HUNTS POINT INTERSTATE ACCESS IMPROVEMENT PROJECT – CONTRACT 1

PIN X731.63, Contract D900047

DB CONTRACT DOCUMENTS
PART 8

SPECIAL SPECIFICATIONS

Final January 15, 2019
This Part 8 – Special Specifications provides access to, and details the Project-specific requirements for the use of, the following documents:

1. NYSDOT Standard Specifications and Construction Materials
2. NYSDOT Engineering Information Issuances
3. NYSDOT Special Specifications.

**NYSDOT Standard Specifications and Construction Materials**


The NYSDOT Standard Specifications Construction Materials can be accessed at the following internet link:


**NYSDOT Engineering Information Issuances**

The Design-Builder shall use the relevant NYSDOT engineering information issuances, which include:

1. Engineering Instructions (EI);
2. Engineering Bulletins (EB);
3. Engineering Directives (ED).

The above listed engineering information issuances can be accessed at the following internet link:


**NYSDOT Special Specifications**

The Design-Builder *may* use NYSDOT Special Specifications which are listed in the Electronic Pay Item Catalog (e-PIC) and which have received General Approval, and *shall* use any NYSDOT Special Specifications which are referenced in this Part 8 or elsewhere in the Contract Documents. Delete and ignore sections in the NYSDOT Special Specifications titled Method of Measurement and Basis of Payment from the NYSDOT Special Specifications.

NYSDOT Special Specifications can be accessed at the following internet link:


The NYSDOT e-PIC may be accessed at the following internet link:

https://www.dot.ny.gov/pic
The following Special Specifications are attached herein:

ITEM 206.04010011 - PNEUMATIC EXCAVATION AND BACKFILL OF TRENCHES
ITEM 206.04020011 - PNEUMATIC EXCAVATION AND BACKFILL OF TEST PITS
ITEM 502.RLCF6011 – PERFORMANCE ENGINEERED MIXTURE – PORTLAND CEMENT CONCRETE PAVEMENT
ITEM 504.00000011 – PERFORMANCE ENGINEERED CONCRETE MIXTURE FOR PAVEMENTS
ITEM 525.X0516111 – DIAMOND GRINDING TO AN IRI VALUE OF 70 INCHES/MILE WITH SLURRY REMOVAL
ITEM 555.80020001 – CRACK REPAIR BY EPOXY INJECTION (RESTORATION)
ITEM 557.11010003 – INTEGRAL PRECAST CONCRETE BARRIER
ITEM 557.01040018 – LIGHTWEIGHT, HIGH – PERFORMANCE SUPERSTRUCTURE SLAB WITH INTEGRAL WEARING SURFACE – BOTTOM FORMWORK REQUIRED
ITEM 557.22040016 – FIELD CAST UHPC CLOSURE POURES (VOLUME)
ITEM 557.25000016 – CRACK SEALING USING HIGH MOLECULAR WEIGHT METHACRYLATE – LINEAR CRACKS
ITEM 557.26000016 – CRACK SEALING USING HIGH MOLECULAR WEIGHT METHACRYLATE – FLOODING
ITEM 557.64010103 – PRECAST CONCRETE DECK – TYPE 1 FRICTION
ITEM 559.90040011 – FIELD APPLIED SACRIFICIAL WAX GRAFFITI-RESISTANT COATING
ITEM 559.91100010 – ANTI-GRAFFITI PROTECTIVE COATING
ITEM 566.13142001 – ELASTOMERIC EXPANSION JOINT SYSTEM – WITH WEAR PLATES
ITEM 584.40000009 – POLYMER OVERLAY WEARING SURFACE FOR STRUCTURAL SLABS (PPC)
ITEM 584.50010018 – THIN POLYMER (EPOXY) OVERLAYS FOR STRUCTURAL SLABS
ITEM 603.95XX0011 – DUCTILE IRON PIPE ON CRUSH STONE BEDDING
ITEM 604.020X0011 – CATCH BASIN – TYPES 1-3 (NEW YORK CITY)
ITEM 604.04020011 – NYC STANDARD FOR 4 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04030011 – NYC STANDARD FOR 5 FOOT DIAMETER PRECAST MANHOLE
ITEM 604.04850011 – NYC STANDARD MANHOLE TYPE A-1
ITEM 604.04860011 – DROP PIPE MANHOLE (NYC)
ITEM 604.04890011 – NYC STANDARD MANHOLE TYPE A-3
ITEM 604.5102nn15 – STORMWATER TREATMENT SYSTEM
ITEM 607.41010010 - TEMPORARY PLASTIC BARRIER FENCE
ITEM 607.7XXYYN39 – STEEL FENCE AND GATE – NYCDPR
ITEM 607.98010111 – TEMPORARY CHAIN-LINK FENCE
ITEM 611.190X0024 – POST PLANTING CARE WITH REPLACEMENT
ITEM 613.70010011 – BIRD REPELLENT SYSTEM
ITEM 615.0101NN10 - LITTER (TRASH) RECEPTACLE TYPE
ITEM 615.08XXNN39 - 1964 WORLD’S FAIR BENCH - RPL SLATS - BACK & ARMS (NYCDPR)
ITEM 615.33XX0011 - TEMPORARY WOODEN TREE GUARD WITHOUT TREE WRAP – NYCDPR
ITEM 615.43000011 - GROUND SURFACE PROTECTION MATS
ITEM 619.22970011 – TRAFFIC ENFORCEMENT AGENTS
ITEM 634.900X0011 – RODENT AND VERMIN CONTROL
ITEM 634.99010017 – BUILDING CONDITION SURVEY
ITEM 634.99020017 – VIBRATION MONITORING (NONBLASTING)
ITEM 637.31020020 – INSPECTION VEHICLE, MIDSIZE/INTERMEDIATE SUV
ITEM 637.4000NN20 – WEBCAM SYSTEM
ITEM 651.10010011 – INSTALL FIRE ALARM FOUNDATION AND POST (NEW YORK CITY)
ITEM 651.03040039 – FIRE ALARM CABLE (NEW YORK CITY) 04 PAIR
ITEM 655.00XX0011 – CAST FRAME AND GRATES AND MANHOLE COVERS
ITEM 680.17006011 – 60 FOOT CAMERA POLE
ITEM 680.95020615 – SERVICE CABLE 2 CONDUCTOR, NO. 06 AWG
ITEM 680.96494811 – FIBER OPTIC TERMINATION CABLE 12 FIBER (IN CONDUIT)
ITEM 800.01000015 – DESIGN BUILD – DESIGN SERVICES
ITEM 800.02000015 – DESIGN BUILD – CONSTRUCTION INSPECTION SERVICES
ITEM 800.03000015 – DESIGN BUILD – QUALITY CONTROL SERVICES
ITEM 800.04000015 – DESIGN BUILD – FORCE ACCOUNT WORK
ITEM 800.04200015 – DESIGN BUILD – RAILROAD NO SHOW FORCE ACCOUNT WORK
ITEM 800.05000015 – DESIGN BUILD – SITE MOBILIZATION
ITEM 800.0600NN15 – DESIGN BUILD – CONSTRUCTION WORK
ITEM 800.06XXNN15 – DESIGN BUILD – CONSTRUCTION WORK – STRUCTURAL REPAIRS
ITEM 800.1000NN15 – DESIGN BUILD – UTILITY RELATED WORK

