

TABLE OF CONTENTS

| <u>Section</u> | <u>Title</u> | <u>Pages</u> |
|-----------------------|--|---------------------|
| 02000 | Site Work..... | 1 to 2 |
| 02050 | Field Engineering..... | 1 to 3 |
| 02100 | Selective Demolition..... | 1 to 5 |
| 02110 | Site Clearing..... | 1 to 2 |
| 02200 | Earthwork..... | 1 to 8 |
| 02221 | Trenching, Backfilling and Compaction..... | 1 to 3 |
| 02400 | Hot-Mix Asphalt Paving..... | 1 to 4 |
| 02617 | Pavement Stripes and Markings..... | 1 to 2 |
| 02751 | Portland Cement Concrete & Pavement..... | 1 to 18 |
| 02760 | Site Electrical Work..... | 1 to 6 |
| 02765 | Message Sign..... | 1 to 5 |
| 02800 | Site Restoration..... | 1 to 3 |
| 02920 | Soil Preparation..... | 1 to 5 |
| 02930 | Lawns and Grasses..... | 1 to 8 |

END TABLE OF CONTENTS

SECTION 02000 – SITE WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- A. The work generally consists of:
 1. Site clearing and demolition as required for the proposed construction.
 2. Construction of new underground electrical conduits, hand holes (pull boxes), wiring and equipment as shown on the plans.
 3. Installation of a new message sign at the location shown on the plans.
 4. Other site work as indicated on the Construction Plan Set.
 5. Lawn restoration and the spreading of topsoil, seeding, & mulching as required to restore all disturbed areas to a “like new” condition.
 6. Control of access to the construction areas, and construction traffic control.
 7. Sealing of all wall penetrations to prevent water infiltration and for fire prevention.
 8. Testing of new message sign equipment and Owner training of equipment operation.
 9. Final cleanup, owner walk through and punch list.

1.3 CONTRACTOR USE OF PREMISES AND LOGISTICS

- A. Use of the Site: Limit use of the premises to work in areas indicated. Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the work is indicated (or required).
 1. The Contractor shall provide all temporary signage for traffic control, access, and safety requirements.
 2. The Contractor shall maintain site access at all times to the Owner’s facilities, including, but not limited to adjacent roads and receiving areas.
 3. Owner Occupancy: Allow for Owner occupancy and use by the public as permitted by the Owner. Coordinate with the Owner in this regard.
 4. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

1.4 CONTROL OF THE WORK AREAS

- A. The contractor is responsible for the security of all work areas and must prevent public access to work areas. Use temporary construction fence as needed to control access to work areas.
- B. Gate locations for the temporary fencing shall be coordinated with the owner. Gates may be moved throughout construction as needed by the Contractor. All associated costs shall be included in the contract. All gates shall be secured after working hours by security locks or other means acceptable to the Owner. During working hours, the work and staging areas shall remain open as little as practicable. The contractor will provide all padlocks and keys to secure all construction gates and provide copies of keys to Owner's representative and Architect.
- C. The contractor may move construction fencing as needed to provide clearance for the work, however, the site shall be secured from public trespass at all times.
- D. The Contractor shall periodically inspect the security measures to insure they function properly and that unauthorized persons, particularly children, are effectively prohibited from gaining entry or from coming into contact with hazardous site features.
- E. The Contractor shall regularly walk the perimeter of the site and inspect the condition and safety of the existing and temporary construction fence. Any sharp edges, loose parts, burrs, or other potentially harmful components shall be repaired/modified to a safe condition.

END OF SECTION 02000

SECTION 02050 – FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. General: This Section specifies administrative and procedural requirements for field-engineering services including, but not limited to, the following:
 - 1. Electrical System testing and tracing of electrical system wiring.
 - 2. Engineering support for various aspects of construction.
 - 3. Testing and troubleshooting of installed equipment.
 - 4. Perform underground utility mark out of all work areas where ground penetrations will occur.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 1 Section "Submittals" for submitting Project record surveys.
 - 3. Division 1 Section "Project Closeout" for submitting final property survey with Project Record Documents and recording of Owner-accepted deviations from indicated lines and levels.

1.3 SUBMITTALS

- A. Certificates: Submit a red-lined drawing, prepared and signed by the licensed electrician certifying the final location and depth of new wiring, handholes, switches, junction boxes, and other electrical equipment.
- B. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of "Submittals" and "Project Closeout" Sections.
- C. Furnish signed and sealed shop drawings for any site work component that requires additional engineering (i.e. message sign foundations).

1.4 QUALITY ASSURANCE

- A. Surveyor Qualifications: Engage a land surveyor, registered in the State of New Jersey, to perform required land-surveying services.
- B. Engineer Qualifications: Engage a structural engineer, licensed in the State of New Jersey, to finalize the message sign footing design and to prepare shop drawings as needed for the exposure and design wind speed at each site location. The message sign footings shown on the plans are based upon manufacturer's suggested requirements and a conservative estimate of local soil conditions.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify layout information shown on the Drawings, in relation to the survey mapping and existing benchmarks, before proceeding to lay out the Work. Preserve permanent reference points during construction.
 - 1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
 - 2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.

- B. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction.
 - 1. Prior to construction, verify the location and depth of underground conduits, sanitary sewer, storm sewer, and water-service piping in all locations where new conduits will cross or where subsurface penetrations will occur.
 - 2. Engage the services of a private underground utility mark out company to locate all buried utilities within the scope of new construction work.

3.2 PERFORMANCE

- A. Work from lines and levels established by the design drawings. Establish the location of new equipment based upon plan information. Calculate and measure required dimensions within indicated or recognized tolerances.
 - 1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
 - 2. As construction proceeds, check every major element for line, level, and plumb.

- B. Construction Log: Maintain a log of control and other field work. Make this log available for reference.
 - 1. Record deviations from required lines and levels, and advise the Owner's Representative, when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

2. On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and site work.
- C. Existing Utilities: Furnish information necessary to adjust, move, or relocate proposed conduits and pull boxes to avoid existing site improvements, utility poles, lines, services, or other appurtenances located in or affected by construction.
- D. Perform necessary voltage drop calculations based upon the ampacity and voltage of the selected equipment and the distance of the branch circuit and adjust conductor sizes to limit voltage drop to three (3) percent.
- E. All equipment shall be grounded and resistance to ground shall be tested and verified by the contractor.
- F. The Contractor shall submit a Request For Information (RFI) to the Architect, if there is any conflicting plan information or confusion over the design intent. This includes a design element that looks out of place, or a number that appears to be juxtaposed or otherwise incorrect.

END OF SECTION 02050

SECTION 02100 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Sawcutting and localized demolition and removal of selected site elements as needed to construct new work. Refer to plans for additional demolition notes and requirements.
- B. Maintain pavements and finished surfaces until demolition is necessary and construction will immediately follow. Apply temporary bituminous pavement patch as needed to reopen driveways and walkways.
- C. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 2 Section "Summary of Work" for use of the building and phasing requirements.
 - 2. Division 2 Section "Contract Closeout" for record document requirements.
 - 3. Division 2 Section "Site Clearing" for site clearing and removing above- and below-grade improvements.
 - 4. Division 2 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.
- D. The plans depict demolition requirements for conventional open trench excavation work. The contractor may employ the use of horizontal directional drilling equipment to install conduits with less site disturbance. All required pre-drilling soils investigation work and utility mark out work shall be undertaken by the contractor.

1.3 DEFINITIONS

- A. Demolish: Completely remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area. Note that the designated storage area may be in another location within the municipality.
- C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse (replace missing hardware); store and protect against damage. Reinstall items in the same locations or in locations indicated.
- D. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Owner, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.
- B. Historical items, memorials, relics, and similar objects encountered during selective demolition, remain the Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to the Owner. Reinstall object to original location and configuration as directed by the Owner.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.
- B. Proposed dust-control measures.
- C. Proposed noise-control measures.
- D. Schedule of selective demolition activities indicating the following:
 - 4. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
- E. Inventory of items to be removed and salvaged.
- F. Inventory of items to be removed by Owner.
- G. Photographs or video recordings, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.
- H. Record drawings at Project closeout according to Division 1 Section "Contract Closeout."
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Pre-Demolition Conference: Conduct conference at Project site with Owner to comply with preinstallation conference requirements of Division 1 Section "Project Meetings."

1.7 PROJECT CONDITIONS

- A. Storage or sale of removed items or materials on-site will not be permitted.

1.8 SCHEDULING

- A. Arrange selective demolition schedule so as not to interfere with Owner's on-site operations.

1.9 WARRANTY

- A. Existing Special Warranty: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS (Not Applicable)

2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Perform PRIVATE underground utility mark out and verify the location of all utilities along the entire work area.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Owner or Owners representative.
- E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- A. Maintain all remaining existing utilities, as required. Protect against damage during selective demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent properties during work. Provide temporary services during new construction work to existing utilities, as acceptable to Owner and to governing authorities.
 - 2. Utility Requirements: Confirm with local water, electric, and gas utilities, prior to the commencement of selective demolition work that all utilities have been located and marked in the field.

3.3 PREPARATION

- A. Disconnect electrical power from equipment being demolished, prior to proceeding with selective demolition operations.
- B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
 - 1. Do not close or obstruct driveways, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide detouring signs and barricades as needed to define alternate routes around closed or obstructed sidewalks and driveways as required by the Owner.
- C. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.
 - 1. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 2. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 3. Strengthen or add new supports when required during progress of selective demolition.
- D. Make every attempt to protect and save all trees and only demolish if the tree cannot be saved with reasonable assurances that it will thrive. Consult with arborist to determine the extent to which tree roots and branches may be pruned, and demolish the tree if pruning is too severe.

3.4 POLLUTION CONTROLS

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
 - 1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as electrocution, icing, flooding, and pollution.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- C. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.
- D. Maintain dust control screening around all fencing that surrounds the construction site at all times.

3.5 SELECTIVE DEMOLITION

- A. Phase the demolition of existing construction so that the site and adjacent areas are kept in a safe and uniform condition. The intent of the demolition limit is for work to be taken to the nearest control joint, but not less than the extent of demolition shown. If a control joint is not present on or beyond four (4) feet of the indicated demolition limit, then sawcut at the designated location. New work shall be constructed to the limit of demolition. Use methods required to complete Work within limitations of governing regulations.

1. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
 2. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.
- B. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saw or hand tools.
- C. The plans define demolition areas with a hatch as shown in the legend. Demolish all surfaces and structural elements within the hatched area down to subgrade. Protect city-owned improvements such as street signs, light posts, junction boxes, and traffic signal control boxes, unless noted otherwise. Protect utility-owned improvements, unless permission has been obtained to demolish same.

3.6 PATCHING AND REPAIRS

- A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.
- B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- C. Install temporary pavement patches over utility trenches and other areas where surfacing has been removed and maintain the temporary patch until permanent pavements are installed. Temporary patches will not be permitted in roadways. In roadways, construct permanent pavement repair upon completion of the related work.,

3.7 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials, not to be re-used, off of Owner's property and legally dispose of them.

3.8 SELECTIVE DEMOLITION SCHEDULE

- A. Remove and salvage the following:
1. Existing signage, as coordinated w/ owner of signage.
 2. Existing on-site pull boxes, conduits, and junction boxes.
 3. Existing fencing. Remove for work clearance and reinstall to same configuration.
 4. Memorial plaques and rocks. All existing features to be removed shall be coordinated with owner prior to removal from site. Reinstall existing memorials to original configuration.

END OF SECTION 02100

SECTION 02110 – SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Topsoil stripping.
 - 2. Removing at-grade improvements.

1.3 PROJECT CONDITIONS

- A. Traffic: Conduct site-clearing operations to ensure minimum interference with roads, streets, parking lots, walks, and other adjacent occupied or used facilities. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from Owner and without proper detouring measures (both pedestrian & traffic) in place.
- B. Protection of Existing Improvements: Provide protections necessary to prevent damage to existing improvements indicated to remain in place.
 - 1. Protect improvements on adjoining properties and on Owner's property.
 - 2. Restore damaged improvements to their original condition, as acceptable to property owners.

1.4 EXISTING SERVICES

- A. General: All existing utility services have been removed and/or capped as part of a separate contract (Demolition). Verify with local utility companies that all services have been disconnected.
- B. Verify with gas utility that the existing gas service stub (left in place during the demolition phase) is in suitable condition for the new project.

