
TECHNICAL SPECIFICATIONS

for

**NJEDA PARKING LOT PROJECT
AQUARIUM SITE
BLOCK 81.01, LOT 1 & 2; BLOCK 81.04, LOT 1.01
CITY OF CAMDEN, CAMDEN COUNTY, NEW JERSEY**

Prepared For:

**New Jersey Economic Development Authority (NJEDA)
Real Estate Division
P.O. Box 990
Trenton, New Jersey 08625**

Prepared By:

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**3 March 2017
Langan Project No. 100595901**

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TECHNICAL SPECIFICATIONS

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**SECTION 02 01 00
MAINTENANCE OF EXISTING CONDITIONS**

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Identification and field mark out of all on-site utility lines to remain in operation during construction.
- B. Identification and field markout of all off-site utility lines within and adjacent to construction work areas.
- C. Submission of procedures to be used to ensure the safety of the utility.
- D. Repair of any damage during construction operations.
- E. Repair/Replace and protect the environmental cap on the site and protect previously remediated areas.
- F. Relocate utilities that are indicated as such.
- H. Protection and maintenance of site features.
- I. Protection and maintenance of other concurrent construction projects.

| 1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 31 20 00 – Earth Moving
- B. Section 31 23 33 – Trenching and Backfill
- C. Contract Drawings

1.03 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of capped utilities and utility lines encountered during construction.
- B. Accurately record actual locations and elevations of existing utilities at proposed utility crossings prior to utility and storm sewer construction. Submit recorded data to Owner's Engineer for verification of proposed design.

1.04 REGULATORY REQUIREMENTS

- A. Contractor shall notify all affected utility companies, agencies, authorities, owners, etc. at least 48 hours prior to the commencement of work or as required by each agency and shall comply with their requirements.
- B. Contractor shall contact the "New Jersey One Call System", (800) 272-1000, service for an official utility mark out.

PART 2 PRODUCTS

NOT APPLICABLE

PART 3 EXECUTION

3.01 IDENTIFICATION

- A. Locate all existing utilities which are to remain in service and/or require relocating during construction as shown on the Contract Drawings.

3.02 PROTECTION

- A. Flag, barricade or suitably protect existing utilities during construction operations and equipment movement. Install shoring and bracing as required.
- B. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction.

3.03 LATERAL DISCONNECTION

- A. Where a utility line is to be disconnected from portions to remain, the lateral pipes shall be cut and suitably plugged/capped in accordance with the Contract Drawings and applicable utility or agency requirements.

3.04 REPAIRS

- A. Any damage to existing, operational utilities by the Contractor or his subcontractors during the on-going construction operation shall be immediately repaired to operational standards at the Contractor's expense. If the repairs are not immediately addressed by the Contractor, the utility owner and/or the Owner shall have the right to contract for the repair at the Contractor's expense.

3.05 RELOCATIONS

- A. Where utility lines are designated to be relocated, construct new utilities as shown and in accordance with these specifications and then remove former service to minimize disruption to the best extent practical. This operation shall be coordinated with the appropriate Authorities, as necessary.

END OF SECTION 02 01 00

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**SECTION 26 56 00
EXTERIOR LIGHTING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:

- 1. Exterior luminaires and accessories, underground conduit, wiring, overhead wiring, and termination.
- 2. Light pole foundations.
- 3. Building mounted luminaires.

- B. Related Sections:

- 1. Section 31 23 33– Trenching and Backfill
- 2. Section 32 16 13 – Concrete Curbs and Gutters
- 3. Site Electrification – To be provided by PSE&G
- 4. Construction documents

- C. References:

- 1. ANSI C78.379 – Electrical Lamps - Incandescent and High-Intensity Discharge Reflector Lamps – Classification of Beam Patterns
- 2. ANSI/NFPA 70 – National Electrical Codes
- 3. ANSI/IES RP-8 – Recommended Practice for Roadway Lighting
- 4. ANSI/IES RP-20 – Lighting for Parking Facilities
- 5. IES Lighting Handbook – 2001 9th Edition
- 6. NEMA – Best practices for metal halide lighting systems
- 7. IES DG-5-94 – Recommended lighting for walkways and class I bikeways
- 8. NECA/IESNA 501-2000 – Recommended practice for installing exterior lighting systems
- 9. NECA/IESNA 501-2000 – Recommended practice for installing exterior lighting systems
- 10. IESNA G-1-02 – Guideline for security lighting for people, property and public spaces
- 11. IESNA RP-06-01 – Recommended practice for sports and recreational area lighting
- 12. AASHTO – Standard specifications for structural supports for highway signs, luminaires and traffic signals, 4th edition (2003 interim)
- 13. IESNA LM-79 - Electrical and Photometric Measurements of Solid-State Lighting Products

14. IESNA LM-80 - Approved Method for Measuring Lumen Maintenance of LED Light Sources

1.4 SUBMITTALS

- A. Product Data: For each type of pole indicated, arrange in order of lighting unit designation. Include data on accessories, finishes, and the following:
 1. Materials and dimensions of poles.
 2. Means of attaching luminaries and indication that attachment is suitable for it.
 3. Bases.
 4. Finish physical samples.
 5. Catalogue cuts.
 6. The Underwriters Laboratory listing and file number for the specific fixture(s) to be utilized.
- B. Shop Drawings: Include anchor-bolt templates keyed to specific poles and certified by manufacturer.
 1. Design calculations, certified by a qualified professional engineer, indicating strength of screw foundation
 2. A photometric report from a national independent testing laboratory with report number, date, fixture catalog number, luminaire and lamp specifications; IES calculations, candlepower tabulations, zone lumen summary and isolux plot.
 3. The Underwriters Laboratory listing and file number for the specific fixture(s) to be utilized.
- C. Product Certificates: Signed by manufacture of poles, certifying that products are designed for load requirements in AASHTO LTS-3 and that load imposed by luminaire has been included in design.
 1. Design calculations, certified by a qualified professional engineer, indication strength of screw foundation.

1.5 QUALITY ASSURANCE

- A. Contractor to verify that all specified site lighting satisfies all applicable guidelines and regulations of the general services administration and local utility provider.
- B. Once, Shop Drawings, are approved, all lighting is to be ordered in a timely manner. The Contractor is then to inform the Landscape Architect/Engineer immediately, in writing, the date when equipment orders are completed and delivery scheduled.
- C. The Owner reserve the right to request standard production model fixture samples for inspection and to order such tests as the Owner deems necessary to insure compliance with these specifications and to reject those luminaries failing such tests, or those

luminaries with improper or inadequate light distributions. The Owner shall be the sole judge as to acceptability.

1.6 PERFORMANCE REQUIREMENTS

- A. Deal Load: Weigh of luminarie and its horizontal and vertical supports, lowering devices, and supporting structure, applies as stated in AASHTO LTS-3.
- B. Live Load: Single load of 2200 N (500 lbf), distributed as stated in AASHTO LTS-3.
- C. Wind Load: Pressure of Wind on standard luminaire, calculated and applies as stated in AASHTO LTS-3.
 - 1. Wind speed for calculation wind load for poles exceeding 15 m in height is 56 m/s (125 mph).
 - 2. Wind speed for calculating wind load for poles 15 m in height or less is 56 m/s (125 mph).

1.7 WARRANTY

- A. Special Warranty: Manufacture's standard form in which manufacturer agrees to repair or replace lighting poles and standards that fail in finish, material, and workmanship within specified warranty period.
 - 1. Protection of Metal from Corrosion: Warranty against perforation or erosion of finish due to weathering.
 - 2. Color Retention: Warranty against fading, staining, and chalking due to effects of weather and solar radiation.
 - 3. Warranty Period: Manufacture's standard, but not less than three years from date of Substantial Completion.
 - 4. For PSE&G luminaires and poles, applicable PSE&G warranties shall govern.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Package aluminum poles for shipping according to ASTM B 660.
- B. Store poles on decay-resistant-treated skids at least 300 mm above grade and vegetation. Support poles to prevent distortion and arrange to provide free air circulation.
- C. Retain factory-applied pole wrappings on metal poles until just before pole installation. For poles with nonmetallic finishes, handle with web fabric straps.

PART 2 - PRODUCTS

2.1 DRIVERS FOR LED LAMPS

- A. General Requirements
 - 1. LED Engines / Drivers: Comply with UL 1993, UL 8760.
 - 2. Designed for type and quantity of lamps served.
 - 3. Designed for the full (rated) light output unless dimmable controls are indicated.
- B. Power Factor: 0.90 or higher unless otherwise indicated.
- C. Total Harmonic Distortion: Less than 20 percent.
- D. Transient Voltage Protection: IEEE C62.42.1. and IEEE C62.42.2, Category A or better.
- E. Interference: Comply with 47 CFR 18, Ch. 1, Subpart b, for regulations concerning the emission of electronic noise.

2.2 LED LAMPS

- A. General Requirements
 - 1. Integral LED lamps: Comply with UL 1993, UL 8750.
 - 2. LED packages and LED arrays: Comply with UL 8750.
 - 3. Color temperature as indicated (by spec sheets will have a CCT tolerance of +/- 500 degree's kelvin unless otherwise noted or approved.)
 - 4. Minimum CRI of 60 for any exterior LED fixture unless otherwise noted.
- B. LEDs shall utilize appropriate technology to achieve the indicated color.
- C. Average rated life shall be a minimum 50,000 hours unless otherwise indicated.
- D. LEDs shall be wired so that a failure of one LED will not adversely affect output of the lamp.
- E. Circuitry shall prevent perceptible flicker over the operating voltage range even when in dimmable mode.
- F. LED's shall meet the LM-80 testing criteria as set forth by the Federal Department of Energy

2.3 LUMINAIRES AND POLES

- A. Pole mounted luminaires to be supplied and installed by PSE&G.

- B. Building mounted luminaires shall be supplied and installed by the Contractor as specified on the drawings.
- C. Poles to be supplied by the Contractor through PSE&G. PSE&G is responsible to install poles.
- D. Refer to site lighting plan and schedule on contract documents for luminaire locations, additional specifications, accessories, and specific model numbers. All final model numbers are subject to PSE&G review and approval.

2.3 CONCRETE FOUNDATIONS AND ANCHORING

- A. Construct light pole and Bollard foundations should be fabricated per PSE&G standards. If any discrepancies occur between the contract documents and PSE&G standards, PSE&G standards shall govern unless noted otherwise by the Project Engineer.
- B. Pre-cast concrete light pole foundations shall be supplied and installed by the Contractor from the following manufacturer(s) or approved equal:

Cromwell Concrete
P.O. Box 99
Cromwell, CT 06416-1429
Phone: (860) 635-5146
Fax: (860) 635-7469

Modern Concrete, Inc.
3900 Clover Road
Easton, PA 18040
Phone: (484) 548-6200
Fax: (610) 258-8165

PART 3 - EXECUTION

3.1 INSTALLATION

- A. PSE&G is responsible to install poles, luminaires and electrical components for the roadway lighting.
- B. Provide concrete base for light poles at location indicated on the construction documents.
- C. Install electrical conduit per PSE&G design layout and standards.

3.2 FIELD QUALITY CONTROL

- A. Operate each luminaire after installation and connection. Coordinate with PSE&G to inspect for improper connections and operation.

- B. Measure illumination levels to verify conformance with performance requirements as specified on the construction drawings and/or local ordinances.
- C. Take measurements during the night sky, without moon or with heavy overcast clouds effectively obscuring the moon.
- D. Coordinate with PSE&G to aim and adjust luminaire to provide illumination levels and distribution as indicated on the construction drawings or as directed.

3.3 CLEANING

- A. Clean electrical parts to remove conductive and deleterious materials.
- B. Remove dirt and debris from enclosure.
- C. Clean photometric control surfaces as recommended by manufacturer.
- D. Clean finishes and touch up damage.

3.4 PROTECTION OF FINISHED WORK

- A. Contractor shall protect all work while construction is in progress. Contractor is responsible for any damage incurred during construction.
- B. Relamp luminaries which have failed or been damaged during construction at substantial completion.

END OF SECTION 26 56 00

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**SECTION 311000
SITE CLEARING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

- A. Work of this Section includes all labor, materials, equipment and services necessary to provide site clearing within the contract limits, or within other limits if indicated, including, but not necessarily limited to the following:
 - 1. Protection of improvements to remain.
 - 2. Removal of trees and other vegetation.
 - 3. Topsoil stripping and stockpiling.
 - 4. Clearing and grubbing.
 - 5. Removal of at-grade, below-grade, and above-grade improvements if so indicated on the plans, or encountered within limits of disturbance.
 - 6. Saw cut existing bituminous asphalt and/or concrete pavements at limits to remain.
 - 7. Legal off-site disposal of materials removed at a facility licensed to accept the specific materials being disposed.

1.03 RELATED SECTIONS

- A. Earthmoving – Section 31 20 00.
- B. Erosion and Sedimentation Control. – Section 31 25 00

PART 2 – PRODUCTS

Not applicable

PART 3 - EXECUTION

3.01 GENERAL

- A. Comply with governing erosion control ordinances. Do not begin earthmoving activities until erosion control measures are in place.