In the event of a discrepancy between the version of any Special Specification attached herein and the version available from the NYSDOT web site listed above, the version included in these Contract Documents shall apply.
ITEM 206.04010011 - PNEUMATIC EXCAVATION AND BACKFILL OF TRENCHES

ITEM 206.04020011 - PNEUMATIC EXCAVATION AND BACKFILL OF TEST PITS

DESCRIPTION
This work shall consist of performing Pneumatic Excavation and Backfill of Trenches or Test Pits in accordance with the contract documents and as directed by the Engineer. This work shall include the protection of tree roots for purposes of installing conduits, direct burial cables and other subsurface utilities.

MATERIALS
Materials shall meet the following requirements, as modified by any supplemental landscape specifications or special notes included in the contract documents:

Pneumatic Excavating Tool. Excavation shall be performed through the use of a pneumatic excavation tool with the following requirements:

The high air velocity excavation tool shall be specifically designed to fracture, pulverize, and displace porous and semi-porous soils without harming or causing damage to tree roots, existing subsurface utilities or other non-porous objects. The Contractor shall submit catalog cuts from the manufacturer verifying that the pneumatic excavation tool meets the following criteria:

- Rated Operating Pressure: 90 – 101.5 psi
- Air Stream Velocity at Cutting Head: 2,005 – 2,278 fps
- Air Displacement: 1,050 – 1,320 gal/min

Air Compressor. The air compressor may be either a portable or truck-mounted unit and shall be adequately sized as required to power the pneumatic excavation tool in accordance with the manufacturer’s recommendations for the pneumatic excavating tool.

Vacuum Truck. A vacuum truck should be used to collect excavated spoil directly from the trench or pit.

Containment Structure. To prevent the spread of excavated soil onto adjacent roadways and areas beyond the designated work zone limits, the Contractor shall provide a mobile structure or barrier to contain the material dislodged by the pneumatic excavation tool from the trench or pit. Timber or corrugated metal shields, tents supported on tubular frames or other structures as approved by the engineer may be used.

Root Protection
- Cotton Mats 711-02
- Burlap 711-06
ITEM 206.04010011 - PNEUMATIC EXCAVATION AND BACKFILL OF TRENCHES

ITEM 206.04020011 - PNEUMATIC EXCAVATION AND BACKFILL OF TEST PITS

Backfill
Topsoil 713-01
Limestone 713-02
Fertilizer 713-03
Organic Material 713-13

CONSTRUCTION DETAILS
The work shall be in accordance with SECTION 206-3 TRENCH, CULVERT and STRUCTURE EXCAVATION with modifications as follows:

The following is to be executed PRIOR TO PNEUMATIC EXCAVATION.

Work Site Safety. Pneumatic excavation shall be performed in compliance with all applicable OSHA regulations and the manufacturer’s operating instructions. Adequate eye and ear protective equipment shall be worn by all crew members present at the work site.

The Contractor shall be responsible to provide adequate equipment and perform pneumatic excavation techniques properly to preclude movement of any air-borne soils onto adjacent roadways or other areas beyond the designated work zone limits. Failure to contain and/or collect the excavated soil will result in the immediate termination of pneumatic excavation until soil containment and/or collection procedures are determined adequate by the Engineer.

The Contractor shall keep the public at a safe distance from the work zone at all times by means approved by the Engineer.

Operator Qualifications. The excavating tool shall be utilized only by personnel having at least one year of experience operating the pneumatic excavation tool. The Contractor shall submit to the Engineer written certification from the equipment manufacturer or supplier of the operator’s training and experience in the use of the pneumatic excavation tool.

Arborist: Unless otherwise directed by the EIC, all pneumatic excavation work shall be performed under the direction of an International Society of Arboriculture (ISA) Certified Arborist provided by the NYSDOT.

Pre-Pneumatic Excavation Meeting. Prior to the start of such excavation, the Contractor and its approved Operator for pneumatic excavation shall attend a meeting arranged by the Engineer with the Regional Landscape Architect, certified Arborist and other parties as appropriate, to review the requirements of this item including the schedule of operations, the mandatory presence of the Arborist, safety measures, reporting, etc.
ITEM 206.04010011 - PNEUMATIC EXCAVATION AND BACKFILL OF TRENCHES

ITEM 206.04020011 - PNEUMATIC EXCAVATION AND BACKFILL OF TEST PITS

The contractor is required to submit a schedule of his anticipated pneumatic excavations at this meeting.

PNEUMATIC EXCAVATION PROCEDURES

Dust Control. The work area shall be watered thoroughly at least 24 hours in advance of but no more than 48 hours prior to the start of any pneumatic excavation to reduce the incidence of airborne dust resulting from the pneumatic excavation operation.

Excavation - General. Trench and test pit excavation using the pneumatic excavation tool shall be performed in accordance with the manufacturer’s recommendations to remove soil without damage to the roots of trees and/or utilities either in or adjacent to the excavation.

Test Pit Excavation. Test pits indicated in the drawings or as directed by the Engineer to be dug within limits designated for pneumatic excavation shall be excavated prior to other trenching using the pneumatic excavating tool.

The limits of the excavation shall be those sufficient to determine existing utility type, size and/or condition. This work shall not relieve the Contractor of the responsibility to locate underground facilities as required under 16 NYCRR Part 753.

