION OF SUBGRADE

- A. Prior to dumping and spreading sand and plant mix soils, the Contractor shall furnish and install grade stakes on a 10 foot grid in open areas and sufficiently spaced in other areas to insure correct line and grade of subgrade and finished grade.
  1. Verify as constructed or existing subgrade elevations and do whatever additional grading is necessary to bring the subgrade to a true, smooth, slope parallel to the finish grade at all areas to receive planting soil for lawns.
  2. Clean up subgrade and dispose of all debris and garbage prior to inspection.
- B. Spray all vegetation on subgrade with a post-emergent herbicide that has been approved by government agencies with jurisdiction. Apply herbicide in strict accordance with manufacturer's direction.

- C. Any soils polluted by gasoline, oil, plaster, construction debris, unacceptable soils, or other substances which would render subgrade unsuitable for a proper lawn or plant growth, shall be removed from the premises whether or not such pollution occurs or exists prior to or during the Contract period. In the event that such material is placed, this material shall be removed and replaced with approved material. All remedial operations associated with soil mixes and controlled fill shall be reviewed and approved by the Owner's Representative.

### 3.03 PLANTING MIXTURES

- A. Planting Mixture for planters and plant backfill shall be of the type(s) indicated in accordance with the planting details, and shall be pre-mixed and placed as specified.
  - 1. Bring to pH levels of 6.5 (minimum) to 7.0 for non-ericaceous plants and for ericaceous plants. pH shall be verified by testing.
  - 2. Lower pH by using elemental sulfur product. Peat moss or copper sulfate may not be used to lower pH.
- B. All amendments shall be thoroughly incorporated into the mixture to assure uniform distribution. Delay mixing of fertilizers if planting will not follow within a few days.

### 3.04 PLACING PLANTING SOIL

- A. Remove all large clods, lumps, brush, roots, stumps, litter, and other foreign material and stones one-half inch (1/2") in diameter or larger. Dispose of removed material legally off-site.
- B. Do not place a muddy or wet soil mix.
- C. Place and spread planting soil mix of the type specified over approved subgrade to a depth sufficiently greater than the depth required for planting areas so that after natural settlement, misting and/or light rolling, as previously approved by Landscape Architect and Owner's Representative, the completed work will conform to the lines, grades, and elevations shown or otherwise indicated.
- D. Grading Tolerances: Lawn and Planting areas shall be fine graded within  $\pm 1/10$  (0.10) feet of grades indicated on drawings. Maintain all "flat" areas and slopes to allow free flow of surface drainage without ponding.

END OF SECTION

**SECTION 329200****LAWNS AND GRASSES****PART 1 - GENERAL**1.01 **SECTION SUMMARY**

- A. Provide sod and related items. Sodding of lawn in Project shall be where indicated and at a time allowed by environmental conditions, by adjacent construction operations, and as specified.
- B. Review of conditions and materials affecting sod installation.
- C. Maintenance of lawn.

1.02 **RELATED SECTIONS**

The Contract Drawings, other sections of these Specifications, and the Contract general provisions, including General and Special Conditions and related Contract documents, apply to this Section.

- A. Section 312300 – Earthwork
- B. Section 329000 – Landscape planting
- C. Refer to local governing authority and code requirements regarding the connection of this system to a potable water system, including any requirements for backflow prevention.

1.03 **SUBMITTALS**

- A. Product Data:
  - 1. Submit manufacturer's or suppliers literature or tear sheets giving name of product, manufacturer's or supplier's name and evidence of compliance with Contract Documents.
    - a. Commercial fertilizer
    - b. Herbicides, pesticides and fungicides
    - c. Mulch(es)
    - d. Sod
- B. Certificates:
  - 1. Submit certified analysis for each treatment, amendment, and fertilizer material specified and as used. Include guaranteed analysis and weight for packaged material.
  - 2. Prior to the use on site of any chemical weed control materials, submit a list of the weed control materials and quantities per acre intended for use in controlling the weed types expected on the site. Submittal shall include data demonstrating the compatibility of the weed control materials and methods of installation or application with the intended planting and sod varieties.