3.02 PROTECTION OF EXISTING IMPROVEMENTS

- A. Provide covering, other types of protection necessary to prevent damage to existing improvements not scheduled for removal. Refer to site drawings for tree protection details.
- B. Protect improvements on adjoining properties as well as on Owner's property.
- C. Restore damaged improvements to their same condition as at start of work as acceptable to Owner of damaged improvements.

3.03 TOPSOIL STRIPPING AND STOCKPILING

- A. Topsoil is defined as friable organic surface soil. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones, and other objects over 2 inches in diameter, and without weeds, roots, and other objectionable materials.
- B. Strip existing topsoil from areas to be covered by paving, from areas where grade elevations are to be changed, and from other areas as indicated.
- C. Remove existing lawn grass from areas before stripping.
- D. Strip topsoil to whatever depths encountered in a manner to prevent intermingling with underlying subsoil or other objectionable material.
- E. Where trees are indicated to be left standing, stop topsoil stripping at drip line of tree. All excavation within drip line shall be performed by hand at direction of a N.J. Certified Tree Expert.

- F. Stockpile at a location which does not interfere with other work and which is acceptable to Owner's Representative. Identify stockpile by sign reading "Topsoil". Stabilize stockpile with grass or geotextile to prevent erosion and windblown dust. Maximum height of stockpile shall be six (6) feet.

3.04 REMOVAL

- A. Remove trees, shrubs, grass and other vegetation, improvements, and obstructions interfering with new work, and elsewhere on site or premises as specifically indicated or as may be required to install all site improvements. Contractor shall coordinate with a N.J. Certified Tree Expert and all subcontractors to determine the actual limits of clearing. Removal includes digging out stumps and roots.
 - 1. A N.J. Certified Tree Expert shall carefully and cleanly cut roots and branches of trees indicated to be left standing, where such roots and branches obstruct new work. Protect as required in accordance with tree protection details, if so indicated.
 - 2. Completely remove stumps, roots of trees removed, and other debris protruding through ground surface.
 - 3. Use only hand methods for grubbing inside drip line of trees indicated to remain standing.
- B. Removal of at-grade, existing improvements in way of new work and elsewhere as specifically indicated. Saw cut existing pavements to remain. Remove only to the limits required for the installation of proposed improvements, unless specifically indicated otherwise.
- C. Fill depressions caused by work of this section, except topsoil stripping, with satisfactory soil material unless further excavation or earthwork at location of depression is indicated.

3.05 DISPOSAL OF WASTE MATERIALS

- A. Remove waste materials from Owner's property and dispose of offsite in legal manner at a facility licensed to accept the specific material being disposed.
- B. Burning of waste materials on Owner's property is not permitted.

END OF SECTION 31 10 00

**SECTION 31 20 00
EARTHMOVING**

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Cutting, proofrolling, filling and grading to required lines, dimensions, contours and elevations for proposed improvements.
- B. Scarifying, compaction, moisture content control and, where deemed necessary, removal of unsuitable material to ensure proper preparation of areas for the proposed improvements.
- C. Protection, modification, and/or installation of utilities as sitework progresses, paying particular attention to grade changes and any necessary staging of work.
- D. All non-hazardous impacted soils and groundwater shall be properly disposed of at an LSRP approved disposal facility.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 01 00 00 – General Requirements
- B. Section 02 01 00 - Maintenance of Existing Conditions
- C. Section 31 25 00 - Erosion and Sediment Control
- D. Section 31 23 33 - Trenching and Backfill
- E. Section 32 12 16 - Asphalt Paving
- F. Section 32 16 13 – Concrete Curbs and Gutters
- G. Contract Documents

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM) - latest edition
 - D 422 Method for Particle Size Analysis of Soils
 - D 1557 Test for Moisture-Density Relations of Soils Using 10-lb (4.5 Kg) Hammer and 18-inch (457 mm) Drop (Modified Proctor)
 - D 2216 Laboratory Determination of Moisture content of Soil
 - D 2487 Classification of Soils for Engineering Purposes

- D 2922 Tests for Density of Soil and Soil- Aggregate in Place by Nuclear Methods (Shallow Depth)
- D 3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
- D 4318 Test for Plastic Limit, Liquid Limit, and Plasticity Index of Soils

- B. American Association of State Highway and Transportation Officials (AASHTO) - latest edition
 - T 88 Mechanical Analysis of Soils

- C. Technical Requirements for Site Remediation – N.J.A.C. 7:26E

- D. NJDEP “Fill Material Guidance for SRP Sites”, dated April 2015

- C. All applicable OSHA and NJDEP Regulations

1.04 QUALITY ASSURANCE

- A. The Contractor shall provide at least one supervisory person who shall be present at all times during execution of the work and who is thoroughly familiar with the type of work being performed and its best methods for completion. This person shall have the authority to act on behalf of the Contractor.

- B. The Contractor shall comply with any provisions of all applicable codes, regulations and standards.

- C. An LSRP retained by the Owner will perform construction inspection on the site in connection with remediation compliance . This inspection will not relieve the Contractor from his responsibility to complete the work in accordance with the Contract documents.

- D. Visual field confirmation and density testing of subgrade preparation and fill placement procedures shall be performed by the Owner’s Engineer and LSRP as part of the construction testing requirements.

- E. The Owner’s Engineer and LSRP shall prepare field reports that indicate environmental testing location, compaction test location, elevation data, testing results and acceptability. The Owner and Contractor shall be provided with copies of reports within one week of the time the test was performed.

- F. All costs related to reinspection due to failures shall be paid for by the Contractor at no additional expense to the Owner. The Owner reserves the right to direct any inspection that is deemed necessary. The Contractor shall provide free access to site and coordinate his construction activities to accommodate inspection activities.

1.05 SUBMITTALS

- A. Within ten days after award of the contract, the Contractor shall submit to the Owner, Owner's Engineer and LSRP a schedule detailing the sequence, and time of completion of all phases of work under this section.
- B. At least two weeks in advance of imported fill use, the Contractor shall submit either the following laboratory test data and a 50-pound soil sample to the Owner's Engineer and LSRP for each type of imported soil/gravel material to be used as compacted fill.
 - 1. Moisture and Density Relationship: ASTM D1557.
 - 2. Mechanical Analysis: AASHTO T-88
 - 3. Plasticity Index: ASTM D 4318
- C. Submit the name of each material supplier and specific type and source of each material. Any change in source or soil type throughout the job requires approval of the Owner and the Owner's Engineer.

1.06 ENVIRONMENTAL CONSIDERATIONS

- A. Construct erosion control systems as shown on the Contract Documents or as directed by the Owner's Engineer to protect adjacent properties and water resources from erosion and sediment damage.
- B. Imported fill shall comply with Section 2.01-C-2.
- C. The majority of the work area contains historic fill assumed to be contaminated. The Contractor should review available environmental reports and familiarize him/herself with soil conditions and appropriate handling of the material.

PART 2 PRODUCTS

2.01 MATERIALS

- A. 3/4-inch clean stone or imported fill material approved by Owner's Engineer and LSRP as specified herein.
- B. Top soil fill – Reference Specification 32 91 13.19 Planting Soil Mixing.
- C. Demarcation barrier – Orange construction/snow fence or approved equivalent
- D. Soil Materials:

1. On-Site Fill - On-site borrow shall consist of those materials previously excavated from on-site excavation areas judged to be suitable by the Engineer.
 - a. On-site fill is assumed contaminated historic fill. On-site fill shall only be reused on the property (Block and Lot) from which it originated and at no time shall on-site fill cross property boundaries except for disposal purposes.
 - b. The native silty sand material may be reused as general or structural fill and the urban fill material is suitable for use as general fill.
 - c. Prior to placement, on-site recycled fill shall not contain:
 - 1) Debris other than concrete and brick previously existing within the excavated fill material.
 - 2) Timber or Railroad Ties.
 - 3) Organic Soils.
 - 4) Other deleterious materials such as vegetation, frozen materials steel rails, rebar, trash, etc.
 - 5) Any evidence of contamination such as staining or odors.
 - d. Unsuitable and deleterious materials and debris shall be disposed of off-site in accordance with all applicable regulations, at no cost to the Owner.
 - e. On-site fill material shall not be used within the upper 1-foot of any landscaped areas to be finished with a permeable engineered cap.
2. Off-Site Fill - Imported fill shall consist of well-graded inorganic soil containing less than 15% fines (passing the No. 200 sieve) and shall be free of wood, metal and the other deleterious materials.
 - a. Fill material shall comply with the NJDEP definition for "clean fill" as specified in N.J.A.C. 7:26E-1.8 and comply with the requirements listed in the NJDEP "Fill Material Guidance for SRP Sites", dated April 2015. Certification of compliance and test results substantiating compliance must be provided to the Owner and LSRP 14 days prior to the Contractor transporting and placing fill material on site. For sources of 'virgin' quarry material, certification provided by the quarry/mine operator may be provided to the Owner and LSRP in lieu of analytical testing, in accordance with the "Fill Material Guidance

for SRP Sites". No fill material may be imported to the site without prior approval from Owner and LSRP.

- b. The Contractor shall notify the Owner's Engineer and LSRP of the proposed borrow source and shall deliver a 50 lb sample to the Owner's Engineer and LSRP at least two weeks prior to the use of the material to permit inspection and laboratory testing of the material to establish field density criteria. The borrow material shall have a water content during blending or placement such that adequate compaction as specified below can be obtained.
3. Unsuitable and deleterious materials and debris shall be disposed of off-site in accordance with all applicable regulations, at no cost to the Owner.

2.02 EQUIPMENT

- A. Excavation is to be performed using capable, well maintained equipment and methods acceptable to the Owner and the Contract Document requirements and schedule.
- B. Compaction shall be performed using a minimum 5-ton static drum weight, vibratory smooth drum roller or approved equivalent.
- C. A smaller vibratory roller may be required for compaction of fill in areas that are inaccessible to the roller specified in Paragraph 2.02.B above. In such a case, a 1-ton double drum walk behind roller shall be used.

PART 3 EXECUTION

3.01 PREPARATION

- A. Prior to all work of this section, the Contractor shall become thoroughly familiar with the Environmental Remediation Reports as well as the site, site conditions, and all portions of the work falling within this section.
- B. The Contractor shall refer to the approved Soil Erosion and Sediment Control plans (SESCP) for staging of earthwork operations and for erosion control measures to be implemented prior to commencement of earthwork.
- C. Locate and identify existing utilities that are to remain and protect them from damage.
- D. Notify utility companies to allow removal and/or relocation of any utilities that are in conflict with the proposed improvements.

- E. Protect adjacent properties from equipment and vehicular traffic.
- F. Protect fences, structures, sidewalks, paving, curbs, etc. to remain from equipment and vehicular traffic.
- G. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed/relocated it shall be referred by a licensed land surveyor and replaced, as necessary, by the same at no additional cost to the Owner.
- H. Remove from the site, material encountered in grading operations that, in the opinion of Owner or Owner's Engineer or LSRP, is unsuitable or undesirable for backfilling in subgrade or foundation areas as per these specifications. Dispose of unsuitable material off-site in an appropriate manner, satisfactory to Owner and in compliance with all governing agencies.
- I. Contractor shall notify the Owner's Engineer and LSRP 72 hours prior to the start of any on-site earthwork.

3.02 GENERAL

- A. Identify required lines, levels, contours and datum to bring site grades to the proposed subgrade conditions inferred from the drawings.
- B. Do not allow or cause any of the work performed or installed to be covered by work of this section prior to all inspections, tests and approvals.
- C. By submitting his bid, the Contractor represents that he has reviewed the information provided and investigated the site to determine type, quantity, quality, and character of excavation work to be performed.
- D. Perform excavation using capable, well maintained equipment and methods acceptable to the Owner and governing agencies.
- E. When performing grading operations during periods of prolonged wet or dry weather, provide adequate measures for surface drainage and ground water control, and moisture control of soils (i.e., wetting or drying by discing) so as to place and compact the soil within the moisture content range a few percentage points of its optimum water content. Any disturbed areas should be proofrolled at the end of each day.
- F. Shoring, bracing, and fencing shall be installed in accordance with Federal OSHA requirements as well as the requirements of all state and local authorities having jurisdiction. Shoring and bracing design, if required, should be done by a Professional Engineer licensed in the State of New Jersey, and shall be the sole responsibility of the Contractor. Such designs shall be submitted to the Owner not

less than one week prior to its intended use.

3.03 EXCAVATION OF REGULATED MATERIAL

- A. Pre-Excavation Plans: Submit 4 copies of the following plans to the RE 30 days before beginning construction operations. Update and resubmit plans to identify changes in the condition or operation of the Work. If the Contractor fails to follow the pre-excavation plans, the RE will suspend the Work.