Trench Excavation. Pneumatic excavation shall be performed at locations as indicated in the drawings or as directed by the Engineer where trench excavation for conduit installation will occur within or in close proximity to the drip-lines of trees.

Trenches shall be excavated to a depth of 3 feet, as indicated in the drawings or as directed by the Engineer.

Root Protection. The Contractor shall place wet burlap or cotton mats upon both the fibrous and structural roots immediately after they have been exposed by the pneumatic excavating tool. The burlap or cotton covering may be removed to perform inspection or utility installation operations, but the Contractor shall be required to keep the burlap or cotton towels wet and the roots moist until backfilling is complete.

The Engineer shall be immediately informed of any damaged tree roots. No tree roots may be pruned except as specifically authorized by the Arborist. In the case that the concentration of roots obstructs the placement of the conduit to the required line and grade, limited pruning may be necessary as directed by the Arborist. Tree roots in excess of 1 inch in diameter, measured at the edge of the excavation, shall be cut cleanly at the edge of excavation using a sharp cutting tool. All root pruning shall be performed under the direction of the ISA Certified Arborist.

Conduit Installation. Conduit and direct burial cables shall be installed in accordance with the applicable conduit specifications and details shown on the drawings, including bedding materials.
ITEM 206.04010011 - PNEUMATIC EXCAVATION AND BACKFILL OF TRENCHES

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In order to facilitate trench backfilling on an expedited basis, the Contractor shall install conduit and direct burial cables in a continuous operation along with the pneumatic excavation operations to allow for backfilling of the trench within the same work shift.

The exposed root system will make “rolling” multiple sections of assembled conduit from the adjacent surface into the trench impossible. Therefore, workers shall pass each individual conduit section carefully through the root system for placement and assembly within the excavated trench.

Trench and Test Pit Backfill. Excavated trenches and test pits containing exposed tree roots shall be backfilled immediately after the Engineer approves the conduit and cable installations within the trench and/or the inspection of the test pit. The Contractor shall provide adequate work crews to backfill trenches and test pits within 24 hours of excavation.

Upon completion of inspection or installation work, the Contractor shall remove the burlap or cotton matting and begin backfilling operations.

Suitable excavated material may be used as backfill up to a depth of 12 inches below finish grade. The existing soil shall be amended with humus, peat, peat moss, or source-separated compost in the ratio of one part organic to seven parts excavated soil. If required, provide additional clean backfill material.

Backfilling of the trench and test pit excavations shall be performed with care not to damage the exposed roots. The Contractor shall compact the backfill material under the direction of the ISA Certified Arborist. The Contractor shall compact the backfill material to be commensurate with the density of the undisturbed adjacent soils unless otherwise directed by the ISA Certified Arborist.

Surface restoration including backfilling the top 12 inches of the excavation with approved topsoil, shall be performed separately under the appropriate items.

The Contractor shall properly dispose of excess and unsuitable excavated materials.

Tree Condition Report. The Contractor shall supply the ISA Certified Arborist with information as needed for the Arborist to prepare periodic reports to the Engineer and Regional Landscape Architect summarizing the number, type and condition of trees adjacent to each pneumatic trench excavation, duration of open trenches, and identify any root damage and actions taken.

METHOD OF MEASUREMENT

Pneumatic Excavation and Backfill of Trenches will be measured as the number of linear feet along the centerline of the excavated trench, including backfill, regardless of the number of conduits or direct burial cables installed within the trench.

Pneumatic Excavation and Backfill of Test Pits will be measured as the number of test pits excavated and backfilled in accordance with the contract documents or where directed by the Engineer.

BASIS OF PAYMENT

The unit price per bid shall include the cost of furnishing all labor, materials and equipment necessary to satisfactorily complete the work.
ITEM 607.41010010 - TEMPORARY PLASTIC BARRIER FENCE

DESCRIPTION
This work shall consist of furnishing, installing, and maintaining Temporary Plastic Barrier Fences of the type and at the locations shown in the plans or where directed by the Engineer.

MATERIALS
Materials for Temporary Plastic Barrier Fences shall meet the following requirements:

- Fence: High-density polyethylene mesh, ultraviolet-stabilized min. 2 years; minimum height 4.0 feet. Color: high-visibility orange or green. When used to protect trees or other vegetation, color shall be high-visibility orange.
- Posts: Rigid metal or wood posts, minimum length 6.0 feet.
- Ties: Steel wire, #14 gauge or nylon cable ties.
- Warning signs: Sheet metal, plastic or other rigid, waterproof material, 1.5 feet by 2.0 feet with 4 inch black letters on a white background. Text shall be: "Protected Site - Keep Out" unless otherwise specified.

CONSTRUCTION DETAILS
Fences shall be erected prior to moving construction equipment onto any area designated for protection.

The line of fences as indicated on the plans shall be staked or marked out on the ground by the Contractor and approved by the Engineer before any fence is installed. Where used for protection of individual trees, fence shall be placed at the drip line (extent of canopy). If not possible, placement shall be as close to the drip line as possible and in no case less than 5.0 feet away from the tree trunk.

On approval of the stakeout, posts shall be securely driven on 6.0 foot-maximum centers, normal to the ground, to a depth 1/3 of the total post length. Plastic barrier fence shall be placed along the side of all posts. Ends of fencing segments shall overlap a distance of at least one half the fence height.

Fencing shall be secured to posts with wire or cable ties at top, middle and bottom of post. Fastener shall be tight enough to prevent the fencing from slipping down. Overlaps shall also be securely fastened.

Barrier fence which is not orange in color shall be flagged at 6.0 foot intervals with red or orange florescent tape. Warning signs shall be mounted on the fence at no more than 100 foot intervals.

Maintenance shall commence immediately after erection of the fence and continue until one week prior to acceptance of the contract, and shall consist of: replacing damaged post(s) and fencing; re-fastening and tightening fencing; and restoring fence to its intended height.

Fencing used for tree or other vegetation protection shall not be temporarily removed to allow equipment access over a protected area, except as required for items of work specifically shown on the plans and approved by the Engineer in writing.
502-1 DESCRIPTION
Construct a Portland Cement Concrete (PCC) pavement and shoulders, if required, as described in the Contract Documents, using a Performance Engineered Mixture (PEM).