- C. Samples:
1. Mulch: Two-pound bag of each type, with manufacture's recommendations on application rate.
- D. Notices and Scheduling
1. Submit a schedule itemizing lawn work to be performed. This schedule shall be in addition to Project Contract Schedule(s) required by General Conditions and shall be submitted within 45 calendar days after Contract Notice to Proceed.
  2. Include in this schedule anticipated dates for commencement and sequencing of lawn work, including but not limited to fertilizer and water applications, sodding, and commencement of maintenance period.
  3. Schedule shall also include, and relate to, work specified in other sections, such as subgrade preparations; landscape soil placements and grading; utility installations paving and site wall installations; and other elements of site. Obtain related scheduling information from General Contractor.
  4. Prior to sod installation, submit confirmation of understanding that the following elements of work have been inspected and approved prior to start of any work of this Section:
    - a. Complete placement of planting soil mix including verification of acceptability of grades, quality of soil mixes, and quality of material placement.
    - b. Confirm, also, that no construction access will be required across lawn areas.
- E. Statement(s) of Qualifications: Submit to confirm qualifications as specified in Article 1.4, herein.
- F. Maintenance Program: Submit a program for continued maintenance of lawn areas after Substantial Completion. Program shall include a report of conditions unique to site that has been identified during Contractor's maintenance of lawn work (Article 3.6, herein). Refer also to Article 1.4, herein.

#### 1.04 QUALITY ASSURANCE

- A. Qualifications:
1. Installation and maintenance foreman on the job shall be competent English-speaking supervisor(s), experienced in landscape installation and maintenance. Perform work with personnel totally familiar with lawn preparations and installations under the supervision of an experienced landscape foreman.
  2. Exhibit and identify a record of at least three (3) lawn installations of similar scope or size to this Project.
- B. Pre-Installation Review of Related Work: Within 45 calendar days after Contract Notice to Proceed for sodding work or such later date as approved by Owner's Representative, but prior to first Pre-Installation Conference, obtain data as necessary and review plant mix materials and soil amendments to be used. Become familiar with proposed plant mixes

and on-site grading conditions. Reference Section 329100, Soil Preparation and Mixes, and design drawings.

1. Submit a report of acceptance of soil mixes as being appropriate for sod installation and, if deemed necessary, recommendations for possible SOC adjustment of amendments.
  2. Review conditions and coordinate findings of report at Pre-Installation Conference.
- C. Pre-Installation Conference: Prior to commencement of any of the work of this section, Contractor shall arrange a conference at the site of this Project with the Owner's Representative, Construction Manager, and Landscape Architect. At least five-(5) working days' notice shall be given prior to the conference.
1. Conference attendance will include the Contractor, the foreman appointed to oversee the work of this Section, the foreman responsible for soil preparation and mixes and soil placement (Section 329100), other representatives of Owner, and other persons as deemed appropriate for coordination of work and quality control.
  2. At the conference, review lawn installation and sequence schedules, specification criteria and installation, procedures, outstanding submittals and approvals, and such other subjects necessary for coordination of Work.
  3. Establish follow up meeting(s) as necessary including but not limited to a final pre-installation review of lawn soil placement.
- D. Inspection for Substantial Completion
1. Maintain all lawn areas until Substantial Completion. Maintenance will be in accordance with requirements specified in Article 3.6 of this Section.
  2. The Landscape Architect will make an inspection for Substantial Completion of the work of this Section at the time of Substantial Completion of the entire Contract. The Contractor shall submit a full and complete written program for maintenance of the lawns for review by the Landscape Architect and Owner's Representative at the time of the request for substantial completion.
    - a. Submit a written request for inspection at least 14 calendar days prior to the day on which the inspection is requested.
    - b. Contractor shall prepare a list with status of items to be completed or corrected for review by the Landscape Architect, prior to inspection.
    - c. At time of the Landscape Architect's inspection, all lawns shall show a uniform, thick, well-developed stand of plants. If the stand is unsatisfactory, as determined by the Landscape Architect, the Contractor's maintenance responsibility shall continue until an acceptable stand of plants is achieved.
    - d. Upon completion of the inspection, the Landscape Architect will amend Contractor's list of items to be completed or corrected as determined necessary and will indicate the anticipated time period for their completion or correction.

3. Lawns will not be accepted until all items of lawn work have been completed or corrected. The Landscape Architect, after Contractor's completion of outstanding work, will recommend to the Owner, in writing, the Substantial Completion of the lawn and grasses work of this Section.
  - a. The Contractor's responsibility for maintenance, however, shall terminate only upon issuance of acceptance by Owner for Substantial Completion.

1.05 REFERENCES

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

Association of Official Agricultural Chemists.

ASTM: American Society for Testing and Materials using test criteria as specified or required by other references.

AASHTO: American Association of State Highway and Transportation Officials.

1.06 REGULATORY REQUIREMENTS

- A. Comply with all rules, regulations, laws and ordinances of local, state and federal authorities having jurisdiction. Provide labor, materials, equipment and services necessary to make Work comply with such requirements without additional cost to Owner.
- B. Procure and pay for permits and licenses required for work of this section.