1. Site-Specific Health and Safety Program (HASP)

- a) Perform a hazard assessment of each proposed work task, and make independent evaluations regarding the appropriate level of health and safety requirements.
- b) Employ a Certified Industrial Hygienist (CIH) or Certified Safety Professional (CSP) to develop and oversee the Site-Specific HASP. The CIH/CSP shall prepare the Site-Specific HASP to protect the Contractor's employees, the subcontractor's employees, the Department's employees and consultants, and the public from contamination present in the areas requiring excavation as shown on the Plans. Ensure that the Site-Specific HASP complies with Federal, State, and local laws, rules, and regulations, including the health and safety requirements of OSHA 29 CFR 1910 and 29 CFR 1926. Implement the Site-Specific HASP, as approved by the Engineer, at the beginning of construction operations.
- c) Ensure that the CIH/CSP reviews site-specific data and addresses the proposed activities to the level of detail needed to ensure that site-specific data, appropriate regulations, and a description of the site conditions are incorporated into the Site-Specific HASP. Specifically, the HASP should address the handling of historic fill material.
- d) Describe workplace and emergency procedures so that the Project is constructed in a safe manner. The Site-Specific HASP shall govern all facets of the Project and encompass the activities of all persons who enter or work on the Project. Incorporate procedures that conform to Federal, State, and local laws, rules, and regulations pertaining to employee working conditions where appropriate, National Institute for Occupational Safety and Health, OSHA, USCG, EPA, and NJDEP.
- e) Include requirements for a health and safety coordinator to monitor the working conditions during excavation procedures and during the handling of regulated material to ensure conformance with the approved Site-Specific HASP. The CIH/CSP shall evaluate the need for air monitoring during excavation and loading operations of regulated material. If deemed necessary, the CIH/CSP or an assigned coordinator, suitably

trained and approved by the CIH/CSP for the work required, shall implement the air monitoring program. The CIH/CSP shall include in the Site-Specific HASP applicable training and qualifications documentation for each health and safety coordinator.

- f) The Contractor shall provide initial and annual training and medical monitoring for Contractor employees scheduled to work in or with regulated material and, per the RE's request, up to 10 Department employees or their authorized representatives as specified in OSHA 29 CFR 1910. Provide the initial training for State employees or their authorized representatives 30 days before excavating.

2. Materials Handling Plan

- a) Develop a Materials Handling Plan (MHP) for regulated material encountered, moved, and disposed of or recycled during construction. Ensure the MHP includes the following:
 - i. Techniques to be used in managing regulated material to protect adjoining properties and workers and visitors to the Project Limits against exposure to regulated material and to prevent release of regulated material to the environment.
 - ii. Standard operating procedures for excavation, stockpiling, transporting, measurement, and disposal of regulated material.
 - iii. Current receiving facility certification and permits.
 - iv. Qualifications of the licensed hauler.
 - v. Proposed routes to receiving facilities and weighing facilities.
 - vi. Waste characterization forms.
 - vii. A sampling and analysis protocol for characterizing the regulated material for on-site reuse and off-site disposal. Include the name, address, and telephone number of the contact for the proposed environmental laboratory and the name and experience of the proposed environmental sampling technician. The proposed environmental laboratory and proposed environmental sampling technician are subject to the Engineer's review and approval.

- viii. Requirements of the receiving facility to accept the regulated material.
 - b) Implement the MHP, as approved by the Engineer, at the beginning of excavation. Perform planning, administrative, and control functions required to implement the MHP.
- A. Where existing grades are above proposed subgrade elevation, excavate materials to the lines and grades shown on the Construction Drawings.
 - 1. The Owner, as the generator, is solely responsible for the designation of excavated material. Unclassified excavation consists of excavation and management of material of whatever nature encountered, except for regulated material or acid producing soil.
 - 2. Excavate using equipment and methods that remove material to the specified excavation limits without disturbing the material outside of the excavation limits. While excavating, protect facilities and structures from damage and disturbance. Ensure that material outside excavation limits is not disturbed. If any material outside the excavation limits becomes disturbed, restore the area as directed by the Engineer. Excavate and grade to ensure proper drainage.
 - 3. Do not excavate more than 15 feet in depth without stabilizing the slope either by temporarily seeding and mulching, or by topsoiling, permanently seeding, and mulching as specified in Section 312500. Submit alternate methods for stabilizing slopes when seeding is not allowable due to seasonable constraints.
 - 4. Notify the Engineer if excavation to the finished grade section results in unstable subgrade or slopes. Obtain Engineer approval before removing unstable material and backfilling the area with suitable material. Backfill with excavated material and compact using the directed method as specified in Section 312000-3.07.
 - 5. If a slope failure develops during excavation, immediately cease operations. Determine the limits of unstable material, and start backfilling immediately. Once the slope has been stabilized, resume excavation by Engineer approved methods.
 - 6. The Engineer will check excavation elevations. Ensure that the elevation is within $\pm 1/2$ inch of the specified elevation.
 - 7. Wet Areas
 - a. If required, submit a dewatering plan including method of dewatering and controlling sediment and contaminants from entering adjacent waterbodies, wetlands, and environmentally sensitive areas. Obtain Engineer approval for dewatering operations before beginning the work.

Excavate wet areas down to firm bottom within the lateral limits. Test the bottom of the excavation area at frequent intervals as the excavation progresses, by taking soundings, samples, or other tests, to determine when firm bottom is reached. The Department may require the Contractor to take additional borings or samples to determine if unsuitable material remains or is entrapped within the excavation limits.

- b. Excavate using equipment and methods to the specified elevation without disturbing the material below that elevation. If the methods and equipment disturb the material below the specified elevation, immediately stop operations. Resume excavation using alternate methods and equipment as approved by the Engineer.
 - c. The Engineer may allow the use of dikes, well points, or other means for dewatering the excavation areas if cofferdams are not shown on the Plans. If permits are required for this work, submit a copy of approvals to the Engineer before proceeding with the work
- C. Temporarily Storing.
1. Temporarily store regulated or hazardous material in stockpiles within the Project Limits. Construct stockpiles on polyethylene sheeting. Contain stockpiles with hay bales or silt fence placed continuously at the perimeter of the stockpiles. For hazardous material, if a stockpile area is not available within the Project Limits, sample and analyze materials in-situ for disposal. Excavate and place the hazardous regulated material directly into trucks, and haul it directly to the approved disposal facility.
 2. Cover stockpiles with polyethylene sheeting. Secure the cover in place at all times. Overlap joints in the polyethylene sheeting a minimum of 12 inches, and place securing materials along the joints. Maintain the cover, and replace damaged polyethylene sheeting as needed.
 3. Clean equipment used for the movement of excavated material at the end of each working day or before removing it from the Project Limits. Install non-vegetative erosion control features to limit the movement of the excavated material from equipment cleaning areas. Temporarily store the excavated material from equipment cleaning in stockpiles.
 4. If regulated material is not designated for reuse on-site, dispose of regulated material within 180 days of being stockpiled.
 5. Do not reuse hazardous regulated material. Dispose of hazardous regulated material within 90 days of being stored in stockpiles.
- D. Sampling and Analysis.

1. Collect, transport, and analyze environmental samples required for facility acceptance of the material. Perform sampling, testing, and inspections conducted in areas containing regulated material according to the Site-Specific HASP.
 - a) Soil sampling frequency is normally 1 sample per 500 cubic yards from the stock pile, but may vary depending on disposal facility requirements and parameters.
 2. Perform sampling, testing, and data management procedures according to NJDEP Field Sampling Procedures Manual, NJDEP Technical Requirements for Site Remediation, NJDEP Management of Excavated Soils Guidelines, Appendix 1 of the NJDEP Waste Classification Form, and EPA requirements.
 3. Do not sample or analyze any part of the Project Limits for purposes of re-delineating designations of excavation.
- E. Document Control.
1. Provide the following items:
 - a) Soil Usage Tracking Log.
 - i. Complete a tracking log for each working day involving excavation, stockpile, transport, and disposal of regulated material. Monitor and record the following information on the tracking log:
 1. Date.
 2. Location maps showing excavation and placement, including depth, of material.
 3. Type, volume, and characteristics of regulated material removed.
 4. Names and signatures of personnel responsible for preparing and executing the tracking log.
 - ii. Submit copies of daily tracking logs to the Engineer on a weekly basis
 - b) Materials and Handling Reports.
 - i. Submit weekly reports to the Engineer documenting the excavation, stockpiling, sampling, off-site management, and on-

site placement of regulated material. Indicate the location and dates of excavation, stockpiling, sampling, off-site management, and on-site placement of regulated material. Explain changes to or variations from the MHP. Additionally, include dates of planned excavation, sampling, and off-site management of regulated material for the coming months.

- ii. Provide a final report documenting the management of regulated material, including the location and dates of excavation, stockpiling, sampling, off-site management, and on-site placement of regulated material. Include plans depicting placement of regulated material. Submit 4 copies of the final report to the Engineer within 30 days of completing excavations of regulated material, off-site management of regulated material, and operations reusing regulated material.

c) Sampling Logs and Analytical Reports.

- i. Submit to the Engineer 2 copies of the sampling logs, chain of custody, and analytical reports after each soil analysis is performed within 10 days of analysis.

d) Water Tracking Logs.

- i. If dewatering is necessary, maintain a water tracking log for water collection, monitoring, and handling activities, and make the log available to the Engineer upon request. In the water tracking log, note daily water removal, treatment, disposal volumes, sampling activities and results, spill incidents, and sampling and reporting activities.

3.04 DISPOSAL OF EXCESS MATERIAL

- A. Dispose of excess regulated material according to applicable federal, state, and local laws, rules, and regulations. Provide the following before removing the excess excavation from the Project Limits.

- 1. At least 10 days before disposing, submit the disposal procedure and location to the Engineer for approval.
- 2. On a Department provided form, obtain the property owner's notarized authorization of the acceptance of the excess material and where it is being placed.

- B. Once material leaves the Project Limits, the Contractor is responsible for ensuring

that the handling procedures, placement method, and disposal location are according to applicable Federal, State, and local laws, rules, and requirements, including permits that may be issued for the Project. If the disposal of excess material results in a violation notice from any governmental authority, immediately correct the violation. Indemnify and defend the Department for any violation incurred, penalty assessed, or any claims, suits, losses, demands or damages of whatever kind or nature arising out of, or claimed to arise out of, the improper disposal of excess materials.

- C. If the Contractor does not correct the violation to the satisfaction of the governmental authority that issued the violation notice, the Contractor is responsible for assessed penalties including costs incurred by the Department to remedy the violations.
- D. Dispose of other material or debris in accordance with all applicable Federal, State, and local laws, rules, and regulations.

3.05 DISPOSAL OF REGULATED MATERIAL

- A. Load, transport, and dispose of regulated material that the Engineer determines to be excess, unusable, or unsuitable for the Project according to Federal, State, and local laws, rules, and regulations. Pay fees associated with removal and disposal of regulated materials.
- B. Submit the results of material sampling and analysis, waste facility applications and acceptance documentation, and fee payment requirements to the Engineer at least 15 days before planned removal of regulated material. Submit to the Engineer a bill of lading for each truckload of regulated material removed from the Project Limits. Ensure that the bill of lading and waste manifest include the following information:
 - 1. Transport subcontractor name, address, permit number, and telephone number.
 - 2. Type and quantity of material removed.
 - 3. Weight of vehicle with weigh slip.
 - 4. Recycling or disposal facility name, address, permit number, and telephone number.
 - 5. Date removed from the Project Limits.
 - 6. Signature of transport vehicle operator.

- C. The Engineer will sign the bills of lading on behalf of the Owner as the generator. Submit 1 copy of the bill of lading to the Engineer by the end of each working day that the transport vehicle leaves the site.
- D. The licensed hauler shall transport the regulated material to the disposal/recycling facility with no unauthorized stops in between, except as required by regulatory authority. The hauler shall use appropriate vehicles and operating practices to prevent spillage or leakage from occurring during transport. Remove excess soil adhering to the wheels or under carriage of the vehicles before leaving the Project Limits. If soil or water escapes to the public roads, immediately clean the road to restore it to the original condition and immediately notify the Engineer. Do not transport regulated material over public roads if they contain free liquid or are sufficiently wet to be potentially flowable during transport.
- E. Submit 1 copy of the documentation of the disposal facility's acceptance of the regulated material, including the weight ticket slips, to the Engineer and the county of origin within 15 days of acceptance at the disposal facility.
- F. Immediately submit written notification to the Engineer if problems arise, regarding the facility chosen to accept the regulated material for off-site management, that would require the return of waste, or if the chosen facility has violated any environmental regulation that may result in regulatory enforcement action. Propose an alternate disposal facility, and obtain the Engineer's written approval of off-site management at such facility.

3.06 DISPOSAL OF REGULATED MATERIAL, HAZARDOUS

- A. Load, transport, and dispose of hazardous regulated material for the Project according to Federal, State, and local laws, rules, and regulations. Pay fees associated with removal and disposal of hazardous regulated materials.
- B. Submit the results of material sampling and analysis, waste facility applications and acceptance documentation, and fee payment requirements to the Engineer at least 15 days before planned removal of hazardous regulated material. For each truckload of hazardous regulated material removed from the Project Limits, submit to the Engineer a bill of lading and waste manifest that include the following information:
 - 1. Transport subcontractor name, address, EPA ID number, and telephone number.
 - 2. Type and quantity of material removed.
 - 3. Weight of vehicle with weigh slip.