502-2 MATERIALS AND EQUIPMENT

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<th>Description</th>
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<td>Constructing Transverse Joints</td>
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<td>502.11516011</td>
<td>Constructing Longitudinal Joints</td>
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<tr>
<td>502.20516011</td>
<td>Sealing Transverse Joints - Highway Joint Sealant</td>
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<tr>
<td>502.30516011</td>
<td>Sealing Longitudinal Joints - Highway Joint Sealant</td>
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502-2.01 Concrete. Use materials meeting the requirements of 501-2.02

In addition to meeting the requirements of §701-07, Anchoring Materials - Chemically Curing, the material used to anchor longitudinal joint ties, dowels, or other miscellaneous items into hardened concrete must be a pourable, two-component, 100% solids structural epoxy dispensed:
- From side-by-side cartridges by manual or pneumatically powered injection guns.
- Through a static mixing nozzle that homogeneously mixes the material without any hand mixing.

The Department may perform supplementary sampling and testing of the joint sealants. Deliver sealant in the manufacturer’s original sealed container legibly marked with the:
- Manufacturer’s name.
- Trade name of the sealant.
- Manufacturer’s lot or batch number.
- Pouring temperature.
- Safe heating temperature.
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<th>ITEM 502.RLCF6011</th>
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<td><strong>ITEM 502.20516011</strong></td>
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<tr>
<td><strong>ITEM 502.30516011</strong></td>
<td>Sealing Longitudinal Joints -</td>
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</table>

Design a concrete mixture proportioned according to AASHTO PP 84, *Developing Performance Engineered Concrete Pavement Mixtures*, for the below specified performance criteria. The mix shall have a well graded aggregate gradation to minimize the paste content while maintaining workability. Aggregate gradation shall meet the requirements of the Tarantula curve (or Shilstone method or 8-18 method) as defined by FHWA at [https://www.fhwa.dot.gov/pavement/concrete/pubs/hif15019.pdf](https://www.fhwa.dot.gov/pavement/concrete/pubs/hif15019.pdf)

Produce a homogeneous mixture of cement, pozzolan (fly ash or GGBFS), fine aggregate, coarse aggregate, air entraining agent, water-reducing and set-retarding admixture, and water using NYSDOT Approved List materials. Other admixtures may be used as approved by the Director, Materials Bureau.

Design a concrete mixture to meet the following requirements:
- Compressive Strength of 3000 psi minimum at 28 days.
- Flexural Strength of 600 psi minimum at 28 days.
- Slump: As desired by contractor for workability.
- Entrained Air: 5% to 8%.
- Super Air Meter (SAM) number <0.20 using AASHTO TP118
- Water/Total Cementitious Material Ratio: 0.40 maximum.
- Paste volume maximum 25%
- Resistivity >16.5 kΩ-cm using AASHTO T358

Perform mix development testing in accordance with ASTM C143, C231, C192, C39, AASHTO T358 and AASHTO TP118 to assure all performance criteria can be achieved during production and placement.

Prior to the start of any concrete placement, provide a copy of the proposed mixture design(s) and trial batch test results to the Director, Materials Bureau, submitted through the Regional Materials Engineer, for evaluation. Trial batch must be performed in the presence of the Engineer. Submit sufficient data to permit the Director to offer an informed evaluation. Include at least the following:
- Concrete mix proportions
- Aggregate composite gradation of mixture.
- Material sources. Include fineness modulus and specific gravity for all aggregates.
- Compressive and Flexural Strength at desired age of opening to traffic, with 28 day results for records when available.
- Target slump for placement
- Target air content of plastic concrete.
- SAM number results of trail mix
- Paste volume calculations for mix
- Resistivity test data

Substantial changes to the approved mix design will not be allowed.

**502-2.02 This subsection is intentionally blank.**

**502-2.03 This subsection is intentionally blank.**
502-2.04 Equipment. Provide the Engineer with an equipment list and specifications a minimum of 14 days prior to the planned start of PCC paving. Bring all equipment needed to place, consolidate, finish, texture, cure, saw cut, seal, and test the PCC pavement and permeable base to the job site a minimum of 1 full work day before its use to allow examination by the Engineer. Repair or replace any equipment found to be defective before or during its use. Discontinue any operation if unsatisfactory results are being obtained. Use of equipment other than described below is subject to the approval of the Director, Materials Bureau.

A. Slipform Paving. Slipform paving consists of a single paver, or a placer/spreader followed by a separate paver, capable of placing, spreading, consolidating, screeding, and finishing the concrete such that hand finishing is kept to a minimum. Use a self-propelled slipform paver equipped with:

- Rigid side forms that laterally support the concrete and minimize edge slumping.
- A full-width finishing pan.
- Attached internal vibrators capable of consolidating the entire concrete placement.
- Use equipment guided by a reference system that ensures the pavement is placed to the specified line, grade, and cross section.

B. Fixed Form Paving

1. Forms. Use straight forms without horizontal joints meeting Table 502-1, Form Requirements, and equipped with:

- At least 3 stake pockets spaced 3 feet apart (maximum), each having a positive, nondetachable wedge.
- Positive, interlocking devices capable of holding abutting sections together to form neat, tight joints.

<table>
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<tr>
<th>Characteristic</th>
<th>Requirement</th>
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<tbody>
<tr>
<td>Material</td>
<td>Steel, 1/4 inch thick, minimum.</td>
</tr>
<tr>
<td>Length</td>
<td>10 feet, minimum.</td>
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<tr>
<td>Depth</td>
<td>Equal to the sum of the edge thicknesses of all pavement layers placed within the form.</td>
</tr>
<tr>
<td>Base Width</td>
<td>Equal to the depth, minimum.</td>
</tr>
<tr>
<td>Horizontal Top Face</td>
<td>2 inch wide, minimum, and lying in a plane with a maximum variation of 1/8 inch in 10 feet.</td>
</tr>
<tr>
<td>Vertical Face</td>
<td>Maximum variation of 1/4 inch in 10 feet and rounded on the upper corner with a 3/4 inch radius, maximum.</td>
</tr>
<tr>
<td>Flange Bracing</td>
<td>Extends outward on the base 2/3 of the form depth, minimum.</td>
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</tbody>
</table>

Flexible, curved, or wooden forms may be used in irregular areas or curved sections having horizontal radii of 100 feet or less.
2. **Paving Equipment.** Use fixed form paving equipment specifically made for placing concrete. The equipment must be capable of placing, spreading, consolidating, screeding, and finishing the concrete to the specified line, grade, and cross section such that hand finishing is kept to a minimum. Use equipment with either attached internal vibrators or in conjunction with hand-held internal vibrators.