PART 2 - PRODUCTS (Not Applicable)

2.1 TEMPORARY PATCH

- A. Temporary patch shall be HMA 9.5M64 (or FABC-1 Marshall Mix) bituminous pavement, 2" thick, atop 4" DGA subbase per specification section 02400.

PART 3 - EXECUTION

3.1 SITE CLEARING

- A. General: Remove grass, improvements, or obstructions, as required, to permit installation of new construction. Remove similar items elsewhere on site or premises as specifically indicated. Removal includes digging out and off-site disposal of stumps and roots.
- B. Topsoil: Topsoil is defined as friable clay loam surface soil containing humus. Phase 2 of this project required the installation of topsoil across the entire site at a depth of not less than 4 inches (100 mm).
 - 1. Strip topsoil to whatever depths are encountered or as determined by the soils engineer in a manner to prevent intermingling with underlying subsoil or other objectionable or unsuitable material(s). Remove heavy growths of grass and vegetation from areas before stripping and dispose of grass, vegetation and root mass off site in a legal manner. Review the Landscaping Plan (and Site & Grading Plans for adjacent off-site areas) and determine the amount of topsoil needed for the completion of the project. Stockpile a sufficient quantity of screened clean topsoil in accordance with the drawings, general provisions of the contract, and the standards of Soil Erosion and Sediment Control in New Jersey, latest revision. Confirm stockpile location with the engineer and owner and insure the topsoil location does not interfere with future work.
 - a. Where existing trees are indicated to remain, leave existing topsoil in place within drip lines to prevent damage to root system.
 - 2. Stockpile topsoil in storage piles in area(s) indicated or directed. Construct storage piles to provide free drainage of surface water. Cover storage piles, if required, to prevent wind erosion.
 - a. Relocate the topsoil pile, if needed, as many times as necessary to accommodate site construction. Install soil erosion measures on and around the new pile location as per plan details and notes.
 - 3. Dispose of unsuitable or excess topsoil as specified for disposal of waste material.
- C. Removal of Improvements: Remove existing above-grade and below-grade improvements as indicated and as necessary to facilitate new construction.
 - 1. Demolish posts, site furniture, fencing and post bases and foundations in their entirety.

3.2 DISPOSAL OF WASTE MATERIALS

- A. Burning on Owner's Property: Burning is not permitted on Owner's property.
- B. Removal from Owner's Property: Contractor to remove waste materials, all excess suitable fill and topsoil from Owner's property.

END OF SECTION 02110

SECTION 02200 - EARTHWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Preparing and grading subgrades for new equipment foundations indicated on the Plan.
 - 2. Excavating and backfilling, including imported controlled compacted backfill (Satisfactory Soil Material) placed in the voids resulting from demolition work.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Division 2 Section "Site Clearing" for site stripping, grubbing, topsoil removal.
 - 2. Division 2 Section "Selective Demolition" for backfilling of voids created by demolition of site improvements.

1.3 DEFINITIONS

- A. Excavation: The removal of all material encountered to subgrade elevations and the reuse or disposal of materials removed.
- B. Subgrade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.
- C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations. All imported material shall be certified clean and shall meet the composition requirements established herein.
- D. Sub-base Course: The layer placed between the subgrade and base course in a paving system or the layer placed between the subgrade and surface of a pavement or walk.
- E. Base Course: The layer placed between the sub-base and surface pavement in a paving system.
- F. Unauthorized excavation consists of removing materials beyond indicated subgrade elevations or dimensions without direction by the Owners Representative. Unauthorized excavation, as well as remedial work directed by the Owners Representative, shall be at the Contractor's expense.
- G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- H. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

- I. NJDOTSS: The New Jersey Department of Transportation Standard Specifications for Highway and Bridge Construction, latest edition and addenda.
- J. Site Improvement: Any man-made structure, wall, foundation, pavement, material, system, component, utility pipe or conduit, or topographic condition that is not naturally in existence on or under the earth.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for the following:
 - 1. Filter fabric.
- C. Samples of the following:
 - 1. 5 lb samples, sealed in air-tight containers, of each proposed fill and backfill soil material from on-site or borrow sources.
 - 2. 12 x 12 inch (300 x 300 mm) sample of filter fabric.
- D. Test Reports: In addition to test reports required under field quality control, submit the following:
 - 1. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrow sources. All soil shall meet the New Jersey Department of Environmental Protection, Residential Clean Fill Standards and all imported material shall be certified as such. A minimum of one soil test for every 250 cubic yards of imported material shall be performed. Virgin quarry processed material does not require testing.
 - 2. One optimum moisture-maximum density curve for each soil material encountered or used in the project.
 - 3. Report of actual unconfined compressive strength and/or results of bearing tests of each stratum tested.

1.5 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.
- B. Testing and Inspection Services:
 - 1. The contractor shall employ a qualified licensed independent geotechnical engineering & testing agency to classify proposed on-site and borrow soils related to equipment foundations as needed to verify that soils comply with specified requirements and to perform required field and laboratory testing.
 - 2. All equipment foundations that are subject to NJ UCC permit review shall be inspected by the local construction official.
- C. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

1. Before commencing earthwork, meet with representatives of the Owner, Architect, Engineer, consultants, Geotechnical Engineer, independent testing agency, and other concerned entities, as required. Review earthwork procedures and responsibilities including testing and inspection procedures and requirements. Notify participants at least 3 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.
2. The contractor will be expected to grade the site to restore all surfaces to original condition and to ensure that soil meets all adjacent surfaces around the limit of demolition work flush.

1.6 PROJECT CONDITIONS

- A. Soil conditions at the project site are unknown, but excavation may be considered earth. Soils are generally sandy and silty sands. Shallow ground water shall be anticipated and all excavations shall be continually de-watered.
- B. Neither the plans, nor the specifications imply that cut and fill are balanced on the project site. The contractor shall be responsible for determining the required quantities of imported soil and granular materials needed in the project and the amount of exported material that shall be disposed of offsite.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS & AGGREGATE

- A. General: On site soils must undergo moisture control to achieve maximum compaction. The contractor shall aerate soils and add moisture if needed to achieve maximum compaction.
- B. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of: rock or gravel, larger than 2 inches (50 mm) in any dimension; debris; waste; frozen materials; vegetation; other deleterious matter.
- C. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
- D. On-site Soil Fill may be used as Backfill and Fill Materials beneath pavements, walkways and other site improvements, provided that it is prepared to be free of deleterious materials, shall not have any particle size larger than two (2) inches, and shall be at or within 3% of optimum moisture content to permit maximum densification. These soils must be moisture controlled and are difficult to dry if they become too wet. If they become too wet, then they must be aerated to restore their properties, or they must be replaced with imported Satisfactory Soil Material at the Contractor's expense.
- E. Subbase and Base Material: Dense Graded Aggregate (DGA) conforming to NJDOTSS Section 301.
- F. Engineered or Select Fill: Soil Aggregate Designation I -15, per NJDOTSS, latest edition.
- G. Bedding Material: Sub-base or base materials with 100 percent passing a 1 inch (25 mm) sieve and not more than 8 percent passing a No. 200 (75 micrometer) sieve.

- H. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate grading size 57, with 100 percent passing a 1-1/2 inch (38 mm) sieve and not more than 5 percent passing a No. 8 (2.36 mm) sieve.
- I. Filtering Material: Evenly graded mixture of natural or crushed gravel or crushed stone and natural sand, with 100 percent passing a 1-1/2 inch (38 mm) sieve and 0 to 5 percent passing a No. 50 (300 micrometer) sieve.
- J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility.
- B. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick minimum, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep.
 - 1. Tape Colors: Provide tape colors to utilities as follows:
 - a. Red: Electric.
 - b. Yellow: Gas, oil, steam, and dangerous materials.
 - c. Orange: Telephone and other communications.
 - d. Blue: Water systems.
 - e. Green: Sewer systems.
- C. Filter Fabric: Manufacturer's standard nonwoven pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.
 - 1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D 4759 and the referenced standard test method in parentheses:
 - a. Grab Tensile Strength (ASTM D 4632): 100 lb (45 kg).
 - b. Apparent Opening Size (ASTM D 4751): #100 U.S. Standard (150 micrometer) sieve.
 - c. Permeability (ASTM D 4491): 150 gallons per minute per sq. ft. (102 L/s per sq. m).

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

- D. Tree protection is specified in the Division 2 Section "Site Clearing."
- E. Strip Topsoil from work area. Only strip top soil from areas where work will immediately be performed. Maintain existing vegetated areas as long as possible throughout construction to control erosion. Phase the stripping of topsoil and vegetation accordingly.

3.2 DEWATERING

- A. Prevent surface water and subsurface or ground water from entering excavations, from ponding on prepared subgrades, and from flooding the building excavation, the project site, and surrounding areas. Install de-watering pumps, piping and siltation filters (at discharge piping) as needed to keep excavations and soils dry and to prevent sediment from washing onto downstream properties and roadways.
 - 1. De-watering pits and pumps shall (MUST) be installed in any excavation where surface water cannot freely drain away by gravity, unimpeded.
 - 2. Install sedimentation control fencing downstream of all de-watering measures.
 - 3. Install a siltation filter bag at the downstream end of discharge piping from de-watering equipment.
- B. Protect subgrade soils from softening and damage by rain or water accumulation.

3.3 EXCAVATION

- A. Earth Excavation: All excavation is classified as "earth" and includes excavation to required subgrade elevation as needed to construct the new site improvements, regardless of the character of materials and obstructions encountered.
- B. Strip topsoil layer and save for re-use in the project.
- C. When directed by the Geotechnical Engineer, or the Owners representatives, remove and dispose of unsuitable material encountered in excavations for structures, pipes, utilities, etc.

3.4 STABILITY OF EXCAVATIONS

- A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations. Adhere to CFR 029 for OSHA safety requirements. Shore and brace excavations as needed and terrace/slope side walls in accordance with OSHA regulations.

3.5 GENERAL EXCAVATION

- A. Excavate only to the minimum extent needed to construct each site improvement, including subbase materials. All excavation shall be performed under the direct observation of the geotechnical engineer. Over excavation will not be permitted and no additional payment will be made for said work.

3.6 APPROVAL OF SUBGRADE

- A. The contractor's Geotechnical Engineer shall inspect and certify the subgrade soil beneath equipment foundations.

- B. When the Geotechnical Engineer determines that unforeseen unsatisfactory soil is present, beneath equipment foundation systems, take the following action:
 - 1. Include in the project up to 12" of additional excavation below and horizontally from the limits of the foundation. Backfill with #57 aggregate or 3/4" clean stone material as directed to establish the bottom of footing elevation. Additional excavation beyond the 12 inches noted above shall be considered additional work.
- C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Geotechnical Engineer and/or Owners' Representative at no additional cost.

3.7 UNAUTHORIZED EXCAVATION

- A. All excavation shall be performed under the presence of the Geotechnical Engineer and shall extend only to the limits needed to properly construct each site improvement so that it is bearing on suitable subgrade. Any excavation beyond suitable subgrade that has not been authorized by the Geotechnical Engineer shall be considered unauthorized.

3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile excavated materials acceptable for backfill in designated area, including suitable borrow materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent wind-blown dust. Place siltation control fencing around the downslope side of all piles.
 - 1. Stockpile soil materials away from edge of excavations.

3.9 FILL AND BACKFILL

- A. Backfill excavations promptly, but not before completing the following:
 - 1. Testing and compaction of existing subgrade.
 - 2. Acceptance of subgrade by the Geotechnical Engineer.
 - 3. Measurement and locations of underground utilities, unusual geological formations, or other features to remain, for record documents.
 - 4. Testing, inspecting, and approval of underground utilities.
 - 2. Removal of trash and debris from excavation.
 - 3. Removal of temporary shoring and bracing, and sheeting.
 - 4. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Backfill all voids from demolition work and utility trenching with suitable on-site soil material or satisfactory soil material compacted in maximum 10 inch lifts, to minimum 95% maximum density per ASTM D-1557, under the direct supervision of the Geotechnical Engineer. Bring compacted backfill material to required subgrade elevation, accounting for the thickness of subbase materials, as required.

3.60 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content per ASTM D-1557.
 - 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to 95% maximum density per ASTM D-1557.
 - a. Stockpile or spread and dry removed wet satisfactory soil material.
3. Include in project schedule, sufficient time for moisture control measures to restore soil stability due to unforeseen prolonged periods of inclement or unseasonable weather.