4. Recycling or disposal facility name, address, permit number, and telephone number.
 5. Date removed from the Project Limits.
 6. Signature of transport vehicle operator.
 7. Waste manifest tracking number.
- C. The Engineer will sign the manifest on behalf of the Owner as the generator. The manifest will verify the type and quantity of hazardous regulated material being transported off-site.
- D. The Uniform Hazardous Waste Manifests are required by the Federal Resource Conservation and Recovery Act (RCRA) (40 CFR Subpart B Parts 262.20 to 262.23) and N.J.A.C 7:26G for all off-site shipments of hazardous regulated materials. The Owner is the generator of the waste. The Department will obtain an EPA Identification Number (EPA ID#) and supply this information to the Engineer for inclusion on the Uniform Hazardous Waste Manifest. The Engineer will provide the Contractor with an EPA ID# if the Project contains hazardous regulated material.
- E. Complete the manifest form in accordance with all applicable regulations and mail to the Bureau of Environmental Program Resources at 951 Parkway Avenue, PO Box 600, Trenton, NJ 08625-0600 to ensure that the "final disposition" (TSD to Generator) copy of the manifest is mailed back to the office responsible for the record keeping requirements.
- F. The Engineer will keep a copy of the original manifest for the Contract files. The Bureau of Environmental Program Resources will distribute the original manifests in accordance with the regulations and also for retention of the manifests per regulatory requirements.
- G. The Contractor is responsible for all manifest discrepancies. Immediately report discrepancies to the Engineer and resolve to the satisfaction of the Engineer. The Engineer will forward a copy of manifest discrepancy letters to the Bureau of Environmental Program Resources.
- H. The licensed hauler shall transport the hazardous regulated material to the disposal/recycling facility with no unauthorized stops in between, except as required by regulatory authority. The hauler shall use appropriate vehicles and operating practices to prevent spillage or leakage from occurring during transport. Remove excess soil adhering to the wheels or under carriage of the vehicles before leaving the Project Limits. If soil or water escapes to the public roads, immediately clean the road to restore

it to the original condition and immediately notify the Engineer. Do not transport hazardous regulated material over public roads if they contain free liquid or are sufficiently wet to be potentially flowable during transport.

- I. Submit 1 copy of the documentation of the disposal facility's acceptance of the hazardous regulated material, including the weight ticket slips, to the Engineer and the county of origin within 15 days of acceptance at the disposal facility.
- J. Immediately submit written notification to the Engineer if problems arise, regarding the facility chosen to accept the hazardous regulated material for off-site management, that would require the return of waste, or if the chosen facility has violated any environmental regulation that may result in regulatory enforcement action. Propose an alternate disposal facility, and obtain the Engineer 's written approval of off-site management at such facility.

3.07 COMPACTION OF SUBGRADE SURFACES

- A. Thoroughly compact the exposed ground surface following clearing and grubbing and any required excavation with a minimum of 6 passes of the above compactor and obtain at least 95% of the maximum density as determined by ASTM D1557, Modified Proctor Test or 85% of relative density as determined by ASTM 2049. Areas of former test pits shall be staked out by the Contractor. After the locations are verified by the Owner's Engineer, the Contractor shall compact these areas with a minimum of 10 passes.
- B. Any soft areas exhibiting excessive weaving or unsatisfactory material identified during excavation, fill placement, compaction and proof-roll shall be removed, and compacted as specified in Section 3.03.A above. Backfilling of these areas shall be done in accordance with Section 3.04.
- C. Prior to preparing the subgrade in low lying areas, perform the following procedures:
 1. Drain standing water by gravity or with a pump. Water should be containerized and tested prior to any discharges to determine if it will require any special handling.
 2. After drainage of low area is complete, remove mulch, mud, debris, and other unsuitable material using equipment and methods that will minimize disturbance to the underlying soils.
 3. Thoroughly compact subgrade as specified herein.

3.08 BACKFILLING AND COMPACTION

- A. No fill materials shall be placed during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until all saturated surficial soils are returned to satisfactory moisture content as determined by the Owner's Engineer.
- B. Place and compact approved fill materials in 12-inch maximum loose lifts using a minimum of 6 passes with the above 5-ton static drum weight compactor and obtain at least 95% of the maximum density as determined by ASTM D-1557. Smaller compaction equipment, together with 6-inch maximum lifts will be necessary for backfill behind walls and areas of limited maneuverability.
- C. Visual confirmation of fill quality, lift thickness and compaction procedures, together with density testing, shall determine the acceptability of fill. Any unsatisfactory material or soft areas exhibiting excessive weaving shall be immediately removed, replaced and recompacted as stated above to the satisfaction of the Owner's Engineer.
- D. No fill material shall be placed in areas of standing water, in areas of frozen or thawing ground, or over surfaces or lifts that have not been approved by the Owner's Engineer and LSRP.
- E. Install demarcation barrier above existing site soils prior to placement of clean fill material in landscape areas.

3.09 MAINTENANCE OF SUBGRADE AND FILLS

- A. Finished subgrades shall be verified by the Contractor to ensure proper elevation and conditions for construction above subgrade.
- B. During earthwork operations, exposed areas shall be constructed or excavated in a manner that provides for surface drainage and prohibits ponding water. All fill areas shall be sealed at the end of each day using a smooth drum roller.
- C. Protect subgrade from excessive construction traffic and wheel loading including concrete and dump trucks.
- D. Remove areas of finished subgrade judged to be unsatisfactory to the depth necessary and replace in a manner that will comply with compaction requirements by use of material approved by the Owner's Engineer and LSRP. Surface of subgrade after compaction shall be hard, uniform, smooth, stable and true to grade and cross-section.
- F. It is the Contractor's responsibility to provide adequate dewatering of the site by means and methods approved by the Owner's Engineer and LSRP, if groundwater is encountered during the earthwork activities.

3.10 FINISH ELEVATIONS AND LINES

- A. For setting and establishing finish elevations and lines, secure the services of a licensed land surveyor acceptable to the Owner and Owner's Engineer and LSRP.
- B. Provide elevation grade stakes and any other surveying necessary for the layout of the work. The Contractor shall conduct his work in such a manner that survey stakes will be protected as long as their need exists. Grade stakes which are damaged or stolen shall be replaced by the Contractor's Surveyor at the Contractor's expense.
- C. Graded areas shall be uniform, hard and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10 feet above or below the design finished subgrade elevation; any deviation shall not result in changes in drainage areas or ponding. All ground surfaces shall vary uniformly between indicated elevations. Finish drainage ditches shall be graded to allow for proper drainage without ponding and in a manner that will minimize the potential for erosion.
- D. Areas having drainage slopes of one-quarter inch per foot or more shall have grade stakes, set with an instrument, at grid intervals of 50-ft.
- E. Areas having drainage slopes of one-quarter inch per foot or less shall have grade stakes, set with an instrument, at grid intervals of 25-ft.
- G. Correct all settlement and eroded areas for one year after date of project completion at no additional expense to Owner. Bring paved and landscaped areas to proper elevation. Replant or replace any grass, shrubs, bushes, or other vegetation disturbed by construction using corrective measures.

3.11 ACID PRODUCING SOILS

- A. If there is a possibility of encountering acid-producing deposits in the course of construction, as identified during the planning process, the following special requirements and conditions will apply:
 - 1. In vegetated areas, the top two feet of soil shall be stripped and stockpiled separately from the material to be excavated. A soil specialist, to be provided by the project sponsor, shall monitor the stripping operation. If any acid-producing deposits are identified, this material and any contaminated soil shall be disposed of on the same day. The presence of acid-producing deposits is detected by the use of the following tests:
 - i. Determining the pH of the soil when suspended in 0.5 Molar calcium chloride solution (of neutral pH). A pH value below 3.0 indicates

- presence-of ferrous sulfate and presence of acid-producing deposits is strongly suspected.
- ii. Test for sulfate by adding a drop of 10 percent barium chloride solution to a water extract of the material. If voluminous flocks of barium sulfate form immediately the presence of acid-producing deposits is strongly suspected.
2. The disposal site shall be approved by the Department. Any soil of this type disposed of shall be covered with a minimum of two feet of cover to prevent rapid oxidation and subsequent acid formation.
 3. In both vegetated and paved areas, when acid-producing deposits are encountered, as determined by the soil specialist, excavated trench material shall be returned to the trench as follows:
 - i. Lower material first, followed by upper material.
 - ii. The top one to two inches of soil on which the deeper soil was stockpiled shall be scraped and placed below a depth of two feet.
 - iii. For pipeline construction, the quantity of material to be displaced by bedding and pipe, as well as soil scraped from the stockpile area, shall be subtracted from the deeper, excavated material and this quantity of deeper material removed to an approved disposal site and covered as described in the "Restoration Measures."
 - iv. After backfilling the deeper soil, one ton of limestone per 2,000 square feet shall be spread over the deeper soil in the trench. This liming requirement is applicable in areas of well drained, nonsaturated soils, as determined by the soil specialist.
 - v. In vegetated areas, the top two feet of soil, stockpiled for this purpose, shall then be replaced. If the top two feet of soil was also contaminated, clean backfill material similar to the native topsoil shall be used in place of the contaminated material.
 4. The excavated acid-producing deposits shall not be exposed for a period longer than eight hours. When acid-producing deposits are encountered, the trench opened in any construction day shall be backfilled and the areas cleaned up by the close of the day. Where this is impracticable, such as in the construction of pumping stations and treatment plants, exposed acid-producing deposits shall be covered with limestone screenings at a rate of 100 tons per acre and then covered with six inches of compacted soil within one week of exposure or before the exposed soil drops to pH 3, whichever occurs first. The pH shall be monitored daily under this procedure.

5. Temporary restoration of vegetated areas shall consist of mulching and shall be put in place at the end of each day's construction. Permanent restoration of the area shall begin as soon as construction is complete and after the results of incubation tests, where necessary, are available.
6. Prior to restoring vegetated areas, the soil specialist shall perform pH tests on the in-situ soil after the construction is completed. If the pH is below 4, intensive liming shall be required in order to make the soil suitable for plant survival.
7. Lime requirement tests shall be performed by the soil specialist to determine the lime application rates. This will require an incubation test in which the sample is oxidized for a period of six weeks, as follows.
 - i. The sample shall be air dried and ground so that the whole sample passes a 0.5-millimeter sieve.
 - ii. The lime requirement to reach pH 6.5 shall be determined initially and again at two-week intervals for six weeks, using standard soil testing techniques.
 - iii. The total lime requirement determined by this method can be extrapolated to the area under consideration.
8. At a minimum of 30 tons of limestone per acre or the amount of lime required according to the incubation test result shall be applied prior to seeding and planting where the pH is less than 4. Where the pH is greater than 4, liming and fertilizing requirements set out in the planting and environmental specifications shall apply.
9. The spreading and mixing of the subsoil and any topsoil contaminated acid-producing deposits around the site and beyond the site is prohibited. Areas used for stockpiling acid-producing deposits shall be minimized, Equipment used for excavation and backfilling shall be cleaned, to the extent practicable, at the end of each day's operation and the soil removed shall be placed in the trench below a depth of two feet. No construction shall take place during significant rainstorms or while the area is saturated to avoid smearing or spreading of the acid-producing deposits over the area.

3.12 DEWATERING

- A. If dewatering is necessary, all groundwater shall be tested, containerized and disposed of in accordance with all applicable regulations, including the New Jersey Department of Environmental Protection.

- B. Submit the results of sampling and analysis, waste facility applications and acceptance documentation, and fee payment requirements to the Engineer at least 15 days before planned removal of collected water. Submit to the Engineer a bill of lading for each truckload removed from the Project Limits. Ensure that the bill of lading and waste manifest include the following information:
1. Transport subcontractor name, address, permit number, and telephone number.
 2. Quantity of water removed.
 3. Weight of vehicle with weigh slip.
 4. Disposal facility name, address, permit number, and telephone number.
 5. Date removed from the Project Limits.
 6. Signature of transport vehicle operator.
- C. The Engineer will sign the bills of lading on behalf of the Owner as the generator. Submit 1 copy of the bill of lading to the Engineer by the end of each working day that the transport vehicle leaves the site.
- D. The licensed hauler shall transport the water to the disposal facility with no unauthorized stops in between, except as required by regulatory authority. The hauler shall use appropriate vehicles and operating practices to prevent spillage or leakage from occurring during transport. Remove excess soil adhering to the wheels or under carriage of the vehicles before leaving the Project Limits. If soil or water escapes to the public roads, immediately clean the road to restore it to the original condition and immediately notify the Engineer. Do not transport regulated material over public roads if they contain free liquid or are sufficiently wet to be potentially flowable during transport.
- E. Submit 1 copy of the documentation of the disposal facility's acceptance of the regulated material, including the weight ticket slips, to the Engineer and the county of origin within 15 days of acceptance at the disposal facility.
- F. Immediately submit written notification to the Engineer if problems arise, regarding the facility chosen to accept the regulated material for off-site management, that would require the return of waste, or if the chosen facility has violated any environmental regulation that may result in regulatory enforcement action. Propose an alternate disposal facility, and obtain the Engineer's written approval of off-site management at such facility.