C. **Vibrators.** Use paver-mounted internal vibrators capable of consolidating the entire concrete placement that are:

- Capable of being shut off without shutting off the paver.
- Equipped with frequency controls readily accessible to the paver operator.
- Capable of simultaneously operating at the same frequency as the other paver-mounted vibrators.
- Capable of operating through a frequency range of 6,000 - 10,000 vibrations per minute.

Check vibrator operating frequencies daily when paving begins. Check frequencies under load with the Engineer present. If the paver is not equipped with direct-read frequency gauges for each vibrator, supply the Engineer with a calibrated, hand-held tachometer, including instructions, to monitor vibrator frequencies. The tachometer will remain the Contractor’s property after paving is complete.

Use hand-held vibrators capable of operating through a frequency range of 6,000 - 10,000 vibrations per minute in any location that is not consolidated by internal vibrators attached to the paving equipment.

D. **This subsection is intentionally blank.**

E. **Saw Cutting Equipment.** Use diamond blade saws capable of making straight cuts to the dimensions depicted in the Standard Sheets that are equipped with cutting guides, blade guards, water cooling systems, dust controls, and cut depth control.

Maintain equipment and supplies to ensure uninterrupted saw cutting. Early entry saws require approval from the Director, Materials Bureau. Submit requests to use early entry saws at least 7 calendar days before paving.

F. **Curing Compound Applicators.** Use atomizing mechanical sprayers capable of exerting consistent pressure without hand pumping that are equipped with tank agitators to continuously mix the curing compound. Use nozzles with spray shields to prevent drift. Flush nozzles daily before use.

Maintain equipment and supplies, including extra nozzles, to ensure uninterrupted curing compound application. In a slip form paving operation, use self-propelled applicators guided by the same reference system as the slip form paver. In a fixed form operation, applicators need not be self-propelled.

G. **The subsection is intentionally blank.**
ITEM 502.RLCF6011 Performance Engineered Mixture -
ITEM 502.10516011 Constructing Transverse Joints
ITEM 502.11516011 Constructing Longitudinal Joints
ITEM 502.20516011 Sealing Transverse Joints -
ITEM 502.30516011 Sealing Longitudinal Joints –
ITEM 502.40516011 Highways Joint Sealant

**H. Diamond Grinding.** Use equipment having gang-mounted diamond saw blades on a multiblade arbor specifically designed for pavement bump cutting or production grinding. When production grinding, use equipment capable of producing a 4 foot (minimum) grinding pass width that is equipped with a vacuum system capable of removing slurry from the pavement surface. Use blade spacers having a minimum thickness of 0.105 inches. Inform the Engineer of the spacer thickness selected.

**I. Drills.** Use gang drills with a minimum of 2 independently powered and driven drills. Use tungsten carbide drill bits. Rest and reference the drill rig frame on and to the pavement surface such that the drilled holes are cylindrical, perpendicular to the surface being drilled, and repeatable in terms of position and alignment. Hand-held drills are permitted for drilling holes in longitudinal joints if there is not enough room to use gang drills resting on the pavement surface.

**J. The subsection is intentionally blank.**

**K. Joint Sealing - Highway Joint Sealant.** Heat the sealant in a melter constructed either:
- As a double boiler with the space between inner and outer shells filled with oil or other heat-transfer medium.
- With internal tubes or coils carrying the sealant through a heated oil bath and into a heated double-wall hopper.

Do not use direct heating. Use a melter capable of maintaining the sealant’s pouring temperature and providing homogeneous sealant equipped with:
- Positive temperature control.
- Continuous full sweep mechanical agitation.
- Separate thermometers indicating the temperatures of the heat transfer medium and the sealant in the hopper. Do not place any sealant if the thermometers are defective or missing.

Provide 2 thermometers having stems 18 inches long and temperature ranges sufficient to meet the requirements of this specification. Use a discharge hose equipped with a controlled heating apparatus or sufficiently insulated to maintain the proper sealant pouring temperature. Use nozzles that apply the joint sealant within the joint confines for the full width and depth of the joint.

**L. Air Blasting Equipment.** Use equipment with traps or other installed devices that prevent moisture and oil from contaminating the concrete surface. Use a compressor that delivers air at a minimum of 120 cfm and develops a minimum nozzle pressure of 90 psi. Check the compressed air stream purity daily with a clean white cloth.
Convene a prepave meeting 7 to 14 days before the planned start of paving with the Engineer and any PCC paving and saw cutting subcontractors to coordinate all aspects of paving and inspection, including equipment review, construction methods, and time and personnel requirements.

Construct a smooth, well consolidated, properly finished, textured, and cured pavement to the line and grade depicted in the contract documents, ± 1/4 inch vertically at any location.

Acceptance criteria for the Concrete shall be:

- Air content 5% to 8%, tested at the control series frequency per Materials Method 9.2
- SAM number <0.20, tested at the Cylinder series frequency per Materials Method 9.2
- Compressive strength >3000 psi using 6” x 12” cylinders tested at the Cylinder series frequency per Materials Method 9.2

**Surface Resistivity.** The Contractor shall measure Surface resistivity and submit the results to the EIC for information only. Collect data in accordance to AASHTO T358 using 6 - 4” x 8” cylinders cast for each day’s placement with samples taken randomly from 2 different trucks of a placement. Test samples will be cured for 28 days following the requirements of ASTM C31 (15), *Standard Practice for Making and Curing Concrete Test Specimens in the Field.* The results of all test cylinder specimens representing an element placed, or part thereof, on a given day will be averaged to determine the Resistivity for each placement.

### 502-3.01 Weather Limitations

**A. Rain.** Do not pave in the rain. Supply sufficient quilted covers, plastic coated fiber blankets, or polyethylene curing covers near the paving operation when rain may be expected. Securely cover any concrete exposed to rain that has not reached initial set or will be visibly affected by the rain.

**B. Cold Weather.** Place concrete when the air temperature is 40°F and rising, or warmer, and when the surface temperature of the area to be paved is 40°F, or warmer. Stop paving when the air temperature falls below 40°F. Measure temperatures in the shade to an accuracy of 1°F. Refer to §502-3.11C, Cold Weather Curing.