3.71 COMPACTION

- A. Place trench and foundation backfill materials in layers not more than 10 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- B. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D 1557:
 1. Compact the top 12 inches (300 mm) below subgrade and each 8 inch thick layer of backfill or fill material at 95 percent maximum dry density.
- C. Compact subgrade soils below equipment foundations. Compaction shall be tested by a geotechnical engineer and certified materials testing & inspection company. All inspection and testing reports shall be furnished to the Architect on a weekly basis.

3.12 GRADING

- A. General: Strip topsoil from work areas, exposing subgrade soils only when absolutely necessary. Uniformly grade areas to a smooth surface, to restore original grade and to maintain positive overland drainage, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated. Employ interim grading measures as needed to maintain the site in good condition.
 1. Provide a smooth transition between existing adjacent grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish grades to required elevations within the following tolerances:
 1. All areas: Plus or minus ½ inch (13 mm).

3.13 FIELD QUALITY CONTROL

- A. Testing Agency Services: All soil inspection and compaction testing shall be under the supervision of a licensed geotechnical engineer. Allow testing agency to inspect and test each subgrade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
 1. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.
 - a. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.

- b. When field in-place density tests are performed using nuclear methods, make calibration checks of both density and moisture gages at beginning of work, on each different type of material encountered, and at intervals as directed by the Engineer.
 2. At subgrade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2000 sq. ft. (186 sq. m) or less of area, but in no case fewer than three tests.
 3. Trench Backfill: In each compacted initial and final backfill layer, perform at least one field in-place density test for each 150 feet (45 m) or less of trench, but no fewer than two tests.
- B. When testing agency reports that subgrades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained. Continue this process until specified compaction is achieved. The contractor may elect to excavate and replace the soil material with imported Satisfactory Soil Material and re-compact same to achieve required density, however, this work shall be treated as unauthorized excavation and no additional payment will be made.

3.14 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, standing water, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or loose compaction due to subsequent construction operations or weather conditions.
 1. Scarify or remove and replace material to depth directed by the Owners Representative; reshape and recompact at optimum moisture content to the required density under the supervision of the Geotechnical Engineer.
- C. Settling: Where settling occurs during the maintenance period, remove finished surfacing, test compaction levels, backfill with additional approved material, compact, test compaction levels, and reconstruct surfacing.
 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.
- D. Provide de-watering measures at all times. The on-site soils must not be allowed to become too wet.

3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove waste material, including excess unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property. There shall be no excess material, as the site shall be graded uniformly to restore original conditions and all surfaces shall meet existing grades.
- B. There shall be no excess soil material stockpiled on the project site at the end of this work.

END OF SECTION 02200

SECTION 02221 - TRENCHING, BACKFILLING AND COMPACTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Excavating and backfilling trenches for electrical utilities.

1.3 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.
- B. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- C. Excavation: Removal of material encountered above subgrade elevations.
- D. Utilities: include underground conduits, pull boxes, electrical equipment, and wiring.

1.4 SUBMITTALS

- A. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Certification that all imported materials are “clean” per NJ DEP Residential Clean Fill Standards.

1.5 QUALITY ASSURANCE

- A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 to conduct soil materials and testing, as documented according to ASTM D 3740 and ASTM E 548, shall certify the compaction of all utility trenches. Refer to section 02050.

1.6 PROJECT CONDITIONS

- A. Existing Utilities: Engage the services of a private underground utility mark out company to locate all utilities within the entire limit of work. Do not interrupt existing public utilities.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory Soil Fill materials are not available from excavations.
- B. On-site soils are suitable for re-use as compacted backfill in trenches (as allowed by construction details) provided that they are prepared and moisture-controlled.

PART 3 - EXECUTION

3.1 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 24 inches higher than top of pipe or conduit, unless otherwise indicated. Provide trench shoring or slope the sidewalls of trenches in accordance with OSHA requirements, Code of Federal Regulations 029.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade. No trench bottom shall be over excavated. If over excavation occurs, the over excavated area shall be filled and compacted as directed by the Engineer or filled with crushed stone to the correct elevation.
- D. Compact trench bottoms and test prior to placing backfill materials.

3.2 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials as directed by the Engineer. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water.

3.3 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 - 2. Measure locations of underground utilities for record documents.
 - 3. Inspecting and testing underground utilities.

3.4 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. Place and compact initial backfill of subbase material, free of particles larger than 3/4 inch to a height of 12 inches over the utility pipe or conduit.
 - 1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit.
- C. Backfill the remainder of the trench with on-site material to within 5 inches of final grade, to leave room for topsoil.
- D. Coordinate backfilling with utilities testing.
- E. Fill voids with approved backfill materials while shoring and bracing, and as sheeting is removed.
- F. Install warning tape directly above utilities, as noted on plan details.

3.5 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than 10 inches in loose depth for material compacted by heavy compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 1557:
 - 1. Under pavements, scarify and re-compact top 6 inches of existing subgrade and compact each layer of backfill or fill material at 95 percent.
 - 2. Under lawn or unpaved areas, scarify and re-compact top 6 inches below subgrade and compact each layer of backfill or fill material at 90 percent.

END OF SECTION 02221

SECTION 02400 - HOT-MIX ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Hot-mix asphalt (HMA) paving (top and base courses) conforming to the New Jersey Department of Transportation Standard Specifications (NJDOTSS) for the construction of "Superpave" bituminous (HMA) concrete pavements as shown on the drawings.
 - 2. Restoration of pavements due to installation of utilities, or other underground structures, or due to excavation for other work adjacent to pavements.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for aggregate subbase and base courses.

1.3 SYSTEM DESCRIPTION

- A. Provide hot-mix asphalt pavement according to the materials, workmanship, and other applicable requirements of the standard specifications of the state or of authorities having jurisdiction.
 - 1. Standard Specification: NJDOT Standard Specifications for Road and Bridge Construction (NJDOTSS), latest edition, with amendments.

1.4 SUBMITTALS

- A. Product Data: For each product specified. Include technical data and tested physical and performance properties.
- B. Job-Mix Designs: Certification, by processing plant, of NJ DOT approval of each job mix proposed for the Work.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed hot-mix asphalt paving similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Manufacturer Qualifications: Obtain materials from a NJ DOT certified hot mix asphalt batch plant, with a record of successful in-service performance.

- C. Regulatory Requirements: Conform to applicable standards of authorities having jurisdiction for asphalt paving work on public property.
- D. Pre-installation Conference: Conduct conference at Project site with Geotechnical Engineer and Testing Company to comply with requirements of Division 1 Section "Project Meetings" Review methods and procedures related to asphalt paving including, but not limited to, the following:
 - 1. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
 - 2. Review condition of substrate and preparatory work performed on the subgrade.
 - 3. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
 - 4. Review and finalize construction schedule for paving and related work. Verify availability of materials, paving Installer's personnel, and equipment required to execute the Work without delays.
 - 5. Review inspection and testing requirements, governing regulations, and proposed installation procedures.
 - 6. Review forecasted weather conditions and procedures for coping with unfavorable conditions.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Conform to applicable NJDOTSS requirements.

1.7 PROJECT CONDITIONS

- A. Pavements, weather limitations and laydown conditions: Conform to NJDOTSS, including requirements for prime and tack coats, which also shall be included in the overall contract.

PART 2 - PRODUCTS

2.1 PAVEMENTS AND BASE COURSES

- A. General: Use materials, gradations, and product formulations conforming to the NJDOTSS.
- B. Bituminous Stabilized Base Course: NJDOTSS Division 400. Mix shall be HMA 19M64.
- C. Bituminous Concrete Surface Course (i.e. pavement top course or layers): NJDOTSS Division 400. Mix shall be HMA 9.5M64.
- D. Prime Coat: NJDOTSS Section 401.03.02
- E. Tack Coat: NJDOTSS Section 401.03.02
- F. Water: Potable.

2.2 AUXILIARY MATERIALS

- A. Herbicide: Commercial chemical for weed control, registered by Environmental Protection Agency (EPA). Provide granular, liquid, or wettable powder form.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that subgrade is dry and in suitable condition to support paving and imposed loads.
- B. Proof-roll subbase using heavy, pneumatic-tired rollers to locate areas that are unstable or that require further compaction.
- C. Notify Owner, in writing, of any unsatisfactory conditions. Do not begin paving installation until these conditions have been satisfactorily corrected.

3.2 PATCHING AND REPAIRS

- A. Patching: Saw cut perimeter of patch and excavate existing pavement section to sound base. Recompact new subgrade. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically.
 - 1. Tack coat faces of excavation and allow to cure before paving.
 - 2. Partially fill excavation with dense-graded, hot-mix asphalt base mix and compact while still hot. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.
 - 3. Thickness shall conform to existing pavement thicknesses, however, in no case shall the total thickness of bituminous pavement for patching or restoration be less than five (5) inches.
- B. Temporary pavement patching is permitted in on-site driveways and parking lots, until such time and permanent pavement is installed. Temporary patching shall be continuously maintained to a safe and uniform condition. Temporary patching shall be a minimum of 1.5 inches thick and shall be constructed flush with adjacent surfaces, with no lips or irregularities in the paving surface. Temporary patching may consist of either Superpave HMA 9.5M64 or Marshall Mix FABC-1 surface course.

3.3 SURFACE PREPARATION

- A. General: Conform to NJDOTSS Divisions 300 and 400 as applicable, including all referenced sections.

3.4 HOT-MIX ASPHALT INSTALLATION

- A. Transportation and delivery, spreading and finishing, and compaction of the material shall conform to NJDOTSS Division 400 and related sections.

3.5 THICKNESS REQUIREMENTS AND FINISH SURFACE REQUIREMENTS

- A. Thickness: Conform to NJDOTSS Division 400.
- B. Surface Smoothness: Conform to NJDOTSS Division 400.

3.6 FIELD QUALITY CONTROL

- A. Asphalt surfaces shall be installed flush with adjacent pavement.
- B. Contractor shall measure and photographically document the thickness of all materials that are constructed. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with specified requirements.
- C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.
- D. In-Place Density: Perform in-place nuclear density testing of compacted pavement by testing agency according to NJDOTSS and tested for compliance.
- E. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

END OF SECTION 02400

SECTION 02617 – PAVEMENT STRIPES AND MARKINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. This work consists of applying white, blue or yellow traffic and pavement thermoplastic markings, in kind, to replace marking that are disturbed by work in this contract.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 1 Section "Summary of Work" for use of the building and phasing requirements.
 - 2. Division 1 Section "Contract Closeout" for record document requirements.

1.3 MATERIALS

- A. Materials for Pavement Stripes or Markings shall conform to NJDOTSS Section 610. Materials for Thermoplastic Traffic markings shall conform to NJDOTSS Section 610.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections, for information only, unless otherwise indicated.

1.5 QUALITY ASSURANCE

- A. Contractor Qualifications: Engage an experienced firm that has successfully completed Work similar to that indicated for this Project.

PART 2 - PRODUCTS (Not Applicable)

2.1 THERMOPLASTIC MARKINGS

- A. Thermoplastic markings shall conform to NJ DOT specifications, parts 610.03 et seq. and 912.03 et seq.

2.2 PAVEMENT PAINT

- A. Pavement paint shall be exterior grade in conformance to Federal standards, TTP-115B and TTP1952E.

PART 3 - EXECUTION

3.1 CONSTRUCTION

- A. Surface preparation shall conform to NJDOTSS Section 610. All dirt, oil, grease and other foreign material shall be removed from the areas upon which the pavement marking or striping is to be placed.
- B. Thermoplastic Pavement markings shall be applied in accordance with NJDOTSS Section 610 et. seq.
- C. Thermoplastic Pavement markings and striping shall be completed and the material shall be thoroughly set before opening to traffic. Opening road to traffic shall be in accordance with NJDOTSS Section 610.
- D. Should the contractor need to remove any existing striping or markings, in pavement areas that are to be preserved, this work shall be done in accordance with NJDOTSS Section 610.
- E. All markings, and traffic control lettering shall conform with the Manual of Uniform Traffic Control Devices, latest edition.

END OF SECTION 02617

SECTION 02751 – PORTLAND CEMENT CONCRETE & PAVEMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes exterior cement concrete pavement for the following:
 - 1. Driveways & aprons.
 - 2. Walkway and pads.
 - 3. Sitework related foundations.
- B. Related Sections include the following:
 - 1. Division 2 Section "Earthwork" for subgrade preparation, grading, and subbase course.