3.13 DUST

- A. In order to control dust, as often as required during each working day, and particularly prior to the conclusion of each working day areas under immediate construction (including access roads and other areas affected thereby) shall be swept and wet down with water sufficiently to lay dust. In addition, these areas shall be wet down during non-working hours (including weekends) as often as required to keep the dust under control. The use of calcium chloride or petroleum products or other chemicals for dust control is prohibited.

END OF SECTION 31 20 00

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**SECTION 312333
TRENCHING AND BACKFILL**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

- A. Trench excavation shall consist of the removal of all pavement, earth, boulders, small structures, rock, and other materials encountered, required for the construction of utility lines, structures, laterals, and appurtenances as shown on the Contract Drawings.
- B. Work shall consist of the placement and compaction of bedding material, select fill, and general backfill in trench excavations.

1.03 RELATED SECTIONS

- A. Earthmoving - Section 312000

1.04 REFERENCES

- A. Excavation work shall be performed in compliance with applicable requirements of authorities having jurisdiction.
- B. Sheeting and bracing shall be installed in accordance with Federal OSHA requirements as well as the requirements of state and local authorities having jurisdiction.
- C. All sheeting and bracing systems required to be in place for longer than 5 days shall be designed, signed and sealed by a Registered Professional Engineer of the State of New Jersey.

D. Standards

1. The current specifications of the New Jersey State Department of Transportation as amended and supplemented herein, shall be followed for all trench work.
2. Trench backfill will be subject to testing by the Engineer to assure proper compaction in accordance with the Modified Proctor Density Test, ASTM D1557-78.

1.05 SUBMITTALS

- A. Design calculations and details of construction for all sheeting and bracing systems to be employed shall be submitted for review and approval of the Engineer.
- B. The Contractor shall submit 50 lb. representative samples each of the bedding material, select backfill material, and general backfill material to the Engineer for analysis no less than 1 week prior to the start of trenching operations.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All structural members of the bracing system shall be free of rot, corrosion, or other deterioration and shall be of adequate size and strength that adequate bracing of the excavation shall be provided.
- B. FILL MATERIALS:
 1. All off-site fill material shall be certified clean in accordance with the Technical Requirements for Site Remediation (N.J.A.C. 7:26E-1.8) and NJDEP's "Fill Material Guidance for SRP Sites", dated April 2015. Only certified clean fill material may be used as part of the engineered cap.
 2. Additional Bedding: Additional bedding material shall consist of 3/4" crushed clean stone.
 3. Select Backfill: Select backfill material shall consist of a well graded mixture of sand and gravel with less than 15 percent passing the No. 200 sieve.
 4. General Backfill: General backfill shall consist of soil free of wood, metal, or other deleterious material.

PART 3 - EXECUTION

3.01 METHOD OF CONSTRUCTION

A. GENERAL

1. Excess materials excavated shall be disposed of off-site as directed by the Engineer and in accordance with all applicable Federal, State, and local laws, rules, and regulations. Materials are assumed contaminated historic fill and shall be handled per requirements of Section 312000 and the Contractor's Health and Safety Plan (HASP) and Material Handling Plan (MHP).
2. Provisions for public safety shall be made in accordance with the appropriate paragraphs of these Specifications. Under no circumstances shall more than 25 LF. of trench be left open overnight. Excavations left open shall be protected.
3. All mass concrete or obstructions shall be defined as material which cannot be removed with reasonable effort utilizing a hydraulic backhoe or loader equivalent to a Caterpillar Model 235 hydraulic excavator or Caterpillar Model 977 payloader. The Contractor shall use pavement breakers, other special equipment, or procedures to remove the materials.
4. All materials excavated under this Section shall be removed from the site unless specifically directed by the Engineer.
5. Sheeting and bracing shall be provided as necessary in accordance with these specifications.

B. TRENCH EXCAVATION FOR UTILITIES AND STRUCTURES

1. The excavation shall be made to the lines and grades shown on the Contract Drawings and shall be of sufficient width to allow men to work efficiently and safely in the trench and to allow proper backfilling below the "spring line".
2. Excavations through existing pavements designated to remain shall be made such that the edges of the pavement are cut straight and neat. Saws shall be utilized to accomplish this.
3. The bottom of the excavation shall be shaped so that an even layer of crushed stone may be spread to a consistent thickness beneath the pipe invert for the entire pipe length. If rock or boulders are encountered at

invert elevation, they shall be removed to a minimum of 1 ft. below the pipe invert.

4. If the soils existing at invert grade are wet, soft, or otherwise unsuitable for the adequate support of the utility being constructed, the Engineer shall be so notified to determine if additional excavation to more suitable material or special foundation preparation is necessary. Additional bedding material will be per this specifications section.
5. Adjustments to pipe/structure invert elevations may be necessary due to conflicts with existing utilities, or obstructions. Such adjustments to the Contract Drawings shall be approved by the Engineer. The Contractor shall carry out such adjustments during construction at no additional cost provided they are within 8 in. vertically and/or 2 feet horizontally from the position indicated on the Contract Drawings.

C. TRENCH BACKFILL

1. Where unsuitable soil conditions exist at the bottom of the trench excavation in the opinion of the Engineer, additional bedding as described above shall be placed and compacted to a depth as ordered by the Engineer.
2. Select backfill shall be placed around the pipe or structure as indicated on the Contract Drawings. Care shall be taken during placement of the select backfill material such that all bedding placed under the haunches of the pipe is thoroughly tamped and unyielding. Select backfill shall be placed in lifts not to exceed 6 inches.
3. The remainder of the backfill to be placed in the trench and around structures shall consist of general backfill material. This material shall be placed in lifts as specified on the Details and each lift shall be compacted with a minimum of 4 coverages of a mechanical tamper. Any backfill material rutting or weaving under the compaction equipment shall be removed and replaced with properly compacted backfill. General backfill materials shall be compacted to not less than 95% of the maximum dry density within non-roadway areas as determined by the Modified Proctor Density Test, ASTM D1557-78.
4. Boulders and cobbles larger than 6" shall not be placed as backfill.
5. In locations where excavation has been carried beneath existing structures, utilities, or pipes, or other areas such that backfill cannot be properly compacted, the Contractor shall furnish and place concrete

backfill (Class C) as required to support such existing structures, utilities, or pipes.

6. When sheeting is withdrawn, all cavities in or adjoining the trench or excavation shall be solidly filled. When sheeting is left in place, all cavities behind the sheeting shall be solidly filled.

3.02 INSTALLATION

- A. The Contractor shall use extreme care in locating existing utilities, and use predrilling, jetting, and pre-excavation to verify that the sheeting system will be clear of the existing utilities to remain in service.
- B. Upon completion of the work, all sheeting and bracing shall be removed to the extent possible. Any material left in place to minimize damage to existing utilities shall be cut off at least 2 feet below finished grade. The material left in place shall not be considered as extra cost to the Owner.

END OF SECTION 31 23 33

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**SECTION 312500
EROSION AND SEDIMENT CONTROL**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

- A. Work shall consist of the construction, placement or erection of soil erosion and sediment control measures as specified herein and as indicated on the Contract Drawings.

1.03 RELATED SECTIONS

- A. Earthmoving - Section 31 20 00

1.04 REFERENCES

- A. Standards
 - 1. The Standards for Soil Erosion and Sediment Control in New Jersey.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Materials are specified on the Contract Drawings

PART 3 - EXECUTION

3.01 INSTALLATION

- A. GENERAL
 - 1. The Contractor shall install all soil erosion and sediment control measures in accordance with the requirements indicated on the Contract Drawings, permit, and specifications. All work shall be performed in accordance with the requirements of the Standards, latest revision.

2. The Contractor shall be responsible for maintenance of all soil erosion and sediment control measures during the Contract.
3. The Contractor shall keep all streets clear of dirt and sediment and shall be responsible for any cleaning of the streets necessary during the course of the project.
4. The Contractor shall comply with all requirements of permit issued by the Soil Conservation District.

B. SEQUENCE OF CONSTRUCTION

1. The Contractor shall submit written notification to the Soil Conservation District at least 72 hours prior to the start of construction of any soil erosion and sediment control measures.
2. A temporary crushed stone wheel cleaning pad shall be installed at the construction entrance/exits as shown on the Contract Drawings.
3. Filter fabric silt fence shall be installed and maintained at locations shown on the Contract Drawings.
4. Equip catch basins with filter fabric inlet protection immediately upon commencement of work and upon construction of new catch basins.
5. All soil erosion and sediment control measures shall be maintained until all work under this Contract is completed.
6. The Contractor shall, as necessary, notify the Soil Conservation District upon commencement and completion of the project.

END OF SECTION 312500

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**SECTION 321216
ASPHALT PAVING**

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SECTION INCLUDES

- A. Work shall consist of the construction of all asphalt paving and related work, as indicated on the Contract Drawings and as specified herein. Limits of each type of pavement are shown on the Contract Drawings. Work shall include, but not be limited to the following:
 - 1. Subgrade preparation.
 - 2. Construction of subbase for driveways.
 - 3. Construction of bituminous stabilized base course.
 - 4. Construction of bituminous concrete surface course for driveways, parking areas and roadways.
 - 5. Pavement markings.

1.03 RELATED SECTIONS

- A. Earthmoving - Section 31 20 00

1.04 REFERENCES

- A. The current specifications of the NJDOT specifications, as amended and supplemented herein, shall be followed for all pavement work and materials.
- B. The compacted subgrade and subbase will be subject to testing by the Engineer to assure proper compaction as described in Section 31 20 00 – Earthmoving of these Specifications.

1.05 SUBMITTALS

- A. Mix Formula: The Contractor shall supply to the Owner, prior to construction, a State-approved mix formula for the type of bituminous concrete specified. The Contractor shall certify to the Owner that the source of his bituminous concrete is a State-approved plant and that the bituminous concrete provided meets the state specifications.

PART 2 - MATERIALS

2.01 SUBGRADE MATERIAL

- A. Non-organic Soil and rock or rubble free of wood, metal or other deleterious materials obtained from on- or off-site sources. All materials shall be subject to approval by the Engineer.

2.02 PAVEMENT MATERIALS

- A. Subbase - Crushed stone Type I-5 shall consist of quarry processed stone or recycled concrete aggregate in conformance with the requirements of Section 901 of the Standard Specifications.
- B. Bituminous Stabilized Base Course - The bituminous stabilized base course material shall be bituminous concrete Type I-2 in accordance with the requirements of Section 903 of the Standard Specifications.
- C. Bituminous Concrete Surface Course - The bituminous concrete surface course material shall be bituminous concrete Type I-5 in accordance with the requirements of Section 903 of the NJDOT Standard Specifications for Road and Bridge Construction. Submit mix design to provide aggregates with high albedo (light reflecting) characteristics.

PART 3 - EXECUTION

3.01 PREPARATION OF SUBGRADE

- A. The Contractor shall fine grade the subgrade to within 0.05 ft of the lines and grades shown on the Contract Drawings. The Contractor is alerted to the fact that special care must be taken in areas where utilities may be at a minimum cover.
- B. After the subgrade has been fine graded, the top 12 inches of the subgrade shall be compacted by a minimum of 4 passes of a minimum 5-ton static weight vibratory roller. All grading and compaction shall be done in such a manner as to produce a smooth, uniform, subgrade surface. Any soils which exhibit weaving

or pumping under the compactor or construction equipment shall be excavated and replaced with compacted fill.

- C. The subgrade shall be prepared after all utilities and other subsurface structures have been placed and the backfill has been properly placed and compacted.
- D. The subgrade shall not be prepared during freezing weather or when frozen, or when it is unstable because of excessive moisture.
- E. When completed, the subgrade shall be at the proper grade and contour, firm, even and free from depressions that may form water pockets, and shall be so maintained until the pavement is placed.

3.02 CONSTRUCTION OF SUBBASE

- A. Subbase shall not be constructed when the subgrade is frozen or when it is soft or unstable. Subbase shall not be constructed during rainy or freezing weather or with frozen material.
- B. The subbase shall be spread, compacted, and graded to within + 1/2 inch of the sections and grades shown on the Contract Drawings.
- C. The subbase shall be compacted by a minimum of 5 passes of a 5-ton static weight vibratory compactor or other approved procedures.
- D. If, in the opinion of the Engineer, the moisture content is excessive or deficient, the Contractor shall make adjustments to the satisfaction of the Engineer and as required for the specified density.
- E. The Contractor shall be responsible for the protection of adjacent structures in or above the proposed subgrade to preclude any damages during placement or compaction.
- F. Should the subbase material become contaminated or for any reason become unsuitable prior to placement of the pavement, the Contractor shall correct or replace the subbase material with satisfactory subbase material at no additional expense.