### 502-3.02 Subbase Course

Furnish in accordance with Section 304, Subbase Course, before placing any PCC. If the area is available, extend the prepared subbase course at the same line, grade, and cross slope as the area being paved such that it is at least:

- 3 feet beyond the longitudinal edges of a slipform pavement.
- 1 foot beyond the outside longitudinal edges of the fixed forms.

Additional subbase course that is not included in the finished work will be paid for under Section 304 items included in the contract.

### 502-3.03 This subsection is intentionally blank.
ITEM 502.RLCF6011 Performance Engineered Mixture –

Portland Cement Concrete Pavement

ITEM 502.10516011 Constructing Transverse Joints

ITEM 502.11516011 Constructing Longitudinal Joints

ITEM 502.20516011 Sealing Transverse Joints –

Highway Joint Sealant

ITEM 502.30516011 Sealing Longitudinal Joints –

Highway Joint Sealant

502-3.04 Slipform Paving. Use equipment meeting §502-2.04A, Slip Form Paving. Establish a reference system to achieve the specified smoothness level. If string lines are used, set them by survey and use dual lines whenever possible.

Maintain uniform concrete quality and head in front of the paver. Coordinate concrete delivery to maintain continuous forward movement of the paver and avoid excessive delivery truck queues. Keep paver tracks clear of concrete and debris before and during paving.

Wet the entire subbase surface without forming puddles or mud immediately before placing concrete.

Consolidate the entire concrete placement using internal vibrators attached to the machine. Combine paver forward speed, vibrator frequency, and vibrator depth to consolidate the concrete without segregation, vibrator trails, or contacting the joint assemblies. Discontinue vibration and tamping if the paver stops.

Determine edge slump by extending a 2 foot (minimum) long straightedge over the longitudinal pavement edges. Immediately correct edge slumps greater than 1/4 inch that are between concrete placements and greater than 3/8 inch at free edges and HMA shoulders.

502-3.05 Fixed Form Paving.

A. Setting Forms. Use forms meeting §502-2.04B1, Forms. Compact the supporting layer at the form line such that the forms are supported for their full length. Set forms to string lines placed at the pavement elevation, line, and grade and to achieve the specified smoothness. If a form sits above the string line, remove the form and trim the form line to the proper grade. If a form sits below string line, remove the form and fill and compact the low area with granular material at least 6 inches on both sides of the form. Frequently check form grade and alignment while paving. Reset forms as necessary.

Set forms to accommodate a full days paving before placing concrete. Extend forms beyond construction bulkheads to provide a working platform at the end of a placement. Secure each form with a minimum of 3 pins each of sufficient length to hold the forms in place without movement during any operation. Lock the forms together such that the form ends are aligned and the joints are tight and smooth. Run the paving equipment atop the forms before placing any concrete and recheck form alignment. Reset forms as necessary.

Align keyway strips in a smooth, horizontal plane, parallel to the top of the form. Match keyway strips on abutting forms such that a nearly seamless keyway results.

B. Paving. Use equipment meeting §502-2.04B2, Paving Equipment. Apply oil to forms before placing concrete. Immediately before placing concrete, wet the entire subbase surface without forming puddles or mud. Uniformly distribute the concrete in front of the paver by maneuvering the delivery truck chute. If concrete is spread by hand, use come-alongs or shovels. Do not use rakes or hand-held vibrators to spread concrete.

Maintain uniform concrete quality and head in front of the paving machine and without running over the screeds. Coordinate concrete delivery to maintain continuous forward movement of the paver and avoid excessive delivery truck queues. Keep form tops clean before and during paving. Consolidate the entire concrete placement using internal vibrators attached to the paver. Combine paver forward speed, vibrator frequency, and vibrator depth to consolidate the concrete without
segregation, vibrator trails, or contacting the joint assemblies. Discontinue vibration and tamping if
the paver stops.

Use hand-held vibrators ahead of the paving equipment to consolidate all concrete not
consolidated by machine-mounted internal vibrators. Keep hand-held vibrators perpendicular to the
pavement surface. Vibrate between 2 and 4 seconds in each location, overlapping adjacent locations.
Do not drag vibrators through the concrete. Do not walk through consolidated concrete.

Mark the midpoint (± ½ inch) of each transverse contraction joint such that the saw cut operator
can accurately locate the first-stage saw cut locations.

C. This subsection is intentionally blank.

D. Form Removal. Remove forms after the concrete has developed sufficient strength to allow
removal without damaging the pavement. Repair pavement damaged during form removal. Remove
forms before making second-stage saw cuts.

502-3.06 Joint Construction. Provide the Engineer approved Materials Details for longitudinal joint
ties and transverse joint supports before placing any joint hardware. Construct joints in accordance with
the Standard Sheets and approved Materials Details. Do not stand on joint hardware.

Base final joint layout on construction staging and the actual location of utilities, drainage
structures, intersections, tapers, and other irregular areas. When pavement panels are tied to moment
slabs, match transverse joints in the moment slab with the transverse joints in the pavement. No moment
slab should be tied to more than 2 pavement slabs at a time.

Submit a proposed joint layout to the Engineer at least 14 calendar days prior to PCC paving.
Obtain the Engineer’s joint layout approval before paving. Include moment slab joints and final pavement
marking layout, in the joint layout that is submitted to the engineer.

Inserting dowels and/or longitudinal joint ties into plastic concrete will be considered in
accordance with the written procedures of the Materials Bureau. Submit a plan to verify dowel and tie
locations, depth, and alignment. Do not insert dowels or ties until the plan is approved by the Engineer.

Make second-stage saw cuts and bevels, clean, and seal joints in accordance with §502-3.12,
Sealing Joints.

A. Transverse Joints. Transverse joints include contraction, expansion, hinge, and construction
joints. Secure joint supports to the subbase as depicted in the Materials Details. Maintain joint
supports in their proper position and alignment during paving.