1.3 REFERENCES

- A. "Manual of Standard Practice" of the Concrete Reinforcing Steel Institute.
- B. ACI 318-83 - Building Code Requirements for Reinforced Concrete.
- C. ACI 302 - Guide for Concrete Floor and Slab Construction.
- D. ACI 305R-77 (R1982) - Hot Weather Concreting.
- E. ACI 306R-78 - Cold Weather Concreting.
- F. ASTM A-185-90a - Steel Welded Wire Fabric, Plain, For Concrete Reinforcement.
- G. ASTM A-615-90 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- H. ASTM C-31-90 - Making and Curing Concrete Test Specimens in the Field.
- I. ASTM C-33-90 - Concrete Aggregates.
- J. ASTM C-94-90 - Ready-Mixed Concrete.
- K. ASTM C-143-90 - Slump of Portland Cement Concrete.
- L. ASTM C-150-89 - Portland Cement.

- M. ASTM C-172-90 - Sampling Freshly Mixed Concrete.
- N. ASTM C-173-78 - Air Content of Freshly Mixed Concrete by the Volumetric Method.
- O. ASTM C-231-89 - Air Content of Freshly Mixed Concrete by the Pressure Method.
- P. ASTM C-260-86 - Air-Entraining Admixtures for Concrete.
- Q. ASTM C-309-89 - Liquid Membrane-Forming Compounds for Curing Concrete.
- R. ASTM C-494-86 - Chemical Admixtures for Concrete.
- S. ASTM D-994-71 - Performed Expansion Joint Filler for Concrete (Bituminous Type).
- T. MCTCB - Maine Concrete Testing Certification Board.

1.4 SUBMITTALS

- A. Product Data: For each type of manufactured material and product indicated.
- B. Design Mixes: For each concrete pavement mix. Include alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated, based on comprehensive testing of current materials.
- D. Material certificates in lieu of material laboratory test reports when permitted by Engineer. Material certificates shall be signed by manufacturer and Contractor certifying that each material item complies with or exceeds requirements. Provide certification from admixture manufacturers that chloride content complies with requirements.
- E. Submit Shop Drawings showing control joint layout for slabs.
- F. Submit a copy of current MCTCB certification card belonging to the preparer of on-site concrete samples.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed pavement work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: Manufacturer of ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
 - 1. Manufacturer must be certified according to the National Ready Mix Concrete Association's Plant Certification Program.
- C. Testing Agency Qualifications: All concrete construction shall be inspected and tested in accordance with specification Section 02050.

- D. Source Limitations: Obtain each type or class of cement material of the same brand from the same manufacturer's plant and each aggregate from one source.
- E. ACI Publications: Comply with ACI 301, "Specification for Structural Concrete for Buildings"; ACI 318, "Building Code Requirements for Reinforced Concrete"; and Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice".
- F. Minimum Field Testing Requirements: Field testing of concrete mixes shall be in accordance with Section 903.03.05 of the NJ DOTSS.

1.6 PROJECT CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

PART 2 - PRODUCTS

2.1 FORMS

- A. Form materials shall conform to NJDOTSS Section 405.
- B. Form materials shall consist of plywood, metal, metal-framed plywood, steel, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces. Materials shall resist movement during concrete placement and to retain horizontal straight forms, free of distortion and defects. Use flexible or curved forms for curves of radius of 100 feet or less.
- C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- A. Plain-Steel Welded Wire Fabric: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.
- C. Reinforcement Bars: ASTM A 615/A 615M, Grade 60, deformed.
- D. Epoxy-Coated Reinforcement Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, deformed bars.
- E. Steel Bar Mats: ASTM A 184/A 184M; with ASTM A 615/A 615M, Grade 60, deformed bars; assembled with clips.
- F. Plain Steel Wire: ASTM A 82, as drawn.
- G. Epoxy-Coated Wire: ASTM A 884/A 884M, Class A coated, plain steel.

- H. Plastic-surfaced or reinforced-paper-covered dowels are available from proprietary sources.
- I. Joint Dowel Bars: Plain steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.
- J. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain steel bars.
- K. Tie Bars: ASTM A 615/A 615M, Grade 60, deformed.
- L. Select paragraph above or below. Tie bars above or hook bolts below may be used for connection between new and existing pavement and between pavement and gutters.
- M. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against pavement form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
- N. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement bars, welded wire fabric, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer coated wire bar supports.

2.3 CONCRETE MATERIALS

- A. General: Use the same brand and type of cementitious material from the same manufacturer throughout the Project.
- B. Portland Cement: ASTM C 150, Type I or II.
 - 1. Fly Ash: ASTM C 618, Class F or C.
- C. Aggregate: ASTM C 33, uniformly graded, from a single source, with coarse aggregate as follows:
 - 1. Class: 4S.
 - 2. Maximum Aggregate Size: 3/4 inches nominal.
 - 3. Do not use fine or coarse aggregates containing substances that cause spalling.
- D. Water: Potable.
- E. Concrete curb and gutters shall conform to NJDOTSS Section 605.02, except that the minimum 28 day compressive strength shall be 4000 psi.
- F. Concrete sidewalks, aprons, ramps, pads, and other miscellaneous flatwork shall conform to NJDOTSS Section 607.02, except that the minimum 28 day compressive strength shall be 4000 psi.

2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures. Air-entrained concrete shall be used where concrete is exposed to the weather.
- B. Air-Entraining Admixture: ASTM C 260.
- C. Water Reducing Admixture: "Eucon 75" by The Euclid Chemical Company, Polyheed Non-Chloride by Master Builders, WRDA with Hycol by Grace Construction Products, or Platocrete 160" by Sika Chemical Corporation or approved equal. The admixture shall conform to ASTM C-494, Type A, and not contain more chloride ions than are present in municipal drinking water.
- D. Non-Corrosive, Non-Chloride Accelerator: "Accelguard80" by The Euclid Chemical Co., or approved equal. The admixture shall conform to ASTM C-494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (or at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures.
 - 1. Subject to compliance with requirements of the Contract Documents, manufacturers offering products which may be incorporated in work include the following:
 - a. Accelguard80" by The Euclid Chemical Co.
 - b. "Plastocrete 161FL", by Sika
 - c. or approved equal.
- E. Air Entraining Admixture: Conform to ASTM C-260, "Darex AEA" as manufactured by The Construction Products Division of W.R. Grace & Company, or approved equal.
 - 1. Subject to compliance with requirements of the Contract Documents, manufacturers offering products which may be incorporated in work include the following:
 - a. "Darex AEA" by WR Grace Co.
 - b. "Eucon Air Mix 250", by Euclid
 - c. or approved equal.
- F. Prohibited Admixture: Calcium chloride, thiocyanates or admixture containing more than 0.05% chloride ions are not permitted.
- G. Certification: Written conformance to the above mentioned requirements and the chloride ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the Architect.
- H. Curing Paper: Water, reinforced appear; "Orange Label Sisalkraft," as manufactured by the American Sisalkraft Corporation, "Scuf-Champ,:" as manufactured by Ludlow Papers, "Flor-Cur W/S," as manufactured by Glas-Kraft, or approved equal.
- I. Moisture Barrier: "J" Pro Vapor Shield, Super Sampson SS4 or Tu Tuff 4, or approved equal.
- J. Color Hardener: L.M. Scofield Co., or approved equal, Lithochrome color hardener. Hardener shall match City of Garfield, NJ existing applied standard.

1. Subject to compliance with requirements of the Contract Documents, manufacturers offering products which may be incorporated in work include the following:
 - a. "Lithochrome", by L.M. Scofield
 - b. "Color Hardener" by Brick form
 - c. or approved equal.
- K. Concrete Colorant: L.M. Scofield Co., or approved equal, Chromix admixture color shall match City of Garfield, NJ existing applied standard.
 1. Subject to compliance with requirements of the Contract Documents, manufacturers offering products which may be incorporated in work include the following:
 - a. "Chromix", by L.M. Scofield
 - b. "Davis Colors" by Huntsman Co.
 - c. or approved equal.
- L. Release Agent: L.M. Scofield Company Lithochrome antiqing release. Color shall match City of Garfield, NJ existing applied standard.
 1. Subject to compliance with requirements of the Contract Documents, manufacturers offering products which may be incorporated in work include the following:
 - a. "Lithochrome Antiquing Release", by L.M. Scofield
 - b. "Antique Release" by Brick Form Co.
 - c. or approved equal.
- M. Concrete Slab Sealer: Prosoco Inc., SLX 100 penetrating sealer, or approved equal.
 1. Subject to compliance with requirements of the Contract Documents, manufacturers offering products which may be incorporated in work include the following:
 - a. "SLX 100" by Prosoco, Inc.
 - b. "Chemstop WB" by Euclid Co.
 - c. or approved equal.
- N. Texture Mat: Shall match City of Garfield, NJ existing applied standard.
- O. Truncated Dome Stamp: Match existing.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Evaporation retarder below temporarily reduces moisture loss from concrete surfaces awaiting finishing in hot, dry, and windy conditions. Evaporation retarders are neither curing compounds nor chemical surface retarders used to delay concrete setting.

- E. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- F. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- G. Clear Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- H. White Waterborne Membrane-Forming Curing Compound: ASTM C 309, Type 2, Class B.
- I. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- J. Products: Subject to compliance with requirements, provide one of the following or approved equal:
 - 1. Evaporation Retarder:
 - a. Cimfilm; Axim Concrete Technologies.
 - b. Finishing Aid Concentrate; Burke Group, LLC (The).
 - c. Spray-Film; ChemMasters.
 - d. Aquafilm; Conspec Marketing & Manufacturing Co., Inc.
 - e. Sure Film; Dayton Superior Corporation.
 - f. Eucobar; Euclid Chemical Co.
 - g. Vapor Aid; Kaufman Products, Inc.
 - h. Lambco Skin; Lambert Corporation.
 - i. E-Con; L&M Construction Chemicals, Inc.
 - j. Confilm; Master Builders, Inc.
 - k. Waterhold; Metalcrete Industries.
 - l. Rich Film; Richmond Screw Anchor Co.
 - m. SikaFilm; Sika Corporation.
 - n. Finishing Aid; Symons Corporation.
 - o. Certi-Vex EnvioAssist; Vexcon Chemicals, Inc.
 - p. or approved equal
 - 2. Clear Solvent-Borne Liquid-Membrane-Forming Curing Compound:
 - a. AH Curing Compound #2 DR; Anti-Hydro International, Inc.
 - b. Res-X Cure All Resin; Burke Group, LLC (The).
 - c. RX Cure; Conspec Marketing & Manufacturing Co., Inc.
 - d. Day-Chem Rez Cure; Dayton Superior Corporation.
 - e. Kurez DR; Euclid Chemical Co.
 - f. Nitocure S; Fosroc.
 - g. #64 Resin Cure; Lambert Corporation.
 - h. L&M Cure DR; L&M Construction Chemicals, Inc.
 - i. 3100-Clear; W. R. Meadows, Inc.
 - j. Seal N Kure FDR; Metalcrete Industries.
 - k. Rich Cure; Richmond Screw Anchor Co.
 - l. Resi-Chem C309; Symons Corporation.
 - m. Horncure 30; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
 - n. Uni Res 150; Unitex.
 - o. Certi-Vex RC; Vexcon Chemicals, Inc.
 - p. or approved equal
 - 3. Clear Waterborne Membrane-Forming Curing Compound:
 - a. AH Curing Compound #2 DR WB; Anti-Hydro International, Inc.
 - b. Aqua Resin Cure; Burke Group, LLC (The).