3.03 BITUMINOUS STABILIZED BASE COURSE

- A. The base course shall be placed on the subbase in accordance with the requirements of Section 304 of the Standard Specifications as soon as stable conditions are achieved. This shall be done so as not to interfere with existing and construction traffic patterns. Prior to placing the surface course, any failed areas in the base shall be patched by excavating both the bituminous base and

subbase course and replaced with additional bituminous base to meet required elevations for stability.

- B. The thickness of the compacted asphaltic concrete shall not vary more than 1/8 inch from the thickness shown on the Contract Drawings.
- D. A tack coat is required between the base course and surface course. The surface shall be broom cleaned and a tack coat shall be applied at a rate specified by manufacturer immediately prior to placement of the surface course.

3.04 BITUMINOUS CONCRETE SURFACE COURSE

- A. The bituminous concrete shall be applied in a single course thickness with a self-propelled paving machine in accordance with Section 404 of the NJ DOT Standard Specifications for Road and Bridge Construction.
- B. The surface of the base course or existing pavement upon which the bituminous concrete pavement is to be placed shall be clean, dry and free from frost when the paving operations are about to start and shall be maintained in that condition. The Engineer may permit, in the case of a sudden rain, the placing of mixture in transit from the plant, if laid at proper temperature and if the roadbed is free of standing water.
- C. Bituminous concrete mixtures shall be laid when the combinations of laydown and base surface temperatures are within the limits shown in the following table.

Minimum Laydown Temperature (Degrees F)

Base Temp.	<u>Course Thickness</u>		
	<u>1"</u>	<u>2"</u>	<u>3" & Greater</u>
20 - 30	-	-	285
33 - 40	-	-	280
41 - 50	310	285	275
51 - 60	300	280	270
61 - 70	290	275	265
71 - 80	285	270	265
81 - 90	275	165	260
91 & over	270	260	265

- E. Contact surfaces of curbing, gutters, manholes, and other structures shall be painted with a thin uniform coating of cut-back asphalt, Grade RC-70 just prior to the placing of the bituminous concrete mixture against them.
- F. When bituminous concrete is laid on existing bituminous concrete or newly constructed bituminous concrete on which traffic has been maintained, the

paved surface shall be given an application of tack coat material at the rate of 0.10 gallons per square yard as directed by the Engineer, prior to placing the new surface. Equipment for applying the tack coat shall be power operated pressure spraying or distributing equipment suitable for the materials to be applied. Bituminous pavements shall be thoroughly cleaned prior to application of tack coat material.

- F. The bituminous concrete shall be compacted at proper temperatures using a 10-ton steel wheeled roller or other approved procedures.
- G. The thickness of the compacted asphaltic concrete shall not vary more than 1/4 inch from the thickness shown on the Contract Drawings.
- H. The finished pavement shall have a smoothness such that at no point varies more than 1/4 inch under a 20-ft straight edge applied parallel to the flow line of the pavement. Low spots or "bird baths" which hold water will be repaired by the Contractor by patching.

3.05 PAVEMENT MARKING

- A. Prior to any pavement marking, the surface of the pavement shall be thoroughly cleaned and all dust, dirt, and other foreign materials removed.
- B. The markings or striping shall be completed as shown on the Contract Drawings.
- C. No markings shall be done until the surface of the pavement has been in place for a minimum of 2 weeks.
- D. The Contractor shall be responsible for protecting the work until the paint has sufficiently dried.
- E. The Contractor shall be responsible for removing tracking marks, spilled paint or paint not meeting the requirements of the Specifications at no additional cost to the Owner.
- F. The paint shall be applied with an atomizing spray type machine.
- G. The paint applied shall be 15 mil thickness minimum.
- H. Paint shall be white for crosswalk and non-H.C. parking spaces, blue for H.C. parking spaces, and be commercially produced pure Type III alkyd – chlorinated rubber conforming to Federal Specification TT-P-115.

END OF SECTION 321216

**SECTION 32 13 13
CONCRETE PAVING**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preparation and placement of Portland cement concrete sidewalks, curb ramps and other concrete areas identified on Contract Documents.
- B. Preparation and placement of concrete sidewalk.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 31 20 00 – Earth Moving
- B. Section 31 23 33.19 – Trenching and Backfilling for Pavement
- C. New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2007.
- D. Contract Documents

1.03 REFERENCE STANDARDS

- A. American Concrete Institute (ACI) latest edition
 - 301 Specifications for Structural Concrete for Buildings
 - 304R Guide for Measuring Mixing, Transporting and Placing Concrete
 - 308 Standard Practice for Curing Concrete
- B. American Society for Testing and Materials (ASTM) latest edition
 - A 185 Steel Welded Wire Fabric, Plain for Concrete Reinforcement
 - C497 Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
 - A615 Deformed and Plain Billet-Steel for Concrete Reinforcement
 - C33 Concrete Aggregates
 - C 94 Ready-Mixed Concrete
 - C 150 Portland Cement
 - C 260 Air-Entraining Admixtures for Concrete
 - D 309 Liquid Membrane-Forming Compounds for Curing Concrete
 - C494 Chemical Admixtures for Concrete

C1751 Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

- C. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.
- D. New Jersey Department of Transportation Standard Specification for Road and Bridge Construction, 2007.

1.04 QUALITY ASSURANCE

- A. The Contractor shall pay for the services of a test laboratory, approved by the Owner's Engineer, for concrete inspection. The test laboratory shall have at least one Professional Engineer on staff and shall submit proof that any concrete inspectors used on the project shall have successfully completed the ACI course in Concrete Inspection within the past year.
- B. Establish and maintain required lines and elevations.
- C. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner's Engineer.
- D. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- E. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of material.

1.05 SUBMITTALS

- A. Submit materials certificate to the Owner's Engineer, which is signed by materials producer and Contractor, certifying that materials comply with, or exceed, requirements specified herein.
- B. The Contractor shall retain an independent testing agency to perform the required tests. The Contractor shall provide any necessary assistance to the testing agency and provide the testing agency with the intended construction schedule at least one week prior to the start of construction.
- C. Submit concrete mix design to the Owner's Engineer for review and approval at least 14 days prior to use.
- D. Testing results of concrete, steel and paving tests performed by Contractor's testing laboratory shall be submitted to Owner's Engineer in a timely manner.

1.06 PROJECT CONDITIONS

- A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Forms shall be of depth equal to depth of curbing or sidewalk, and so designed as to permit secure fastening together at tops. Coat forms with nonstaining type of coating that will not discolor or deface surface of concrete.
- B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185.
- C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 60.
- D. Concrete materials: Comply with requirements of Section 03 30 00 for concrete materials, admixtures, bonding materials, curing materials and others as required. Concrete shall have a minimum 28-day compressive strength of 4000 psi.
- E. Joint Sealers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A.
- F. Welded wire fabric as indicated on Contract Documents.

2.02 MIX DESIGN AND TESTING

- A. Concrete mix design and testing shall comply with requirements of ACI.
- B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce following properties:
 - 1. Compressive Strength: 4,000 psi, minimum at 28 days, unless otherwise indicated on Contract Documents.
 - 2. Slump Range: 4-inches +/- 1-inch at time of placement
 - 3. Air Entrainment: 4 to 7 percent

PART 3 EXECUTION

3.01 PREPARATION

- A. Proof-roll prepared base material surface to check for unstable areas. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.
- B. Remove loose material from compacted base material surface to produce firm, smooth surface immediately before placing concrete.

3.02 INSTALLATION

- A. Form Construction
 - 1. Set forms to required grades and lines, rigidly braced and secured.
 - 2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place minimum of 24 hours after concrete placement.
 - 3. Check completed formwork for grade and alignment to following tolerances:
 - Top of forms not more than 1/8-inch in 10-ft
 - Vertical face on longitudinal axis, not more than 1/4-inch in 10-ft
 - 4. Clean forms after each use and coat with form release agent as often as required to ensure separation from concrete without damage.
 - 5. Install 6-inch x 6-inch welded wire fabric as indicated on Contract Documents. Support wire on metal wire chairs to ensure that wire stays mid-depth of sidewalk section during concrete pour.
- B. Reinforcement: Locate, place and support reinforcement in accordance with Contract Documents and ACI.
- C. Concrete Placement
 - 1. Place concrete in accordance with requirements of NJDOT Standard Specifications and ACI requirements.
 - 2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structures until they are at required finish elevation and alignment.

3. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hour, place construction joint. Automatic machine may be used for curb and gutter placement at Contractor's option. Machine placement must produce curbs and gutters to required cross-section, lines, grades, finish and jointing as specified for formed concrete. If results are not acceptable, replace with formed concrete as specified.
 4. Concrete placement in poor weather conditions shall be subject to limitation of ACI.
- D. Joint Construction: Construct expansion, weakened-plane control or contraction, and construction joints straight with face perpendicular to concrete surface. Construct traverse joints perpendicular to centerline, unless otherwise detailed.
1. Weakened-Plane Control or Contraction Joints: Provide joints at spacing of 15-ft o.c. maximum each way. Construct control joints for depth equal to at least 1/4 concrete thickness, as follows:
 - a. Form tooled joints in fresh concrete by grooving top with recommended tool and finishing edge with jointer.
 - b. Form sawed joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
 2. Construction Joints: Place concrete joints at end of placements and at locations where placement operations are stopped for period of more than 1/2 hour, except where such placements terminate at expansion joints. Construct joints using standard metal keyway-section forms.
 3. Expansion Joints: Locate expansion joints at maximum of 18-ft o.c. maximum each way. Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, sidewalks, and other fixed objects.
- E. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 1/2-inch or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.

3.03 CONCRETE FINISHING

- A. After striking off and consolidating concrete, smooth surface by screening and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10-ft straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.
- B. Work edges of sidewalks, gutters, back top edge of curb, and formed joints with edging tool, rounding edge to 1/2-inch radius. After completion of floating and trowelling, when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
 - 1. Paving: provide course, nonslip finish by scoring surface with stiff-bristled broom perpendicular to flow of traffic.
 - 2. Curbs, gutters and sidewalks: Broom finish by drawing fine haired broom across surface perpendicular to line of traffic. Repeat operation as necessary to produce a fine line texture.
- C. After form removal, clean ends of joints and point up minor honeycombed areas. Remove and replace areas or sections with major defects, as directed by Owner's Engineer.
- D. Protect and cure finished concrete paving using acceptable moist-curing methods, more particularly described in "water-curing" section of ACI 308.

3.04 BACKFILL

- A. After the concrete has set sufficiently, the spaces in front and back of the curb and gutter or sidewalk shall be refilled to the required elevation with suitable material in accordance with Section 31 20 00, which shall be compacted until firm and solid and neatly graded.

3.05 CLEANING AND ADJUSTING

- A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

END OF SECTION 32 13 13

**SECTION 32 16 13
CONCRETE CURBS AND GUTTERS**

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Preparation and Placement of Concrete Curbs

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 31 20 00 – Earth Moving
- B. Section 31 23 33 – Trenching and Backfill
- C. Section 32 13 13 - Concrete Paving
- D. New Jersey Department of Transportation Standard Specifications for Roads and Bridge Construction 2007
- E. Contract Documents

1.03 REFERENCE STANDARDS

- A. American Concrete Institute (ACI) latest edition
 - 304R Guide for Measuring Mixing, Transporting and Placing Concrete
 - 308 Standard Practice for Curing Concrete
- B. American Society for Testing and Materials (ASTM) latest edition
 - A 185 Steel Welded Wire Fabric, Plain for Concrete Reinforcement
 - C497 Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement
 - A615 Deformed and Plain Billet-Steel for Concrete Reinforcement
 - C33 Concrete Aggregates
 - C 94 Ready-Mixed Concrete
 - C 150 Portland Cement
 - C 260 Air-Entraining Admixtures for Concrete
 - D 309 Liquid Membrane-Forming Compounds for Curing Concrete
 - C494 Chemical Admixtures for Concrete

C1751 Performed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

- C. FS TT-C-800 - Curing Compound, Concrete, for New and Existing Surfaces.
- D. New Jersey Department of Transportation Standard Specification for Road and Bridge Construction, 2007.
- E. City of Paterson Department of Engineering and Department of Public Works.

1.04 QUALITY ASSURANCE

- A. The Contractor shall warrant that concrete curbs are 4,000 psi or as required by the City of Paterson.
- B. Establish and maintain required lines and elevations.
- C. Check surface areas at intervals necessary to eliminate ponding areas. Remove and replace unacceptable work as directed by Owner.
- D. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- E. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of material.

1.05 SUBMITTALS

- A. Submit concrete mix design to the Owner's Engineer for review and approval at least 14 days prior to use.

1.06 PROJECT CONDITIONS

- A. Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. The forms shall be of a depth equal to the depth of curbing or sidewalk, and so designed as to permit secure fastening together at the tops. Coat forms with non-staining type coating that will not discolor or deface surface of concrete.
- B. Concrete Materials: Comply with requirements of applicable Section 03 30 00 for concrete materials, admixtures, bonding materials, curing materials and others as required. Concrete shall have a minimum 28-day compressive strength of 4000 psi or as required by the City of Paterson.
- C. Joint Fillers: Resilient pre-molded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.
- D. Welded wire fabric as indicated on Contract Documents.