1.07 PROJECT/SITE CONDITIONS

- A. Acquaintance With Existing Site Conditions:
  1. Through study of all Contract Documents, and by careful examination of the site, become informed as to the nature and location of the Work, the nature of surface and subsurface soil conditions, the character, quality and quantity of the materials to be encountered, the character of equipment and facilities needed preliminary to and during the prosecution of the Work, the general and local conditions, and all other matters which can in any way affect the Work.
  2. Investigate the conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of this work site. Conform to all governmental regulations in regard to the transportation of materials to, from, and at the job site, and secure in advance such permits as may be necessary.
- B. Should the Contractor, in the course of Work, find any discrepancies between Contract Drawings and physical conditions or any omissions or errors in Drawings, or in layout as furnished by the Owner, it will be Contractor's duty to inform the Landscape Architect (Design Consultant) immediately in writing for clarification. Work done after such discovery, unless authorized by the Landscape Architect, shall be done at the Contractor's risk.

- C. Sequencing and Scheduling:
1. Adjust, relate together, and otherwise coordinate work of this Section with Work of Project and all other Sections of Specification.
  2. Sod installation shall not begin until all other constructions, including installation of all utilities and placement of planting soil mixes, are complete and possibility from damage caused by operations does not exist.
- D. Environmental Requirements:
1. Perform soil work only during suitable weather conditions. Do not disc, rototill, or work soil when frozen, excessively wet, or in otherwise unsatisfactory condition.
  2. Place sod only at seasonal times within appropriate temperature range and wind conditions for plant development as approved by Landscape Architect:
    - a. Acceptable Sodding Seasons/Times:
      - 1) Spring: April 1st - June 15th
      - 2) Fall: September 1st - October 15<sup>th</sup>
    - b. Sodding at any time other than within the above seasons shall be allowed only when the Contractor submits a written request for permission to do so and permission is granted in writing by the Owner. Newly sodded areas, if installed out of season, must be continuously watered according to best recommended and Landscape Architect approved practice. Contractor shall be responsible for providing an acceptable stand of grass as specified.

#### 1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Packaged Materials: Deliver packaged materials in unopened bags or containers, each clearly bearing the name, guarantee, and trademark of the producer, material composition, manufacturers' certified analysis, and the weight of the material.
- B. Bulk Materials
1. Deliver bulk materials with each individual shipment accompanied by an affidavit from the vendor (supplier), countersigned by the Contractor upon receipt, identifying the material type, composition, analysis, and weight and certifying that the material furnished complies with specification requirements of this Project.
  2. Affidavits shall be furnished in duplicate with one copy submitted to Construction Manager at the end of day of shipment receipt at the Project site and the second copy retained with material or on file with Contractor.
- C. Mulch, amendment materials, or soil stored on site temporarily in stockpiles prior to placement shall be protected from intrusion of contaminants, erosion and from mechanical or environmental damage.

**PART 2 - PRODUCTS**2.01 SOD

- A. Sod shall be a species recommended by an experienced, local American Sod Producers Association-certified nursery. Sod to be strongly rooted, weed-disease and pest free and uniform in thickness.
- B. All slopes greater than 3:1 shall be pegged to hold sod in place.
- C. Refer to construction documents for sod producer.

2.02 ACCESSORY MATERIALS

- A. Planting soil mixes shall be furnished and installed and top dressing material shall be furnished as specified in Section 329100, Soil Preparation and Mixes.
- B. Provide fertilizers, herbicides and like materials as required by conditions and as approved by Landscape Architect for each condition of use.
  - 1. Herbicides: For possible use if there is seed germination in lawn areas after plant soil mix placement and prior to sod installation.
    - a. Herbicides shall be approved before use for type and rate of application by the Landscape Architect and by local and state agencies with jurisdiction.
    - b. Post-emergent shall be Roundup, as manufactured by Monsanto Agricultural Products Company, C3NJ, St. Louis, MO 63166, or an approved equal.
  - 2. Humic Extract: Provide "Feedback" as supplied by the Troubled Soils Company, New Haven, CT 06519 (1-800/326-3361), or approved equal.
  - 3. Ground Limestone: Provide a Ground Limestone with a minimum of 88% of calcium and magnesium carbonates. Material shall have a total of 100% passing the 10 mesh sieve, minimum of 90% passing the 20 mesh sieve, and a minimum of 60% passing the 100 mesh sieve.

C. FERTILIZER

- 1. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis or a manufacturer's certificate of compliance covering analysis shall be furnished to the Landscape Architect. Store fertilizer in a weatherproof place and in such a manner that it shall be kept dry and its effectiveness shall not be impaired.
- 2. Percentages of nitrogen, phosphorus and potash shall be based on laboratory test recommendations as approved by the Landscape Architect. For the purpose of bidding, assume 10% nitrogen, 6% phosphorus and 4% potash by weight. At least 50% of the total nitrogen shall contain no less than 3% water-insoluble nitrogen. At least 60% of the nitrogen content shall be derived from super-

phosphate containing not less than 18% phosphoric acid or bone meal containing 25% - 30% phosphoric acid and 2% - 3% nitrogen. Potash shall be derived from muriate of potash containing 55% - 60% potash.