- c. Safe-Cure Clear; ChemMasters.
 - d. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
 - e. Day Chem Rez Cure (J-11-W); Dayton Superior Corporation.
 - f. Nitocure S; Fosroc.
 - g. Aqua Kure-Clear; Lambert Corporation.
 - h. L&M Cure R; L&M Construction Chemicals, Inc.
 - i. 1100 Clear; W. R. Meadows, Inc.
 - j. Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
 - k. Rich Cure E; Richmond Screw Anchor Co.
 - l. Resi-Chem Clear Cure; Symons Corporation.
 - m. Horncure 100; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
 - n. Hydro Cure; Unitex.
 - o. Certi-Vex Enviocure; Vexcon Chemicals, Inc.
 - p. or approved equal.
4. White Waterborne Membrane-Forming Curing Compound:
- a. AH Curing Compound #2 WB WP; Anti-Hydro International, Inc.
 - b. Aqua Resin Cure; Burke Group, LLC (The).
 - c. W.B. Resin Cure; Conspec Marketing & Manufacturing Co., Inc.
 - d. Thinfilm 450; Kaufman Products, Inc.
 - e. Aqua Kure-White; Lambert Corporation.
 - f. L&M Cure R-2; L&M Construction Chemicals, Inc.
 - g. 1200-White; W. R. Meadows, Inc.
 - h. White Pigmented Resin Cure E; Nox-Crete Products Group, Kinsman Corporation.
 - i. Rich Cure White E; Richmond Screw Anchor Co.
 - j. Resi-Chem High Cure; Symons Corporation.
 - k. Horncure 200-W; Tamms Industries Co., Div. of LaPorte Construction Chemicals North America, Inc.
 - l. Hydro White 309; Unitex.
 - m. or approved equal.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Coloring Agent: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.
 - 1. Color: As indicated by manufacturer's designation.
 - 2. Color: Match Architect's sample.
 - 3. Color: As selected by Architect from manufacturer's full range.
- C. Pavement-Marking Paint: Alkyd-resin type; ready mixed; complying with FS TT-P-115, Type I, or AASHTO M 248, Type N. Color: white, yellow or blue.
- D. Glass Beads: AASHTO M 247.
- E. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery with emery aggregate containing not less than 50 percent aluminum oxide and not less than 25 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

- F. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- G. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class and grade to suit requirements, and as follows:
 - 1. Type II, non-load bearing, for bonding freshly mixed concrete to hardened concrete.
 - 2. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
 - 3. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.7 CONCRETE MIXES

- A. Prepare design mixes, proportioned according to ACI 211.1 and ACI 301, for each type and strength of normal-weight concrete determined by either laboratory trial mixes or field experience.
- B. Use a qualified independent testing agency for preparing and reporting proposed mix designs for the trial batch method.
 - 1. Do not use Owner's field quality-control testing agency as the independent testing agency.
- C. Proportion mixes to provide concrete with the following properties:
 - 1. Compressive Strength (28 Days): 4000 psi.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - 3. Slump Limit: 3 inches.
 - a. Slump Limit for Concrete Containing High-Range Water-Reducing Admixture: Not more than 8 inches after adding admixture to plant- or site-verified, 2- to 3-inch slump.
- D. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than Portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Combined Fly Ash and Pozzolan: 25 percent.
 - 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 - 4. Combined Fly Ash or Pozzolan, and Ground Granulated Blast-Furnace Slag: 50 percent Portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
- E. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content of 2.5 to 4.5 percent.
- F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content as follows within a tolerance of plus or minus 1.5 percent:
 - 1. Air Content: 5.5 percent for 1-1/2-inch maximum aggregate.
 - 2. Air Content: 6.0 percent for 1-inch maximum aggregate.
 - 3. Air Content: 6.0 percent for 3/4-inch maximum aggregate.

2.8 CONCRETE MIXING

- A. Ready-Mixed Concrete: Comply with requirements and with ASTM C 94.
 - 1. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Comply with requirements and measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixers of 1 cu. yd. or smaller capacity, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixers of capacity larger than 1 cu. yd. , increase mixing time by 15 seconds for each additional 1 cu. yd.
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Proof-roll prepared subbase surface to check for unstable areas and verify need for additional compaction. Proceed with pavement only after nonconforming conditions have been corrected and subgrade is ready to receive pavement.
- B. Remove loose material from compacted subbase surface immediately before placing concrete.

3.2 EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form release agent to ensure separation from concrete without damage.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating reinforcement and with recommendations in CRSI's "Placing Reinforcing Bars" for placing and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum 2" cover to reinforcement.
- D. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap to adjacent mats.

3.4 JOINTS

- A. General: Construct construction, isolation, and contraction joints and tool edgings true to line with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline, unless otherwise indicated.
 - 1. When joining existing pavement, place transverse joints to align with previously placed joints, unless otherwise indicated.
- B. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour, unless pavement terminates at isolation joints.
 - 1. Provide preformed galvanized steel or plastic keyway-section forms or bulkhead forms with keys, unless otherwise indicated. Embed keys at least 1-1/2 inches into concrete.
 - 2. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
 - 3. Provide tie bars at sides of pavement strips where indicated.
 - 4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 5. Use epoxy bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, walks, other fixed objects, and where indicated.
 - 1. Locate expansion joints at intervals of 20 feet, unless otherwise indicated.
 - 2. Extend joint fillers full width and depth of joint.
 - 3. Terminate joint filler less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 - 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 - 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 - 6. Protect top edge of joint filler during concrete placement with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with groover tool to the following radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover marks on concrete surfaces.
 - a. Radius: 1/4 inch).
 - 2. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
- E. Edging is included in this Article for its similarity to jointing. Timing of edging after initial floating is critical.
- F. Edging: Tool edges of pavement, gutters, curbs, and joints in concrete after initial floating with an edging tool to the following radius. Repeat tooling of edges after applying surface finishes. Eliminate tool marks on concrete surfaces.
 - 1. Radius: 1/4 inch.

3.5 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcement steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.
- B. Remove snow, ice, or frost from subbase surface and reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at the time concrete is placed. Do not place concrete around manholes or other structures until they are at the required finish elevation and alignment.
- D. Comply with requirements and with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery, at Project site, or during placement.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures to consolidate concrete according to recommendations in ACI 309R.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

- H. Place concrete in two operations; strike off initial pour for entire width of placement and to the required depth below finish surface. Lay welded wire fabric or fabricated bar mats immediately in final position. Place top layer of concrete, strike off, and screed.
 - 1. Remove and replace portions of bottom layer of concrete that have been placed more than 15 minutes without being covered by top layer, or use bonding agent if approved by Architect.
- I. Curbs and Gutters: When automatic machine placement is used for curb and gutter placement, submit revised mix design and laboratory test results that meet or exceed requirements. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not approved, remove and replace with formed concrete.
- J. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mix designs.
- K. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover reinforcement steel with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, reinforcement steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.6 CONCRETE FINISHING

- A. General: Wetting of concrete surfaces during screeding, initial floating, or finishing operations is prohibited.
- B. Float Finish: Begin the second floating operation when bleed-water sheen has disappeared and the concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats, or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots, and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft bristle broom across float-finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.

2. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch deep with a stiff-bristled broom, perpendicular to line of traffic for service yard slabs.

3.7 SPECIAL FINISHES

- A. Slip-Resistant Aggregate Finish: Before final floating, apply slip-resistant aggregate finish to pavement surfaces according to manufacturer's written instructions and as follows:
 1. Uniformly spread 25 lb/100 sq. ft. of dampened nonslip aggregate over the surface. Tamp aggregate flush with surface using a steel trowel, but do not force below surface.
 2. After curing, lightly work surface with a steel wire brush or an abrasive stone, and water to expose nonslip aggregate.

3.8 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and follow recommendations in ACI 305R for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Begin curing after finishing concrete, but not before free water has disappeared from concrete surface.
- D. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 CONCRETE CURBS

- A. Excavation for curbs shall be made to the required depth and to a width that permits the installation and bracing of the forms. The underlying material shall be shaped and compacted to a firm, even surface. Unstable material shall be removed and replaced with acceptable material which shall be compacted (95% Proctor).
- B. Immediately before placing the concrete, the underlying material shall be thoroughly dampened, and the forms given a coating of light oil or other material which can prevent adherence of the concrete to the forms and which does not discolor the concrete. Where removed and used again, the forms shall be thoroughly cleaned and treated each time before using.
- C. The concrete shall be placed immediately after mixing. The edges, sides and faces shall be spaded or vibrated and the surface tamped to compact the concrete thoroughly and bring the mortar to the surface, after which the surface shall be finished smooth and even by means of a wooden float.
- D. Concrete curbs shall be constructed in sections having uniform lengths of 20 feet. The length of these sections may be reduced where necessary for closures but no section less than 6 feet will be permitted. The forms on the face of all curb shall be removed as soon as the concrete holds its shape and the surface shall then be finished with a fine hair brush to a smooth and even finish. Plastering will not be permitted. The top edges of curb shall be rounded. Edges where expansion joint material has been placed shall be finished with an edging tool having a radius of not over $\frac{1}{4}$ inch.
- E. As soon as the forms are removed, the concrete shall be covered with wet burlap if finishing prevents the immediate application of curing compounds. The concrete shall remain covered until it is to be finished, at which time the wet burlap shall be removed from that amount of concrete that can be immediately finished. As soon as finishing is complete, curing compound shall be applied.
- F. Any exposed surface against which some rigid type of construction is to be made shall be left smooth and uniform so as to permit free movement of the curb.
- G. All tool marks shall be removed with a wetted brush or wooden float and the finished surface shall present a uniform appearance.
- H. Care shall be taken to minimize damage to previously constructed areas. Any damage shall be repaired without additional compensation.
- I. Expansion joints shall be provided opposite joints in abutting concrete surface courses and at approximately equal distances of not more than 20 feet between joints. Joints shall be filled with preformed expansion joint filler, $\frac{1}{2}$ inch, which shall be flush with the top and face. Between concrete curbs and concrete surface or base course, $\frac{1}{2}$ inch, preformed expansion joint filler shall be installed and the joint shall be sealed with hot-poured joint sealer.
- J. The curb shall be protected until finally accepted. During this period, any damage caused by construction operation shall be repaired without additional compensation.

- K. When the curb is to be constructed upon concrete, all dirt, bituminous material, and other loose or adhering matter shall be removed from the surface. The curb shall be doweled with steel dowels. The diameter of holes drilled in concrete shall be not more than $\frac{3}{4}$ inch greater than the diameter of dowels. The dowels shall be set in grout. Transverse joints in doweled curb shall be installed directly over transverse joints and over definite cracks in the concrete. Additional joints shall be installed between slab joints and cracks so as to divide the curb into sections of approximately equal lengths of not more than 20 feet. The joints shall be constructed as specified elsewhere herein.

3.10 CONCRETE PADS & SIDEWALKS

- A. Set forms accurately to line, radius and grade. Securely stake to prevent movement.
- B. Thoroughly consolidate and screed to thickness of 4" or 6" except as otherwise shown.
- C. Set premolded joints at equal spacing, maximum 20' on center. Provide joint filler against foundation walls and other vertical surfaces. Set $\frac{3}{4}$ " below level of finish slab for walks with concrete finish and flush where brick finish is shown.
- D. Trowel concrete to remain exposed and finish with a fine wet broom drawing across the surface of walk. Provide transverse tooled control joints between expansion joints in intervals equal to 5 feet by 5 feet sidewalk width, except as otherwise shown. Tool all edges including both sides of expansion joints. Provide expansion joints every 20 feet.
- E. Damp cure all concrete in accordance with requirements specified.
- F. Protect surface from damage from pedestrians and traffic until fully cured.
- G. Cure and seal exposed surfaces of walks in accordance with requirements specified.

3.11 CONCRETE EQUIPMENT FOUNDATIONS

- A. General: Comply with ACI 304 as specified.
- B. Inspection: Before placing concrete, inspect formwork, reinforcing, and items to be embedded or cast-in. Notify other trades to complete installation of their work; cooperate in setting such work. Moisten wood forms immediately before placing concrete where form coatings are not used.
- C. Deposit concrete continuously or in layers of such thickness that no concrete shall be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. Provide construction joints where sections cannot be placed continuously. Deposit concrete as close as possible to its final location to avoid segregation.
 - 1. Deposit concrete in forms in horizontal layers not deeper than 24 inches; avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- D. Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping, in accordance with ACI recommended practices.

1. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- E. Maintain reinforcing in proper position during concrete placement operations.
- F. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified. When air temperature has fallen to or is expected to fall below 40 Degrees F uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 degrees F, and not more than 80 degrees F at point of placement.
1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 2. Do not use calcium chloride, salt or other materials containing antifreeze agents or chemical accelerators, unless otherwise accepted in mix designs.
- G. Hot Weather Placing: When hot weather conditions exist that could impair quality and strength of concrete, place concrete in compliance with ACI 305 and as follows:
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled. Chopped ice may be used to control temperature provided water equivalent of ice is calculated in total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
 2. Cover reinforcing steel with water-soaked burlap if necessary, so that steel temperature shall not exceed the ambient air temperature immediately before embedment in concrete. Fog spray forms, reinforcing steel and subgrade just before concrete is placed.
 3. Use water-reducing retarding admixture (Type D) when required by high temperatures, low humidity, or other adverse placing conditions.