2.02 MIX DESIGN AND TESTING

- A. Concrete mix design and testing shall comply with requirements of ACI and Section 32 13 13 of these Specifications as they relate to Cast-in-Place Concrete.
- B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:
 - 1. Compressive Strength: 4,000 psi, minimum at 28 days, unless otherwise indicated on the Contract Drawings or as required by the City of Paterson.
 - 2. Slump Range: 4-inches +/- 1-inch at time of placement
 - 3. Air Entrainment: 4 to 7 percent

PART 3 EXECUTION

3.01 PREPARATION

- A. Proof-roll prepared base material surface to check for unstable areas. The curbing and light pole base work shall begin after any unsuitable areas have been corrected and are ready to receive concrete. Compaction testing for the base material shall be completed prior to the placement of the curbing and light pole bases.

- B. Surface Preparation: Remove loose material from compacted base material surface to produce a firm, smooth surface immediately before placing concrete.

3.02 INSTALLATION

A. Form Construction

1. Set forms to required grades and lines, rigidly braced and secured.
2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place a minimum of 24 hours after concrete placement.
3. Check completed formwork for grade and alignment to following tolerances:
 - Top of forms not more than 1/8-inch in 10-ft.
 - Vertical face on longitude axis, not more than 1/4-inch in 10-ft.
4. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.
5. Install 6-inch x 6-inch welded wire fabric as indicated on Contract Documents. Support wire on metal wire chairs to ensure that wire stays mid-depth of sidewalk section during concrete pour.

B. Concrete Placement

1. Comply with applicable requirements of ACI and Architectural Specifications.
2. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structures until they are at the required finish elevation and alignment.
3. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of dowels, and joint devices.
4. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 2 hours, place

construction joint. Automatic machine may be used for curb and gutter placement at Contractor's option. Machine placement must produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, replace with formed concrete as specified.

5. Concrete placement shall be conducted in accordance with related ACI recommended procedures.

C. Joint Construction

1. Transverse Expansion Joints: Transverse expansion joint in sidewalk shall have the filler cut to the exact cross section of the sidewalk. The joints shall be similar to the type of expansion joint used in the adjacent pavement. Joint spacing as specified on the plans.

- D. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 2-inches or more than 1-inch below finished surface where joint sealer is indicated. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.

- F. Joint Sealants: All joints shall be sealed with approved exterior pavement joint sealants and shall be installed per manufacturer's recommendations.

3.03 CONCRETE FINISHING

- A. After striking off and consolidating concrete, smooth surface by screening and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10-ft straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.

- B. Work back top edge of integral curb, and formed joints with an edging tool, and round to 2-inch radius. Eliminate tool marks on concrete surface. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing as follows:

1. Curbs and light pole bases: Broom Finish by drawing fine-hair broom across surface perpendicular to line of traffic. Repeat operation as necessary to produce a fine line texture.

- C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed.

- D. Protect and cure finished concrete using acceptable moist-curing methods, more particularly described in the "water-curing" section of ACI 308-81.

3.04 BACKFILL

- A. After the concrete has set sufficiently, the spaces in front and back of the curb and around light pole bases shall be refilled to the required elevation with suitable material in accordance with Section 31 20 00, which shall be compacted until firm and solid and neatly graded.

3.05 CLEANING AND ADJUSTING

- A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

END OF SECTION 32 16 13

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**SECTION 33 40 00
STORM DRAINAGE UTILITIES**

PART 1 GENERAL

1.01 SECTION INCLUDES

Work under this section shall consist of providing all labor, plant facilities, materials, tools, equipment, shop drawings and supervision necessary and required to install all of the storm drainage facilities as specified in accordance with the Contract Documents. This work shall include but not be limited to:

- A. Installation of the drainage system consisting of manholes, catch basins, pipes, and all necessary and required accessory items and operations, including connection to existing drainage facilities.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 01 11 00 – Summary of Work
- B. Section 02 01 00 – Maintenance of Existing Conditions
- C. Section 31 20 00 – Earth Moving
- D. Section 31 23 33 – Trenching and Backfill
- E. Section 31 25 00 – Erosion and Sediment Control
- F. Local governing authority and code requirements.
- G. All necessary construction permits.
- H. Contract Documents
- I. City of Camden regulatory requirements

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM) latest edition.

A706	Type 1R
C14	Concrete Sewer, Storm Drain, and Culvert Pipe.
C76	Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
C443	Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
C478	Precast Reinforced Concrete Manhole Sections.

C923	Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes.
D1557	Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
D2922	Test Methods for Density of Soil and Soil - Aggregate in Place by Nuclear Methods (Shallow Depth).
D3017	Test Methods for Moisture Content of Soil and Soil-Aggregate Mixtures.

- B. American Association of State Highway and Transportation Officials (AASHTO) - latest edition
- C. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specification for Cold Weather Masonry Construction.
- D. Manufacturers specifications for HDPE piping and Nyloplast structures.

1.04 QUALITY ASSURANCE

- A. An Engineer, selected and paid by the Owner (herein referenced to as "Owner's Engineer"), shall be retained to perform construction inspection on-site based on measurement, visual observation, and judgment.
- B. Visual field confirmation shall be performed by the Owner's Engineer as part of the construction testing requirements.
- C. All costs related to reinspection due to failures shall be paid for by the Contractor at no additional expense to Owner. The Owner reserves the right to direct any inspection that is deemed necessary. Contractor shall provide free access to site for inspection activities.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's certificate for castings, pipe and accessories to certify that products meet or exceed specified requirements.
- B. Submit shop drawings of the precast structures to the Owner's Engineer for approval prior to fabrication. Shop drawings shall include dimensions, reinforcing, joint treatment, invert elevations and invert locations.

1.06 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.

- B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.07 COORDINATION

- A. Coordinate the Work with termination of storm sewer connection outside building including connection to existing storm sewer system.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS AND ACCESSORIES

- A. Reinforced Concrete Pipe (RCP): Straight and flared end sections complying with requirements of ASTM C 76, Class III unless another class type is indicated on the Contract Documents, installed with flexible plastic (Bitumen) gaskets at all joints. Gaskets shall comply with AASHTO M-198 75I, Type B, and shall be installed in strict accordance with pipe manufacturer's recommendations.
- B. High Density Polyethylene Pipe (HDPE) for conveyance pipes
 - 1. High Density Polyethylene pipe and fittings shall have smoothed interior and corrugated annular exterior. The material of construction shall consist of closed foam cell having a minimum compressive strength of 20 psi, which will provide high stress resistance to cracks.
 - 2. The bell-and-spigot HDPE piping network shall be joined using watertight connections in accordance with the requirements of ASTM D3212. Elastomeric seals (Gaskets) made of polyisoprene and meeting the requirements of ASTM F477 shall show no visible leaks when tested under a 10 ft hydrostatic water test. Provide those by Hancor Co. or other manufacturer that can provide watertight joints.
 - 3. To prevent crumbling and provide better joint performance of the HDPE pipe, the bell and spigot ends shall be reinforced, including a bell tolerance device. The bell tolerance device must be installed by the pipe manufacturer.

2.02 CATCH BASINS, INLETS, MANHOLES AND COMPONENTS

- A. General: All manholes, catch basins and drain inlets shall be built in accordance with, and in the locations shown on the Contract Documents. All structures will require shop drawings approved by the Owner's Engineer and Town Engineer.

No concrete or masonry shall be placed when the temperature is below forty (40) degrees Fahrenheit, or when indications are for lower temperatures within twenty-four (24) hours, unless protection of concrete and masonry is approved by the

Owner's Engineer. Damage to the structure because of freezing shall be corrected by the Contractor at his own expense, to the satisfaction of the Owner's Engineer.

Manholes, catch basins and drain inlets shall be constructed as soon as the pipe laying reaches the location of the structures. Should the Contractor continue his pipe laying without making provisions for completion of the structures, the Owner's Engineer shall have the authority to stop the pipe laying operations until the structure is completed.

Any structure which is mislocated or oriented improperly shall be removed and rebuilt in its proper location, alignment and orientation at the Contractor's expense.

- B. Precast Concrete Manholes: AASHTO M199-93/ASTM C478-90b. Manhole diameter shall be selected to accommodate the inflow and outflow pipes.

Pour-in-place or Precast Reinforced Concrete Catch Basins (Control Structures): AASHTO M199-93/ASTM C478-90b rated for H20 loading, with minimum concrete strength of 3,000 psi. Inlet size shall be selected to accommodate the inflow and outflow pipes.

1. Manhole Barrel: Reinforced precast concrete in accordance with ASTM C478 with gaskets in accordance with ASTM C923.
 - a. Construct manholes of precast concrete sections as required by Contract Documents to size, shape, and depth indicated, but never less than 4-ft inside diameter.
2. Mortar and Grout: Mortar for finishing and sealing shall be Class "C". Honeycombing less than two (2) inches deep shall be repaired using Class "D" mortar.
3. Brick Transition Reinforcement: Formed steel 8-gage wire with galvanized finish.
4. Foundations: All foundations shall rest on firm soil of uniform bearing and stone subbase as shown on Contract Documents.
5. Inverts: Brick or smooth concrete invert channels shall be constructed in all manholes and in all catch basins and drain inlets which do not have sumps, to insure a smooth flow of water through the structure.

The invert channel shall be constructed to the elevations shown on the Contract Documents and/or as approved by the Owner's Engineer. Channels shall slope smoothly and evenly from the entrance pipe to the outlet pipe.

6. Frames, Cover, and Gratings: Frames, Covers and/or gratings for manholes, catch basins, and drain inlets shall be of the type and size indicated on the

Contract Documents. Frames shall be well bedded in mortar and shall be set accurately to the correct alignment and grade.

7. Ladder Rungs: Forged Aluminum to dimensions shown on Contract Documents.
8. Precast Structures: Precast structures shall be installed only after shop drawings have been approved by Owner's Engineer and shall meet the requirements of ASTM C478.

Grout around pipes which protrude through the walls of the structure and on all joints shall contain "Antihydro", or other approved additive to insure water tightness. Cement grout shall contain two parts cement to one part sand and additive in accordance with manufacturer's recommendations. Mortar shall be applied to the bottom 1/3 of the opening before the pipe is inserted.

The top grade of the precast concrete corbel section shall be set sufficiently below finished grade to permit a maximum of seven (7) and a minimum of two (2) courses of 8-inch brick to be used as risers to adjust the grade of the casting. Manhole frames shall be set on a grout pad as specified herein above.

9. Provide precast manhole shaft construction with eccentric cone top section and lipped male/female rubber gasket joints or mortar joints.
10. Brick shall be new units conforming to AASHTO Designation M-91, latest revision, Grade MS.
11. Mortar shall conform to ASTM C270, Type M.
12. Pipe joints for rigid pipes shall be made with mortar, grout, gaskets, or as recommended by the pipe manufacturer.
13. Manholes and Pipe constructed within the Right-of-Way shall be manufactured and installed in accordance with all applicable Standard Specifications and the Contract Documents.

2.03 MANUFACTURED WATER QUALITY TREATMENT DEVICES

- A. All water quality units shall be built in accordance with, and in the locations shown on the Contract Documents. All structures will require shop drawings approved by the Owner's Engineer and Town Engineer. Refer to manufacturer's specifications for installation and operation information.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Contract Documents.

3.02 PREPARATION

- A. Hand trim excavations to required elevations. Correct over excavation with fine aggregate.
- B. Remove large stones or other hard matter which could damage piping or impede consistent backfilling or compaction.
- C. 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.

3.03 GENERAL

- A. The Contractor shall install all drainage structures and pipe in the locations shown on the Contract Documents and/or as approved by the Owner's Engineer. Pipe shall be of the type and sizes specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented.
- C. Excavation and Backfill shall be in accordance with Section 31 20 00 of these specifications.
- D. Storage and Handling of Pipe - All pipe shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in the handling of the pipe. Storage of pipe on the job shall be in accordance with the pipe manufacturer's recommendations.
- E. Damage to Pipe - Pipe which is defective from any cause, including damage caused by handling, and determined by the Owner's Engineer as unrepairable, shall be unacceptable for installation and shall be replaced at no cost to the Owner as directed by the Owner's Engineer.

Pipe that is damaged or disturbed through any cause prior to acceptance of the Work, shall be repaired, realigned or replaced as directed by the Owner's Engineer, at the Contractor's expense.

3.04 BEDDING

- A. Excavate pipe trench and place bedding material in accordance with Section 31 23 33 or work of this Section.

3.05 INSTALLATION - PIPE

- A. Laying Pipe: Each length of pipe shall be laid with firm, full and even bearing throughout the entire length, in a trench prepared and maintained in accordance with Section 31 23 33 of these Specifications and Contract Documents. Pipe shall be laid upgrade unless otherwise approved by the Owner's Engineer.

Concrete pipe over 24-inches in diameter shall be laid with the lift holes on top of the pipe. After the pipe is installed, the lift holes shall be sealed with suitable concrete plugs to the satisfaction of the Owner's Representative. No lift holes will be permitted in pipes 24-inches in diameter and smaller.