Construct transverse joints perpendicular to both the pavement surface and longitudinal joints in
the area being paved. Use a 15 foot typical transverse joint spacing for pavements having standard
slab widths of 12 and 14 feet. For pavements having other slab widths, determine typical maximum
and minimum transverse joint spacings in accordance with the following:

\[ L_{\text{max}} = W_{\text{min}} \times 1.33 \]
\[ L_{\text{min}} = W_{\text{max}} \div 1.33 \]

where:
ITEM 502.RLCF6011  Performance Engineered Mixture –
ITEM 502.10516011  Portland Cement Concrete Pavement
ITEM 502.11516011  Constructing Transverse Joints
ITEM 502.20516011  Constructing Longitudinal Joints
ITEM 502.30516011  Sealing Transverse Joints –
ITEM 502.40516011  Sealing Longitudinal Joints –

ITEM 502.50516011  Highway Joint Sealant

\[ L_{\text{max}} = \text{maximum transverse joint spacing (slab length)} \]
\[ L_{\text{min}} = \text{minimum transverse joint spacing (slab length)} \]
\[ W_{\text{max}} = \text{maximum slab width across the pavement (load carrying slabs only)} \]
\[ W_{\text{max}} \leq 15 \text{ feet} \]
\[ W_{\text{min}} = \text{minimum slab width across the pavement (load carrying slabs only)} \]

1. **Transverse Contraction Joints.** All transverse joints are contraction joints unless otherwise shown in the contract documents. Contraction joints are constructed in a straight line across the full width of the PCC pavement and shoulders. Contraction joints may be slightly angled (rather than straight across a pavement) at tied longitudinal joints between lanes placed separately if the placements do not have the same centerline, e.g., where a ramp centerline diverges from parallel to the pavement centerline. Contraction joints may terminate at, or be misaligned at, untied longitudinal joints as discussed in §502-3.06B3, Untied Longitudinal Joints with Keyway.

Store transverse contraction joint support assemblies in inverted stacks at the project site. Cover epoxy coated steel such that it is protected from direct sunlight. Handle joint supports such that no twisting or bending occurs during storage and positioning. Supports with bent, twisted, or deformed wires will be rejected.

Before placing concrete, position transverse joint supports such that the:
- Entire longitudinal axis of each dowel is located at the mid-depth of the pavement slab or up to 1 inch below the mid-depth of the slab.
- Longitudinal axes of the dowels are aligned parallel with the pavement centerline and pavement surface such that the maximum misalignment of one dowel end relative to the other is ¼ inch.
- Midpoint of the longitudinal axis of each dowel is at the center of the joint (±1 inch).
- Longitudinal axes of the two end dowels are 4 to 8 inches from the longitudinal joints.
- Longitudinal axes of the dowels are spaced 4 to 12 inches apart.

Mark the location of each transverse joint on the subbase before placing concrete such that the assembly is properly positioned. Also mark the longitudinal midpoints of the dowels such that the saw cut operator can accurately locate first-stage saw cuts. In a slipform paving operation, mark the joint support midpoint on the subbase immediately adjacent to the pavement. In a fixed form paving operation, mark the joint support midpoint on the form or such that the saw cut operator can easily locate the joint midpoint. Do not cut the shipping wires.

Use saws meeting §502-2.04E, Saw Cutting Equipment. Make first-stage saw cuts as soon as the concrete has hardened sufficiently to permit sawing without causing raveling wider than 1/8 inch. Replace blades if raveling persists. Center first-stage saw cuts within 1 inch of the longitudinal midpoints of the dowels.

Complete first-stage saw cuts before any uncontrolled cracking occurs. Be prepared to make first-stage saw cuts 24 hours a day to prevent uncontrolled cracking. Provide lighting required to make first-stage saw cuts at night at no additional cost to the State.

Sweep or wash first-stage saw cut debris from the pavement before profiling, before it rains, or before opening the pavement to any traffic, such that debris does not enter the joint.
2. Transverse Expansion Joints. Construct transverse expansion joints as part of the utility and drainage structure isolation systems depicted in the Standard Sheets or where indicated in the contract documents. Handle and position expansion joint supports in accordance with §502-3.06A1, Transverse Contraction Joints.

Construct expansion joints using 3/8 to 5/8 inches thick premoulded resilient joint filler placed in 1 piece between longitudinal joints. Tightly place and support abutting sections of joint filler such that no concrete infiltrates the joint. Place expansion caps on the dowels as depicted in the Materials Details. Do not tap or hammer the caps onto the dowels.

No saw cuts are required in expansion joint construction. Remove the finishing cap, if supplied, after the concrete has developed sufficient strength to prevent damage.

3. Transverse Construction Joints. Construct transverse construction joints wherever there is an interruption of more than 30 minutes in concrete paving operations. Construct these joints as wide as the concrete placement, typically 1 or 2 lanes, but not necessarily the full pavement width. Align construction joints with transverse contraction or construction joints in adjacent lanes. Refer to Table 502-2 for choosing the proper construction joint type.

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<tr>
<th>TABLE 502-2 CONSTRUCTION JOINT TYPES</th>
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a. **Bulkheads.** Bulkheads may be slotted or solid. Place a slotted bulkhead over the dowels of an exposed joint assembly such that half of the dowel lengths are embedded within newly placed concrete. Immediately remove plastic concrete in front of the bulkhead and from the exposed joint support.

The transverse joint assembly may be omitted and a solid bulkhead may be used. In this case, drill and anchor dowels, if required, into the transverse joint in accordance with §502-3.06D, Drill and Anchor Dowels or Ties, such that they meet the positioning requirements of §502-3.06A1, Transverse Contraction Joints. In either case, ensure the bulkhead is capable of supporting the weight of the plastic concrete.

b. **Saw Cut.** Saw cut full depth construction joints at locations that satisfy the minimum and maximum slab length requirements of §502-3.06A, Transverse Joints. Saw cut when the
concrete has obtained sufficient strength to be saw cut without damage to concrete to remain in place. Do not cut within 12 inches of a longitudinal joint tie. Remove the hardened concrete ahead of the saw cut. Drill and anchor dowels, if required, into the saw cut face in accordance with §502-3.06D, Drill and Anchor Dowels or Ties, such that they meet the positioning requirements of §502-3.06A1, Transverse Contraction Joints. Do not drill into longitudinal joint ties.

In lieu of drilling holes, the contractor may use transverse joint supports fabricated with closed-end, hollow plastic cylinders instead of dowels. Use hollow cylinders with outer diameters equal to the drilled hole diameters described in §502-3.06D, Drill and Anchor Dowels or Ties. Position cylinders as required in §502-3.06A1, Transverse Contraction Joints.