3. Lawn areas shall have fertilizer applied in two (2) applications with a thorough watering immediately following application. The first application shall be one (1) week before the sod installation at the rate of 35 pounds per 1,000 square feet harrowed into the top two inches (2") of sodbed. The second application shall be done at the rate of 25 pounds per 1,000 square feet, immediately following the second mowing.
4. Water: Potable, clean, fresh and free from harmful material, water shall be furnished by Owner as necessary for lawn installation and maintenance. Include all hoses and other irrigation equipment required for correct use of water without waste.

### **PART 3 - EXECUTION**

#### **3.01 VERIFICATIONS**

- A. Prior to construction of lawn areas, ascertain the location of all electric cables, conduits, underdrainage systems and utility lines. Take proper precautions so as not to disturb or damage sub-surface elements. Contractor failing to take these precautions shall be responsible for making requisite repairs to damaged utilities at Contractors own expense.
- B. Verify that required underground utilities are available, in proper location and ready for use. Coordinate with other trades.
- C. Verify that all final grades blend with adjacent grades and that area(s) to be sodded is free from depressions and abrupt changes in slope and that all grades as placed have been approved by, and remain satisfactory to Landscape Architect.
- D. Verify that all tree planting in lawn areas and all shrub beds adjacent to lawn areas have been installed, will remain as approved, and no further construction work will occur which will or may require access through lawns.

#### **3.02 PREPARATIONS AND PLACING OF PLANTING SOILS**

- A. Refer to Section 329100, Soil Preparation and Mixes, for information and conditions related to previous placing of Planting Soils including but not limited to the following:
  1. Depth of soil placement for lawn areas.
  2. Grading tolerances.
  3. Rolling.
- B. Allow for and verify that planting soils of lawn areas, completed in placement with deficiencies corrected as necessary, to settle for a minimum fourteen (14) days prior to beginning of lawn installation.
- C. Coordinated sequencing of work shall allow immediate sod installation after completion of verifications and preparations.

### 3.03 ADDITIONAL SOIL AMENDMENTS

- A. Humic Extract: Apply humic extract to lawn areas in accordance with the following sequences and at the rates indicated. Humic extract shall be applied mixed with sufficient quantities of water to completely saturate areas of application.
  - 1. At Site (on bare soil): Apply four (4) days prior to sod installation at the rate of 3 to 4 gallons of humic extract per acre.
  - 2. At Site: Twenty-one (21) to thirty (30) days after sod installation apply to on-site lawn areas at the rate of 1 to 2 gallons of humic extract per acre.
- B. Lawn Fertilizer: Apply fertilizer and work thoroughly (harrowed) into the top two inches (2") of planting soil in two applications. The applications shall be within five (5) days before sodding at the approximate total rate (to be verified) of thirty-five pounds (35 lb.) per thousand square feet, or as otherwise determined by approved soil test results.
- C. Ground Limestone: If recommended as a result of the soil analysis, ground limestone shall be mechanically applied at the rate determined by the test results. Apply in separate applications but at same time period of lawn fertilizer.

### 3.04 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
  - 1. Lay sod across angle of slopes exceeding 1:3.
  - 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.
- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod. Thereafter, water as required to insure healthy growth and prevent sod shrinkage.

### 3.05 STABILIZING

- A. Stabilize all slopes and erosion-prone areas with erosion control matting, sod and appropriate staking as required to prevent washouts and erosion

### 3.06 TURF PROTECTION

- A. Turf Protection Stake: 32" height, reinforced polymer with 8" long, 3/8" diameter galvanized spike, color green as provided by [www.Standardgolf.com](http://www.Standardgolf.com) model number 37750, or approved equal. Posts are to be placed no more than 8'-0" on center
- B. Turf Protection Rope: 1/4" diameter polypropylene braided rope, color green as provided

by www.Standardgolf.com model number 37200, or approved equal.

### 3.07 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
  - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
  - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
  - 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Provide water from non-university source and turf-watering equipment to convey water from sources as required to keep turf uniformly moist to a depth of 4 inches.
  - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of sod or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
  - 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
- D. Turf Post fertilization: Apply fertilizer after initial mowing and when grass is dry.
  - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

### 3.08 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Landscape Architect:
  - 1. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

### 3.09 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written

recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

- B. Refer to maintenance specification for long term pest control

3.10 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

END OF SECTION