3.12 FIELD QUALITY CONTROL

- A. Testing Services: Testing shall be performed according to the following requirements:
1. Sampling Fresh Concrete: Representative samples of fresh concrete shall be obtained according to ASTM C 172, except modified for slump to comply with ASTM C 94.
 2. Slump: ASTM C 143; one test at point of placement for each compressive-strength test, but not less than one test for each day's pour of each type of concrete. Additional tests will be required when concrete consistency changes.
 3. Air Content: ASTM C 231, pressure method; one test for each compressive-strength test, but not less than one test for each day's pour of each type of air-entrained concrete.
 4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each set of compressive-strength specimens.

5. Compression Test Specimens: ASTM C 31/C 31M; one set of four standard cylinders for each compressive-strength test, unless otherwise indicated. Cylinders shall be molded and stored for laboratory-cured test specimens unless field-cured test specimens are required.
 6. Compressive-Strength Tests: ASTM C 39; one set for each day's pour of each concrete class exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. . One specimen shall be tested at 7 days and two specimens at 28 days; one specimen shall be retained in reserve for later testing if required.
 7. When frequency of testing will provide fewer than five compressive-strength tests for a given class of concrete, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, current operations shall be evaluated and corrective procedures shall be provided for protecting and curing in-place concrete.
 9. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive compressive-strength test results equal or exceed specified compressive strength and no individual compressive-strength test result falls below specified compressive strength by more than 500 psi .
- B. Test results shall be reported in writing to Architect within 24 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing agency, concrete type and class, location of concrete batch in pavement, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- C. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as the sole basis for approval or rejection.
- D. Additional Tests: Testing agency shall make additional tests of the concrete when test results indicate slump, air entrainment, concrete strengths, or other requirements have not been met, as directed by Architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

3.13 REPAIRS AND PROTECTION

- A. Remove and replace concrete pavement that is broken, damaged, or defective, or does not meet requirements in this Section.
- B. Drill test cores where directed by Architect when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.
- C. Protect concrete from damage. 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 as they occur.
- D. Maintain concrete pavement free of stains, discoloration, dirt, and other foreign material. Sweep concrete pavement not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 02751

SECTION 02760 – SITE ELECTRICAL WORK

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Site electrical work includes exterior structures, concrete bases, grounding rods, conductors, grounding conductors, conduits, safety switches, hand holes (junction boxes) trenching, and all materials necessary and incidental to a fully operational and code compliant installation.
- B. Furnish and install conduits and hand holes for cables as shown on the plans.
- C. Furnish and install overcurrent protection, ground fault protection, conductors, conduits, hand holes, fire stopping of wall penetrations, and grounding for all new exterior circuits added to the site (i.e. message sign).

1.2 RELATED SECTIONS

- A. Section 02751: Portland Cement Concrete & Paving
- B. Section 02765: Message Signs

1.3 DEFINITIONS

- A. Electrical equipment: Manufactured or assembled parts that, in the aggregate, perform a function in an electrical system. Equipment includes, but is not limited to; electrical panels, circuit breakers, switches, message signs, surge suppressors and grounding materials.
 - 1. Message Sign shall mean a premanufactured school identification sign, completed with a digital message board that can be programmed by the Owner. A Basis of Design product is included on the plans.
- B. All lighting work shall be coordinated and performed by the electrical contractor and all work shall conform to the National Electrical Code, latest edition.
- C. Conduits & Raceways: Enclosures that protect electrical system conductors from one connection point to another.
- D. Pull Boxes: Also known as hand holes are premanufactured, non-conductive boxes that provide access to underground electrical system wiring, including termination points for conduits.

1.4 SUBMITTALS

- A. For each type of electrical equipment, provide the following:

1. Materials and dimensions of equipment.
 2. Diagrams and drawings illustrating the means by which the equipment is anchored in place.
 3. Technical specifications verifying the means of operation, function, ratings, and options with respect to the basis of design product. All information must demonstrate that parity (equivalence) or superiority exists in the submitted product.
- B. Submittals shall be arranged in order of unit designation.
- C. Include data on features, accessories and finishes.
- D. Shop Drawings: Anchor bolt templates keyed to specific poles and certified by manufacturer.
- E. Product Certification shall be signed by manufacturers of lighting units and shall certify that products comply with requirements of Drawings and Specifications.
- F. Field Test Reports shall indicate and interpret test results for compliance with performance requirements.
- G. Operation Manuals and Maintenance Data.

1.5 QUALITY ASSURANCE

- A. Comply with ANSI C2
- B. Comply with NFPA 70
- C. Comply with National Electrical Code, latest edition.
- D. Schedule electrical inspections with local Building Department.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Package products for shipping according to ASTM B 660.
- B. Store equipment on decay-resistant treated skids at least 12 inches above grade and vegetation. Support equipment housings to prevent distortion and arrange to provide free air circulation.
- C. Retain factory-applied wrappings on surfaces until final acceptance by the Owner.
- D. Store equipment in a location to prevent vandalism or theft.

1.7 WARRANTY

- A. Written warranty, signed by manufacturer and installer agreeing to replace parts exhibiting a failure of finish, as specified below, shall be provided to Owner. This warranty shall be in addition to, and not a limitation of, other rights and remedies the Owner may have under requirements of the Contract Documents.

1. Warranty against perforation or corrosion of finish due to weathering.
2. Warranty against fading, staining, and chalking due to effects of weather and solar radiation. Warranty period shall be Manufacturer's Standard, but not less than three years from the date of Substantial Completion.
3. Certify full operation of all equipment for the term of the warranty. Warranty must not be pro-rated.

1.8 POWER SUPPLY & CIRCUITRY

- A. Furnish & install all wiring, conduits, circuit protection, hand holes, grounding rods, grounding conductors, disconnect switch, conduit anchors, accessible elbows, junction boxes, conduit fittings, wall sealants, fire stopping, and all else needed to provide a code-compliant power supply to the remote location where the message sign will be installed as shown on the plan.

1.9 EQUIPMENT

- A. Furnish and install new equipment in accordance with manufacturer's installations instructions and applicable codes.
- B. Install a foundation system to securely mount the equipment in accordance with the manufacturer's instructions.

PART 2 - PARTS

2.1 GENERAL

- A. Metal parts shall be free of burrs, sharp corners and edges.
- B. Sheet metal components shall be corrosion-resistant aluminum, unless otherwise indicated. Form and support to prevent warping.
- C. Housings shall be rigidly formed, weather and light-tight enclosures that will not warp in use. Provide filter/breather for enclosed luminaires.
- D. Doors, frames and other internal access panels shall be smooth operating, free from light leakage under operating conditions, and arranged to permit repair using conventional tools. Arrange doors, frames, lenses, diffusers and other pieces to prevent accidental falling during repair and when secured in operating position. Provide for door removal for cleaning or replacing lens. Arrange to disconnect transformer when door opens.
- E. Exposed hardware shall be stainless steel .
- F. Plastic parts shall have high resistance to yellowing and other changes due to aging, exposure to heat, and ultraviolet radiation.
- G. Furnish new overcurrent protection in owner's designated electrical panel as required.
- H. Furnish surge & lightning suppression as required by code and the specified design.

2.3 FINISHES

- A. Comply with AAMM's "Metal Finishes for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Aluminum: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes:
 - 1. Color and finish shall match existing light fixtures used in the City. Provide color sample submittal.

2.4 PULL AND JUNCTION BOXES

- A. Small Sheet Metal Boxes: NEMA OS 1.
- B. Cast Metal Boxes: NEMA FB 1, cast aluminum with gasketed cover.
- C. Underground Enclosures; Concrete polymer resin hand hole & junction box, Tier 15
 - 1. Basis of Design: Hubbell Power Systems
 - a. Box: Model B12162230A, 30 inches deep
 - b. Cover: Model C12162202A ("ELECTRIC" or "DATA" as applicable)

2.5 EQUIPMENT

- A. Install all required conduits, grounding conductors, ground rod, hand holes, conduit & box mounting hardware, and an exterior mounted NEMA 3R safety switch (with mounting hardware, brackets & conduits) to disconnect power to the sign. Mount switch 3 feet above grade.

2.6 WIRES AND CABLES

- A. UL-listed building wires and cables with conductor material, insulation type, cable construction, and rating as specified in Part 3 "Applications" Article.
- B. Rubber Insulation: Conform to NEMA WC 3.
- C. Thermoplastic Insulation: Conform to NEMA WC 5.
- D. Cross-Linked Polyethylene Insulation: Conform to NEMA WC 7.
- E. Ethylene Propylene Rubber Insulation: Conform to NEMA WC 8.
- F. Solid conductor for 10 AWG and smaller (THHN or THWN); stranded conductor for larger than 10 AWG (THHN or THWN) .

2.7 CONNECTORS AND SPLICES

- A. UL-listed factory-fabricated wiring connectors of size, ampacity rating, material, and type and class for application and for service indicated. Select to comply with Project's installation requirements.
- B. Splices made in handholes shall be water-tight in accordance with NEC requirements.

PART 3 - INSTALLATION

3.1 INSTALLATION

- A. Concrete foundations shall be constructed according to appropriate Division 3 Section for "Cast in Place Concrete."
 - 1. Comply with details for reinforcement and for anchor bolts, nuts and washers. Verify anchor-bolt templates by comparing with actual pole bases furnished.
 - 2. Finish for parts exposed to view shall be troweled and rubbed smooth. Comply with Division 3 Section for "Cast in Place Concrete" for exposed finish.
- B. Conduits shall be placed in trenches at depths prescribed by the NEC given surface loading conditions. Exposed conduit shall be securely fastened to building walls and run level and plumb per NEC in a workmanlike manner.
- C. Any wall penetrations in the building shall be sealed and fire stopped per building code.
- D. All equipment shall be installed in heavy duty metal enclosures, with suitable wall mounting hardware given the location designated on the plans.
- E. Wiring between panels, controllers, and equipment shall be installed in conduits, conduit type per NEC given the environment of each installation location.

3.2 CONNECTIONS

- A. Ground equipment
 - 1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Ground metal supports structures according to NEC.
- C. The plan is diagrammatic. Conductor and conduit sizes and locations are shown on the plan and may be adjusted to suit field conditions, but in no case shall field adjustment contradict the requirements set forth in the National Electrical Code.
- D. Furnish all required conductors, grounding conductors, wire connectors, insulating tape, sealants, grommets, lugs, oxidation retardants and all else necessary and required for a fully operational and code compliant installation.

3.3 INSTALLATION

- A. Install wires and cables as indicated, according to manufacturer's written instructions and the NECA "Standard of Installation."
- B. Remove existing wire from raceway before pulling in new wire and cable.
- C. Pull conductors into raceway simultaneously where more than one is being installed in same raceway.
 - 1. Use pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation.
 - 2. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage cables or raceway.
- D. Install exposed cable, parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.
- E. Conductor Splices: Keep to minimum.
 - 1. Install splices and taps that possess equivalent or better mechanical strength and insulation ratings than conductors being spliced.
 - 2. Use splice and tap connectors that are compatible with conductor material.
- F. Connect outlets and components to wiring and to ground as indicated and instructed by manufacturer. Tighten connectors and terminals, including screws and bolts, according to equipment manufacturer's published torque-tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals according to tightening torques specified in UL Standard 486A.

3.4 FIELD QUALITY CONTROL

- A. Inspect each piece of installed equipment for damage. Replace damaged units.
- B. Advance Notice: Give dates and times for field tests.
- C. Provide instruments to make and record test results.
- D. Tests and Observations: Prepare a written report of tests, inspections, observations and verifications indicating and interpreting results.
- E. Malfunctioning Fixtures and Components: Replace or repair, then re-test. Repeat procedure until units operate properly.
- F. Obtain local building department inspections and approvals of all work.

3.5 CLEANING AND ADJUSTING

- A. Clean units after installation. Use methods and materials recommended by Manufacturer.
- B. Touchup any surface finish scratches with manufacturer's approved coatings.

END OF SECTION 02760

SECTION 02765 – MESSAGE SIGN

PART 1 GENERAL

1.01 ACCEPTABLE PRODUCT

- A. Products of the following manufacturer or comparable, provided they comply with the following specifications and are considered functionally and physically similar/acceptable:
 - 1. Basis of Design Model: TekStar
 - a. Integrated LED Display Cabinets and Identification Cabinet with Support Structure
 - b. TekStar 20mm LED Electronic Message Center
 - 2. Manufacturer: Stewart Signs
2201 Cantu Court, Sarasota, FL., 34232

1.02 QUALITY STANDARDS

- A. Signage and work under this section shall be manufactured by vendors dealing extensively in this type of work and capable in producing first quality work
Signage provider shall have at least ten (10) years of experience providing LED products and services for other organizations
- B. All work and installation shall be in accordance with the requirements of these specifications and manufacturer's recommendations. In the event of disagreement between these specifications and the manufacturer's recommendations, these specifications shall govern.
- C. Entire unit, including the assembled product to include UL listing (NOT ETL only)
- D. Made in the USA of domestic and foreign components.