Bell and spigot pipe shall be laid with the bell end upgrade. The pipe shall be joined so that there will be uniform space around the pipe. Trimming of the pipe shall not be allowed.

Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. Prior to placing a length of pipe, the end of the previously laid length shall be carefully and thoroughly wiped smooth and clean to obtain an even and close fitting joint.

No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

- B. Place pipe on minimum 6-inch thick bed of compacted bedding or as detailed on the Contract Documents.
- C. Install pipe, fittings, and accessories in accordance with ASTM C12, ASTM D2321, manufacturer's instructions and/or state or local requirements. Seal joints to be watertight.
- D. Lay pipe to slope gradients noted on Contract Documents with maximum variation from true slope of 1/8-inch in 10-ft.
- E. Place and compact bedding aggregate at sides and to the springline of the pipe as per these Specifications.
- F. Refer to the Sections 31 20 00 and 31 23 33 of these Specifications for backfill requirements. Do not displace or damage pipe when compacting.
- G. Full Lengths of Pipe: Only full lengths of pipe shall be used in the installation except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.

- H. Pipe Entrances to Structures: All pipe entering structures (e.g.: manholes, catch basins, etc.) shall be cut flush with the inside of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, ragged edges, or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation.

Only full sections of pipe shall be used where entering a structure which will be exposed to view, such as endwalls, headwalls, end sections, etc.

- I. Bedding and Backfilling: The type of materials to be used in bedding and backfilling and the method and placement shall conform to the requirements of these Specifications.
- J. Protection During Construction: The Contractor shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and or adjacent to any pipe shall be performed at the Contractor's risk.
- K. Tolerance: Pipe shall be laid accurately to the line and grade shown on the Contract Documents and/or as approved by the Owner's Engineer. Allowable tolerances shall be 1/2-inch on grade and 1-inch on line in any section of pipe between structures. Deviations from these tolerances shall be a basis for rejection of the line of pipe by the Owner's Engineer. Any line which has been rejected shall be rebuilt to correct line and grade by the Contractor at his own expense.

3.06 INSTALLATION - CATCH BASINS, MANHOLES AND CONTROL STRUCTURES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for storm sewer pipe to be placed at proper elevation.
- C. Place precast reinforced concrete sections with provision for storm sewer pipe sections at the location and elevation specified on the Contract Documents.
- D. Level top surface of each precast concrete shaft sections as assembly progresses.
- E. Establish elevations and pipe inverts for inlets and outlets as indicated.
- F. Lay brick masonry in running bond with full 3/8-inch mortar joints to receive casting assembly. Level casting frame in grout to receive grated inlet or manhole cover.

3.07 PLACING PRE-CAST MANHOLE BARREL SECTIONS

- A. Place base pad to proper elevation and location and trowel top surface level for placement of manhole barrel.
- B. Place manhole barrel plumb and level to correct elevations and anchor to base pad.

1. After completion of slab foundation the first joint of manhole barrel shall be lowered into position, grooved end first, and set level and plumb on concrete base. Align and adjust to proper grade prior to placing and forming invert which shall be poured immediately after setting of first section of manhole barrel.
2. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer recommendations. Place "Ram-nek", or equivalent, plastic rope on tongue end. Lower next section into position, and remove excess material from interior of structure. Add additional material on exterior of joint, if necessary, for completely watertight joint.

3.09 PIPE JOINTS

- A. Mortar Joints (RCP): After each length of RCP is laid, the lower portion of the bell shall be filled with mortar, and the succeeding length shall be laid in place so that the inner surfaces of the abutting lengths are flush. The remainder of the joint shall be completely filled with mortar and sufficient additional mortar used to form a bead around the joint flush with the outside diameter of the bell. The inside of the joint shall be wiped and finished smooth. Joints shall be thoroughly wet before the mortar is placed.
- B. Cold Applied Joint Sealer (RCP): Bell and spigot or tongue and groove RCP shall be wiped clean and dry before applying the sealer to the pipe joint. Before the pipes are placed in contact with each other, the spigot end or tongue end of the pipe shall be completely covered with an excess of sealer, and then the pipe shall be laid to the established line and grade so that the inside surfaces of abutting pipe are flush.

3.10 INTERFACE WITH EXISTING FACILITIES

- A. Requirements: The Contractor shall make all required connections of the proposed drainage facilities into existing drainage facilities, where and as shown on the Contract Documents and/or as approved by the Owner's Engineer.
- B. Compliance With Facility Owner Requirements: Connections made into existing drainage facilities shall be performed in accordance with the requirements of the Owner of the facility. The Contractor will be required to comply with all such requirements, including securing of all required permits, and paying the costs thereof. The cost of making the connections in accordance with the requirements of the Owner of the existing facility shall be included in the Contract Sum.

3.11 REMOVAL OF EXISTING UTILITIES

- A. The Contractor shall remove and legally dispose of off-site all abandoned utilities encountered during installation of the storm drainage facilities. In particular, all

components of the existing combined sewer shall be removed from the site and up to the nearest off-site manhole.

3.12 MODIFICATIONS OF EXISTING STRUCTURES

- A. General: The Contractor shall alter, reconstruct and/or convert existing structures where and as shown on the Contract Documents, and/or as approved by the Owner's Engineer. In general, alterations shall be performed with the same type of material used in the original construction unless otherwise indicated on the Contract Documents or approved by the Owner's Engineer.
- B. Damage to Existing Installations: The Contractor shall exercise extreme care during such alteration, reconstruction and/or conversions so as not to damage any portions of the structure and/or pipe shown to remain. Any such damage shall be repaired by the Contractor at his own expense and to the satisfaction of the Owner's Engineer and Owner of the damaged structure.

3.13 CLEANING AND REPAIR

- A. The Contractor will be required to clean the entire drainage system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and the Contractor shall furnish all necessary hose, pumps, pipe and other equipment that may be required for this purpose. No debris shall be flushed into existing storm drains or streams; all debris shall be removed from the system and disposed of in accordance with all governing agencies.
- B. After the system has been cleaned, the Contractor shall thoroughly inspect the system along with the Owner's Engineer and all repairs shown to be necessary shall be promptly made by the Contractor.
- C. All Work of cleaning and repair as specified herein shall be performed at the Contractor's expense and to the complete satisfaction of the Owner's Engineer.

3.14 FINAL INSPECTION

Upon completion of the Work and before final acceptance by the Owner, the entire drainage system shall be subject to a final inspection in the presence of the Owner's Engineer and City Engineer. The Work shall not be considered as complete until all requirements for line, grade, cleanliness, and workmanship have been completed to the satisfaction of the Owner's Engineer and a City of Camden Representative Engineer.

END OF SECTION 33 40 00

**SECTION 33 90 00
OTHER UTILITIES**

PART 1 GENERAL

1.01 SCOPE OF WORK

Work under this Section shall consist of providing all labor, plant facilities, materials and equipment necessary and required to install the electric, telephone and cable television facilities in accordance with the Contract Documents. This Work shall include but not be limited to:

- A. Installation of on-site utilities consisting of pipe, conduit and all necessary and required accessory items and operations associated with said installation.
- B. Coordinate with the utility companies regarding the installation of utilities within the right-of-way and on-site as required, including connections to existing facilities.

1.02 RELATED SECTIONS

- A. Section 01 11 00 – Summary of Work
- B. Section 31 23 33 – Trenching and Backfill
- C. Local Utility Companies and Governing Agencies
- D. Contract Documents

1.03 COORDINATION

- A. All work under this Section shall be coordinated with the electric and telephone utility company and shall comply with all requirements, details, regulations, etc. of said utility company. The Contractor shall coordinate with each utility to define where his limit of work exists before submitting a bid price for this Section.
- B. Work shall be coordinated with the electrical and/or mechanical contractors responsible for building and light standard connections.

PART 2 PRODUCTS

2.01 GENERAL

- A. When available, those materials specified by the appropriate utility company shall be used in lieu of those materials specified in this Section.

2.02 ELECTRIC, TELEPHONE AND CABLE DUCTBANK

- A. Concrete ductbank shall comply with all requirements of applicable utility companies.
- B. All conduit, fittings, joints, handholes shall comply with all requirements, regulations, specifications and recommendations of the governing utility agency and/or NJCU.

2.03 MANHOLE/PULL PITS

- A. All manholes and pull pits required by the utility company shall comply with all requirements, regulations, specifications, details, and recommendations of said utility company.

PART 3 EXECUTION

3.01 CONSTRUCTION

- A. General:

The Contractor shall install all pipe, conduit and ductbank in the locations as shown on the Drawings and/or as approved by the Owner's Engineer and utility company. Pipe and conduit shall be of the type and sizes specified and shall be laid accurately to line and grade. Any necessary structures shall be accurately located and properly oriented.

- B. Excavation and Backfill:

- 1. When available, those requirements, specifications and procedures, for excavation and backfill, specified by the appropriate utility company shall be used in lieu of these specifications. When such specifications are not available from said utility company, the requirements of this specification shall apply.
- 2. The provisions of Section 31 23 33 Trenching and Backfill shall govern Work under this Section.

- C. Storage and Handling of Conduit and Pipe:

All pipe and conduit shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in handling. Storage of pipe and conduit on the job shall be in accordance with manufacturer's recommendations, subject to the approval of the Owner's Engineer.

D. Damage to Pipe and Conduit:

Pipe or conduit which is defective from any cause, including damage caused by handling, and determined by the Owner's Engineer as unrepairable, shall be unacceptable for installation and shall be replaced at no cost to the Owner as directed by the Owner's Engineer.

Pipe or conduit that is damaged or disturbed through any cause prior to acceptance of the Work shall be repaired, realigned or replaced as directed by the Owner's Engineer, at the Contractor's expense.

E. Pipe Installation:

1. All piping and conduit shall be laid in accordance with the requirements and procedures specified by the appropriate utility company. When such requirements are not available from said utility company, the requirements of this specification shall apply.
2. Each length of pipe and conduit shall be laid with firm, full and even bearing throughout its entire length, in a trench prepared and maintained in accordance with Section 31 23 33. Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. The interior of the pipe and the jointing seal shall be free from sand, dirt and trash before installing the line. Minimum cover over the top of the pipe or conduit shall comply with the utility specifications and shall never be less than 2-ft.
3. Bedding and Backfilling: The type of materials to be used in bedding and backfilling and the method of placement shall comply with the requirements and procedures specified by the appropriate utility company. When such requirements are not available, the type of materials to be used in bedding and backfilling and the method of placement shall conform to the requirements of these specifications and as shown on the Details of the Drawings. However, only certified clean fill shall be used for backfill and bedding.
4. Protection During Construction: The Contractor shall protect the installation at all times during construction, and movement of construction equipment, vehicles and loads over and adjacent to any pipe shall be performed at the Contractor's risk.

At all times when pipe laying is not in progress, all open ends of pipes shall be closed by temporary watertight plugs. If water is in the trench when work is resumed, the plug shall not be removed until the trench has been pumped dry and all danger of water entering the pipe has passed.

F. Pipe/Conduit Joints:

1. When available, those specifications and requirements specified by the appropriate utility shall be used in lieu of these specifications. Where such specifications are not available from said utility company, the requirements of this specification shall apply.
2. All joints are to be made watertight in accordance with the requirements specified herein. Pipe shall be jointed in strict accordance with the Pipe manufacturer's instruction. Jointing of all pipe shall be done entirely in the trench. Assembly of PVC conduit shall be with a solvent type adhesive as recommended by the conduit manufacturer.

G. Manholes/Pull Pits:

Any manholes or pull pits required by the appropriate utility shall be fabricated, bedded, located and backfilled in accordance with said utility requirements and recommendations. Final location(s) shall be approved by the Owner's Engineer.

H. Connection to Existing Facilities:

1. General: The Contractor shall terminate the upstream end of the electric and telephone conduit at a location specified by the electric and telephone companies.
2. Compliance with Requirements of Owner of Facility: Connections into existing facilities shall be performed in accordance with the requirements of the owner of the facility. The Contractor shall be required to comply with all such requirements, including securing of all required permits, and paying the costs thereof. The cost of making the connections in accordance with the requirements of the Owner of the existing facility shall be included in the Contract Sum.
3. Cable pulling and connection of wire and cable to the existing facilities is not covered under this specification and will be done by others.

I. Service Lines:

1. The Contractor shall install electric/telephone conduit to points as shown on the Drawings. All pipes and conduit shall be properly sealed with watertight plugs and shall be clearly marked from above.

3.02. INSPECTION AND TESTING

- A. The Contractor shall perform all inspection and testing of these installations as required by the appropriate utility company and shall bear all costs arising therefrom.

3.03 FINAL INSPECTION

- A. Upon completion of the Work and before final acceptance by the Owner, these installations may be subjected to a final inspection in the presence of the Owner's Engineer, a City of Camden Representative Engineer or a representative of the utility company. The Work shall not be considered as completed until all requirements for line, grade, cleanliness, tests and workmanship have been met.

END OF SECTION 33 90 00

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