2.0 GENERAL SIGN CONSTRUCTION

- A. Entire sign shall be manufactured by one manufacturer to include
 1. Thermoformed Identification Sign Face
 2. External Extruded Aluminum Cabinet
 3. Internal LED Display Cabinet
- B. Signage is to be an integration of 4 major components
 1. External Identification Cabinet
 - a. *Cabinet Dimensions*
 - i. Outer Cabinet (1) 5'x8'
 - ii. Inner LED Cabinet (2) 25" x 91" (active display area)
 - b. *Cabinets constructed using 12" deep aluminum extrusions*
 - i. Extrusion Thickness – 0.156"
 - ii. Double reinforced corners, internally welded
 - c. *Hinged Sign Face(s)*
 - i. Allows access to internal lamps and ballast(s) without removing face(s)
 - ii. Concealed extruded aluminum hinges
 - iii. Cover supported with integrated props when open
 - d. *DuPont TGIC Powder Coat Finish*
 - e. *Internally Illuminated LED lamping*
- C. Makrolon SL® Sign Faces – Matte Finish (UL APPROVED)
 1. Entire Cabinet containing ID area & LED display is enclosed with Thermoformed, Bayer Makrolon SL® sign face (UV / graffiti / vandal resistant)
 2. Face decorated with second surface (inside), 3M High Performance Translucent vinyl for all name / logo graphics
- D. Integrated internal LED Display Cabinets (proprietary UL approved design)
- E. LED display cabinet is mounted inside the External Identification Cabinet, behind the Makrolon SL Sign Faces for protection against UV/graffiti/vandalism damage
 1. Double-sided LED displays will have one internal LED Display Cabinet inside
 2. LED Display Cabinet constructed using aluminum extrusions
 3. Cabinets are weather resistant & placed inside the External Identification Cabinet
 - a. *Hinged cover allows access to internal electronic components without requiring the removal of LED modules*
- F. Forced Air Ventilation (heating and cooling protection)
 1. Ventilation Fans are installed in both the Internal LED Display Cabinets and in the External Identification Cabinet.
 2. LED cabinets shall have forced air ventilation

G. LED Display

1. Pixel Pitch: 20mm
2. LED Pixel Matrix: 32x112 (4 line)
3. FULL COLOR: Three (3) LEDs per Pixel: 1 red, 1 blue and 1 green
4. LED Boards are mounted to a hinged front to allow opening Internal LED Cabinet to allow servicing internal electronic components without the need to remove the LED boards
5. NIT Rating shall be variable, up to 10,000
6. LED boards to be 16 pixels high by 16 pixels wide
7. The LED display shall be capable of displaying the following:
 - a. Text sizes range from 5.5" – 24"
 - b. Display shall be capable of displaying graphics, video clips and animations
 - c. FULL COLOR = 281 quintillion colors
 - d. Up to 60 frames per second video clips, animations and transitions
 - e. 1,200 Hertz refresh rate
 - f. 32 Gigabyte Solid State Hard Drive with pre-loaded graphics library
8. Brightness controlled either automatically via a light sensor or manually through use of the controlling software.
9. Temperature probe included to allow displaying ambient temperatures
10. 208V power requirements (see quote for specifics)
11. Exhaust fans run 24/7 to prevent moisture build-up inside the displays.

H. System Requirements

1. Operating software to operate on any Windows-based computer.
2. Minimum requirements for software installation
 - Windows 7 or better
 - 512 MB RAM
 - True color 24-bit color video card, minimum resolution of 1024x768
 - 100 MB free drive space
 - Network card
 - Adobe Reader or other PDF viewing software.

I. Software Specifications (DOWNLOAD OPTION)

- Scheduling will be made in 12 or 24-hour formats
- User-friendly menu and icon based software
- On-line help will provide excerpts from the Owner's Manual
- Menu-guided control
- Simultaneous display and edit capability
- Automatic rebooting of system disk shall be made after power outage; system clock and calendar shall continue to function during power failure.
- Various text modules and scalable fonts
- Traveling text
- Scheduling can be pre-programmed years in advance
- Menu guided control of all software feature
- Unlimited online upgrades to software
- Unlimited access to online graphics library
- Display Date/Time in 14 different Formats
- Provide 31 transition effects
- Schedule messages in daily, weekly, yearly or in specific dates and times
- Trigger messages based on ambient temperatures
- Supported Video file formats: AVI, MOV, MP4, and 3GP.
- Supported Image File Formats: BMP, GIF, ICO, JPG, PNG and TIF.
Display temperature in Fahrenheit or Celsius
- Ability to add borders to text
- Ability to overlay text on top of graphics or video clips
- Ability to provide a count-down to a specific event in days, hours, minutes or seconds
- Ability to preview message before transmitting to display.

J. Power Supplies

- Power supply circuitry to be conformal coated
- Support a Voltage Range of: 88 ~ 264VAC
- Overload protection: 105 ~ 135% of rated power
- Input Efficiency: 80%
- Over Temperature Protection: Auto shut-down of voltage and recovers automatically when temperature goes down.
- Working Temperature: -40 degrees up to 176 degrees Fahrenheit

K. Data Communication Options

A. LED display shall be compatible with the following options.

Each option has specific requirements to be reviewed prior to manufacturing.

1. Ethernet Cable or Short Range Wireless

3.0 SPECIFIED PRODUCT WARRANTY

A. Lifetime warranty against workmanship and defects

B. Lifetime warranty on the Makrolon SL® sign faces due to breakage by vandalism, apart from gunshots

C. 5 Year warranty on the LED display and internal components & lamping.

D. 1 year warranty on any communication device

E. Provide written warranty for complete details.

4.0 SOFTWARE TRAINING

A. Provide online video training with no fees and unlimited telephone training
Online, self-guided video tutorials at no cost as well.

B. Manufacturer will provide online links to software, programming / user manuals and maintenance procedures.

SECTION 02800 – SITE RESTORATION

PART 1 - GENERAL

1.1 SUMMARY

- A. The work under this section shall consist of furnishing all labor, equipment and materials for performing site restoration activities to return the site to pre-construction or improved conditions as described in the Specifications and shown on the Construction Drawings.
- B. Related Sections
 - 1. Section: "Site Clearing"
 - 2. Section: "Earthwork"

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil: The Contractor shall spread sufficient amounts of topsoil material required to provide a minimum of six inches of topsoil over disturbed areas to be vegetated. The Contractor shall prepare topsoil that meets the requirements of Section 02920.
- B. Fertilizers: The Contractor shall furnish sufficient amounts of fertilizer, which may be either fluid or dry formulations of commercial carriers of available plant nutrients. The fertilizer shall contain total nitrogen, available phosphoric acid, and soluble potash in the ratio of 10-20-10. The Contractor shall submit the manufacturer's label or certificate indicating compliance with specifications to the Construction Oversight Engineer and for review and approval. During the work, the Construction Oversight Engineer reserves the right to reject any material that has become caked or otherwise damaged.
- C. Mulch: The Contractor shall furnish sufficient amounts of mulch. The Contractor may use either hay or straw for mulch. Hay for mulching shall be mowings of acceptable herbaceous growth free from noxious weeds. Straw for mulching shall be stalks of oats, wheat, rye or other approved crops free from noxious weeds.
- D. Asphalt: The Contractor shall furnish sufficient amounts of each asphalt pavement layer. The subbase course shall be dense graded aggregate (DGA) conforming to the requirements of Section 02200. The asphalt base course shall be NJDOT HMA 19M64. The asphalt surface course shall be NJDOT specification HMA 9.5M64

2.2 EQUIPMENT

- A. The Contractor shall furnish all equipment required to complete the work of this Section.

PART 3 - EXECUTION

3.1 RESTORATION OF THE SITE

- A. The Contractor shall provide a final layer of material over excavation areas consistent with the existing conditions (i.e., quarry process, asphalt, etc.) in accordance with the requirements below.

3.2 LANDSCAPED AREAS

- A. Topsoil Placement
 - 1. Prior to the placement of topsoil, the subgrade soil shall be loosened to a depth of two inches and graded so that it will be parallel to the proposed finished grade. Topsoil shall be spread, raked and compacted to form, after settlement, smooth draining grades. The minimum depth of topsoil after compaction shall be four inches.
- B. Fertilizer Application
 - 1. Fertilizer shall be evenly spread over the surface of soil in areas as directed. Rates of application shall be as required to promote tree growth. Tests required to determine rate of fertilizer application shall be made by the Contractor and the rate accepted by the Engineer. Any method of application that will ensure an even distribution will be acceptable.
- C. Mulching
 - 1. The surface of areas where mulch is to be applied shall be cleared of stones, stumps, wire, and other obstacles that might hinder subsequent landscaping operations. The ground shall be harrowed or disked to produce a state of suitable tillage.
 - 2. The mulch shall be spread uniformly in a continuous blanket of sufficient thickness to completely hide soil from view. Mulch may be spread before or not later than three days after placement of topsoil unless otherwise approved. Anchorage to hold mulch in place may be applied by an approved method during mulching operation or subsequently.
- D. The Contractor shall care for landscaped areas until final acceptance. Such care shall consist of providing protection against traffic by approved warning signs or barricades, and repairing areas damaged following seeding or mulching operations due to wind, water, fire or other causes. Damaged areas shall be repaired to re-establish condition and grade of area prior to seeding and shall be re-fertilized, re-seeded, and re-mulched as specified herein. The Contractor shall keep seeded areas mowed until acceptance by cutting to a height of three inches when growth reaches six inches, or as directed.
- E. When, in the judgment of the Owner, at any time prior to acceptance, any area which has been landscaped fails to produce a satisfactory growth of grass after a suitable period of time has elapsed, the Contractor shall re-plant, re-fertilize and re-mulch such areas as specified.

3.3 ASPHALT COVER

- A. For areas requiring a final asphalt cover, the Contractor shall perform asphalt installation in accordance with the minimum layer thicknesses shown on the Construction Drawings and Section 02400. The subbase course shall be dense graded aggregate conforming to the requirements of Section 2200. The asphalt base course shall be NJDOT HMA 19M64. The asphalt surface course shall be NJDOT HMA 9.5M64. The Contractor shall install all asphalt courses based on the requirements of the NJDOT Standard Specifications, latest edition.
- B. The Contractor shall install the asphalt to the existing cut line of the asphalt. At the joint between the new asphalt and the existing pavement, the Contractor shall provide a smooth transition.
- C. All pavement and subbase restoration courses shall be at least as thick as adjacent surfaces they adjoin.

3.4 CLEANUP OF THE PROJECT SITE

- A. The Contractor shall perform final cleanup of all work areas and adjacent areas upon completing the site restoration (removal of tarps; broom cleaning paved surfaces; removal of any traffic barriers, etc.).
- B. The cleaning work shall also include the following:
 - 1. Repair of any erosion or runoff related damage.
 - 2. Grading and final cover, as required, of all areas used by the contractor.
 - 3. Removal of all materials such as excess construction material, wood, debris and any other foreign material; and
 - 4. Removal of all construction equipment;
- C. Final cleanup of all work areas and adjacent areas upon completing the site restoration (removal of tarps; broom cleaning paved surfaces; removal of any traffic barriers, etc.); removal of all constructed related equipment and material that is not part of the final site design; and all other items and services required for site restoration for which pay items are not provided elsewhere in this Contract.

END OF SECTION 02800

SECTION 02920 - SOIL PREPARATION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this section.
- B. Restoration of lawn areas disturbed by construction.

1.2 WORK INCLUDED

- A. Topsoil.
- B. pH adjusters.
- C. Soil Conditioners.
- D. Fertilizer.

1.3 RELATED SECTIONS

- A. Section 02100 - Selective Site Demolition
- B. Section 02200 - Earthwork - Site
- C. Section 02930 - Lawns and Grasses.

1.4 SUBMITTALS

- A. Product Data: Manufacturer's technical literature with installation and storage instructions for each product specified.
- B. Samples: If requested by Engineer.
- C. Quality Control:
 - 1. Test Reports: Topsoil composition, in duplicate. Acid-producing deposits, in duplicate
 - 2. Certifications: In duplicate.

1.5 QUALITY ASSURANCE

- A. Reference Standards: Applicable requirements of standards and specifications referenced herein apply to the Work of this Section.
- B. Regulatory Agencies: Conform to applicable requirements of Local and State department of Architecture Extension service of the state in which the project is located.
- C. Contractor's certification that products installed conform with requirements specified.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in unopened containers bearing manufacturer's name and content identification.
- B. Store materials as recommended by the manufacturer.

1.7 PROJECT CONDITIONS

- A. Coordination: Coordinate this Work with the Work of other Sections to avoid any delay or interference with other Work.
- B. Imported topsoil will be needed in the project to meet the requirements of the lawn restoration detail.

PART 2 - PRODUCTS

2.1 TOPSOIL

- A. Existing Soil: Existing topsoil is sparse and little to no excess topsoil is expected to be generated during this work. Strip topsoil from work area, place in a stockpile and install silt fence around same per the Soil Erosion & Sediment Control Plan. Modify existing topsoil to conform to composition requirements specified below and supplement as needed to provide minimum topsoil thicknesses suitable for new lawns and grasses.
- B. Off-Site Topsoil:
 - 1. The contractor must import screened clean topsoil to the site, proving that it conforms to composition requirements specified below. The soil shall meet NJ DEP residential clean fill standards. Include at least one test report for each 200 cubic yards of topsoil imported to the site.
 - 2. Screened Topsoil: Furnished by Contractor as needed to insure that an average topsoil thickness of five (5) inches is restored in all disturbed areas.
- C. Composition:
 - 1. Specific for lawns, grasses, trees, plants and ground covers specified and shown on the drawings.
 - 2. Physical Analysis (Soil Texture):

| Quantity Percent by Oven Dry Weight | Size Fraction | Range of Particle Diameter (Inches) |
|-------------------------------------|---------------|-------------------------------------|
| Zero (0)% | gravel | Larger than 3/4 |
| Less than 3% | gravel | 1/4 to 3/4 |
| Less than 10% | gravel | 2/25 to 1/4 |
| 40% to 65% | sand | 1/500 to 2/25 |
| 25% to 60% | silt | 1/12,500 to 1/500 |
| Less than 20% | clay | Smaller than 1/12,500 |

- a. Determine amounts of sand, soil and clay in the bail by hydrometer method or mechanical analysis. Size gravel by separation on screens with appropriate size openings.
 - b. Soil should be relatively free of undecomposed roots, sticks, leaves, paper and other organic material. Remove undesirable trash such as glass, plastic or metal fragments before seeding or planting.
3. Chemical Analysis:
- a. Organic matter content (% oven dry weight of soil):
 - 1) Sandy loam 1.25% to 20%.
 - 2) Loam and silt loam 2.5% to 20%.
 - 3) Soil with less than 10% organic matter use wet oxidation method of analysis.
 - 4) Soil with more than 10% organic matter use loss on ignition method of analysis.
 - b. Soil reaction: pH of 4.5 to 7.0.
 - c. Soluble salt content:
 - 1) Conductivity (Ece, millimhos per centimeter):
 - Less than 1.0 mmhos/cm for a 1:1 soil:water ratio.
 - Less than 0.5 mmhos/cm for a 1:2 soil:water ratio.
 - Less than 0.33 mmhos/cm for a 1:3 soil:water ratio.

2.2 PH ADJUSTERS

- A. Lime:
 - 1. Natural dolomitic limestone containing not less than 85 percent of total carbonates with a minimum of 30 percent magnesium carbonates.
 - 2. Gradation: Minimum 50 percent passing 100-mesh sieve and 90 percent passing 10-mesh sieve.
- B. Aluminum Sulfate: Commercial grade.

2.3 SOIL CONDITIONERS

- A. General:
 - 1. Use singly or in combinations required to meet requirements for topsoil.
 - 2. Soil Conditioners: Nontoxic to plants. Acid-neutralization as required.
- B. Peat:
 - 1. Peat humus derived from a freshwater site and conforming to ASTM D 2607 as modified herein.
 - 2. Shred and granulate peat to pass ½-inch mesh screen and condition in storage pile for minimum six months after excavation.
- C. Sand: Clean and free of toxic materials.
- D. Perlite: Horticultural grade for planters.
- E. Vermiculite: Horticultural grade for planters, free of toxic substances.
- F. Rotted Manure:
 - 1. Well rotted horse or cattle manure containing maximum 25 percent by volume of straw, sawdust, or other bedding materials; free of stones, sticks and soil and containing no chemicals or ingredients harmful to plants.

2.4 FERTILIZER

- A. Commercial Grade fertilizer:
 - 1. Complete, neutral character, with elements derived from organic sources, containing the following percentages of available plant nutrients:
 - a. Lawns: For each 100 square feet of area provide fertilizer with a minimum of 1 lb. actual nitrogen with a minimum of 50 percent in organic form, 4 percent phosphoric acid, and 2 percent potassium. Provide nitrogen in a form that will be available to lawn during initial period of growth.
 - b. Trees and Shrubs: Provide fertilizer with not less than 5 percent total nitrogen, 10 percent available phosphoric acid and 5 percent soluble potash.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas in which Work is to be performed. Report in writing to owner and Engineer all prevailing conditions that will adversely affect satisfactory execution of Work. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Starting Work constitutes acceptance of the existing conditions and this Contractor shall then, at his expense, be responsible for correcting all unsatisfactory and defective Work encountered.
- C. Examine existing topsoil found at the project site for suitable for re-use as specified herein. Determine if existing topsoil satisfies topsoil requirements as defined herein and/or if they can be modified to comply. Supplement with additional imported topsoil as needed to restore all disturbed areas to lawns and grasses as shown on the drawings.

3.2 PREPARATION

- A. Subgrade:
 - 1. After areas required to be landscaped have been brought to required subgrade, thoroughly till to minimum depth of 8 inches by scarifying, disking, harrowing, or other approved methods.
 - 2. Remove debris and stones larger than one inch in any dimension remaining on surface after tillage.

3.3 TOPSOILING

- A. Immediately prior to placing topsoil, prepare entire planting areas shown on drawings, scarify subgrade to a 8 inch depth for bonding of topsoil with subsoil.
- B. Lawns: Spread topsoil evenly to a minimum depth of 5"-6" inches. Do not spread topsoil when frozen or excessively wet or dry.
- C. Correct irregularities in finished surfaces to eliminate depressions.
- D. Protect finished topsoil areas from damage by vehicular or pedestrian traffic.

3.4 pH ADJUSTERS, SOIL CONDITIONERS AND FERTILIZER

- A. Application: Apply fertilizer and soil conditioners in accordance with the Permanent Seeding Specification on the Soil Erosion and Sediment Control Plan.
- B. Adjust pH level in topsoil and subgrade soils as discussed in related earthwork sections. Dispose of acid soils off-site in a legal manner.

END OF SECTION 02920

SECTION 02930 – LAWNS AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Section 02920 – Topsoil Preparation

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Seeding.
 - 2. Fertilizing.
 - 3. Mulching.
- B. Related Sections include the following:
 - 4. Division 2 Section "Site Clearing" for topsoil stripping and stockpiling.
 - 5. Division 2 Section "Earthwork" for excavation, filling and backfilling, and rough grading.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for turfgrass, identifying source, including name and telephone number of supplier.

- C. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.
- D. Qualification Data: For landscape Installer.
- E. Material Test Reports: For existing surface soil and imported topsoil.
- F. Planting Schedule: Indicating anticipated planting dates for each type of planting.
- G. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of lawns during a calendar year. Submit before expiration of required maintenance periods.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Topsoil Analysis: Furnish soil analysis by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; deleterious material; pH; and mineral and plant-nutrient content of topsoil.
 - 1. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
- B. Sod: Harvest, deliver, store, and handle sod according to requirements in TPI's "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" in its "Guideline Specifications to Turfgrass Sodding."

1.7 SCHEDULING

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion. These periods may be extended or reduced according to prevailing weather conditions and growers' recommendations.
 - 1. Spring Planting: April 1-May 31.
 - 2. Fall Planting: August 15-October 15
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 LAWN MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: 60 days from date of Substantial Completion.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
- B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
 - 1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches (100 mm).
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water lawn at a minimum rate of 1 inch (25 mm) per week.
- D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow grass to 1 ½- 2 inches high.
- E. Lawn Post-fertilization: Apply fertilizer after initial mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to lawn area.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.3 percent weed seed.

Lawn mix shall be proportioned by weight as follows:

- a. 16.5 percent Kentucky bluegrass (*Poa pratensis*).
- b. 66 percent chewing red fescue (*Festuca rubra* variety).
- c. 16.5 percent perennial ryegrass (*Lolium perenne*).

2.2 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 5 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - 2. Furnish imported screened topsoil, certified clean per NJ DEP Residential Clean Fill Standards. Provide this submittal at the beginning of the project.

2.3 INORGANIC SOIL AMENDMENTS

- A. Limestone is used to raise pH and neutralize acidic soils. Add percentages of carbonates, calcium, and magnesium. Revise to a pelleted form of limestone with a water-soluble binder that speeds breakdown if required.
- B. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: Class T, with a minimum 99 percent passing through No. 8 (2.36-mm) sieve and a minimum 75 percent passing through No. 60 (0.25-mm) sieve.
- C. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 (3.35-mm) sieve and a maximum 10 percent passing through No. 40 (0.425-mm) sieve.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade. Conforming to the National Bureau of Standards PS23.
- F. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
- G. Sand: Clean, washed, natural or manufactured, free of toxic materials.
- H. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.4 ORGANIC SOIL AMENDMENTS

- A. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.
- B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 PLANTING ACCESSORIES

- A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.6 FERTILIZER

- A. All fertilizer shall be granular pills, packets or pellets with 35-80% of the total nitrogen in a slow release form.
- B. All fertilizers shall be uniform in composition, free flowing and suitable for application with approved equipment. Fertilizers shall be delivered to the site fully labeled according to applicable State laws and shall bear the name, trade mark, and warranty of the producer.
- C. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- D. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- E. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- F. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.7 MULCHES

- A. Straw Mulch: Provide air-dry, clean, free of mildew and noxious weeds, and shall be small grained straw such as wheat or barley.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 LAWN PREPARATION

- A. Limit lawn subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches (100 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. A minimum of 5" of topsoil shall be spread over prepared subgrade.
 - 2. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface at a rate determined by soil test analysis, and thoroughly blend planting soil mix.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil mix to a depth required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil mix over loosened subgrade. Mix thoroughly into top 2 inches (50 mm) of subgrade. Spread remainder of planting soil mix.
- C. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:
 - 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 - 2. Loosen surface soil to a depth of at least of 6 inches (150 mm). Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches(100 mm) of soil. Till soil to a homogeneous mixture of fine texture.
 - 3. Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, trash, and other extraneous matter.
 - 4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
- E. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h). Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sowing rates vary with grass species and mixtures. Revise first paragraph below to suit Project.
- C. Sow seed at the rate of 4 lbs./1000 sq. ft. (1.8 kg/92.9 sq. m) or 265 lbs./acre.
- D. Rake seed lightly into top 1/8 inch (3 mm) of topsoil, roll lightly, and water with fine spray.
- E. Retain options in paragraph below if specifying blankets or mesh. Coordinate erosion-control materials with slope ratios and revise if required.
- F. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.
- G. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment. Spread mulch uniformly so that 75-95% of the soil surface is covered.
 - 1. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.
- H. Protect seeded areas from hot, dry weather or drying winds by applying peat mulch within 24 hours after completing seeding operations. Soak and scatter uniformly to a depth of 3/16 inch (4.8 mm) and roll to a smooth surface.

3.5 LAWN RENOVATION

- A. Renovate existing lawn.
- B. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish lawn where settlement or washouts occur or where minor regrading is required.
- C. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.
- D. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- E. Mow, dethatch, core aerate, and rake existing lawn.

- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).
- I. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches (100 mm) of existing soil. Provide new planting soil to fill low spots and meet finish grades.
- J. Apply seed and protect with straw mulch as required for new lawns.
- K. Water newly planted areas and keep moist until new lawn is established.

3.6 SATISFACTORY LAWNS

- A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).
- B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.7 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.
- C. Remove erosion-control measures after grass establishment period.

END OF SECTION 02920