Saw cut the newly placed concrete full depth and full width through the midpoint of the longitudinal axis of each cylinder (± 1 inch). Remove hardened concrete and the joint assembly ahead of the saw cut. Remove the hollow cylinder embedded in the concrete that remains and anchor the dowels in accordance with §502-3.06D, Drill and Anchor Dowels or Ties, to the required alignment in §502-3.06A1, Transverse Contraction Joints.

c. **Removal.** Remove all concrete to the midpoint of the preceding transverse joint without damaging the dowels, dowel coatings, or the pavement to remain in place.

### 4. **Transverse Hinge Joints.**
Do not place hinge joints without the Engineer’s approval. Construct transverse hinge joints when a slab length exceeds the geometric requirements of §502-3.06, Transverse Joints. (This situation typically occurs near structures that are skewed from perpendicular to the pavement centerline.)

Locate hinge joints such that they are equally spaced between other types of transverse joints. Construct hinge joints in accordance with 502-3.06A1, Transverse Contraction Joints, except the positioning requirements do not apply. Instead, position transverse hinge joint supports such that the:

- Entire longitudinal axis of each deformed bar is located at the mid-depth of the pavement slab or up to 1 inch below the mid-depth of the slab.
- Longitudinal axes of the bars are aligned parallel with the pavement centerline and pavement surface such that the maximum misalignment of one bar end relative to the other is 1 inch.
- Midpoint of the longitudinal axis of each bar is at the center of the joint (±1 inch).
- Longitudinal axes of the two end bars are 4 to 10 inches from the longitudinal joints.
- Longitudinal axes of adjacent bars are spaced 4 to 18 inches apart.

### B. **Longitudinal Joints.**
When required, Select tie type, size, spacing, and positioning in accordance with the contract documents. Provide a minimum clearance of 3 inches between the end ties in a slab and any part of the transverse joint support. Keep ties free of materials that inhibit bonding to concrete or anchoring material. Maintain ties in their proper position during paving.

Eliminating a longitudinal joint (and subsequent sawing and sealing) between a shoulder and adjacent lane is optional provided (1) the lane and shoulder are paved simultaneously and (2) the resulting slabs meet the geometric requirements detailed in §502-3.06A, Transverse Joints.
When longitudinal joints do not align with permanent pavement markings, the Contractor shall furnish additional longitudinal joint ties at a minimum of ½ the normal longitudinal joint spacing.

1. **Longitudinal Joints Between Lanes Paved Simultaneously.** Use one-piece ties fabricated into assemblies capable of securely holding 2 or more ties. Secure the assemblies to subbase prior to paving in accordance with the Materials Details.

   Make first-stage saw cuts parallel to the pavement centerline and perpendicular to the pavement surface before uncontrolled cracking occurs. Use equipment specified in §502-2.04E, Saw Cutting Equipment. Replace saw blades if raveling wider than 1/8 inch occurs. Center first-stage saw cuts within 1 inch of the longitudinal midpoint of the ties.

   Sweep or wash first-stage saw cut debris from the pavement before profiling, before it rains, or before opening the pavement to any traffic, such that debris does not enter the joint.

2. **Tied Longitudinal Joints Between Lanes Paved Separately.** In a slip form operation, construct a butt joint and drill and anchor one-piece ties into the hardened concrete in accordance with §502-3.06D, Drill and Anchor Dowels and Ties.

   Use # 6 ties, 28 inches long between travel lanes and 18 inches long between a travel lane and a PCC shoulder. Anchor ties between travel lanes 12 inches into the previously placed concrete, leaving 16 inches projecting from the joint face. Anchor ties between a travel lane and a PCC shoulder 8 inches into the previously placed concrete, leaving 10 inches projecting from the joint face.

   Place end ties in a slab 12 to 14 inches from the transverse joint. Typically, space ties between the end ties 24 inches apart, maximum. Pavements having 4 or more tied lanes, or 3 lane pavements 12 inches (or more) thick, may require a decreased spacing in accordance with the contract documents.

   In a fixed form operation, construct either a butt or a keyed joint. If a butt joint is constructed, drill and anchor longitudinal joint ties as described above. If a keyed joint is constructed, use multiple-piece ties. Apply a corrosion inhibiting coating to the threads of all components before assembly. Bolt the female portion of the tie to the form prior to paving as depicted in the Standard Sheets. Insert and tighten the male ends before paving the adjacent lane. Ensure all threaded connections are tight.

   First-stage saw cuts are not required between lanes paved separately.

3. **Untied Longitudinal Joints with Keyway.** Construct untied longitudinal joints with keyways at utilities and/or drainage structures, at intersections, between adjacent lanes having non-parallel center lines (such as ramps), or where indicated in the contract documents. Form as depicted in the Standard Sheets. Transverse joint type, location, and alignment may be changed when a transverse joint intersects an untied longitudinal joint.

   Patch honeycombing along the untied longitudinal joint face to achieve a smooth surface prior to applying the bond breaker and placing the adjacent concrete.

   First-stage saw cuts are not required.

**C. Utility and Drainage Structures and Telescoping Manholes.**
Detail jointing around each utility and drainage structure in the proposed joint layout submitted to the Engineer for approval. When possible, do not isolate, or “box out,” utilities and drainage structures from the pavement. Instead, set and center utilities and drainage structures between transverse joints. Use a minimum slab length, $L_{\text{min}}$, as defined in §502-3.06A, Transverse Joints. Reinforce the slab that contains the structure. Select reinforcement size and spacing such that:

$$A_s \geq 0.0018(s)(t)$$

where:

- $A_s$ = Area of a steel bar (in$^2$)
- $s$ = Spacing of steel bars (in). Minimum 3” clearance between bars.
- $t$ = Slab thickness (in)

Use mat reinforcement with steel in both directions. Use top and bottom double mat reinforcement for slabs thicker than 10”. Refer to the Standard Sheet for mat reinforcement placement locations. Pave the slab with the structures at the same time as the surrounding pavement. When using telescoping manholes, remove temporary support bolts from the telescoping manhole casting as soon as the concrete hardens.

**D. Drill and Anchor Dowels or Ties.** Use drills meeting §502-2.04I and chemically curing anchoring material meeting §701-07. Do not drill holes until the concrete has developed sufficient strength to withstand drilling without damage. Damage from drilling will be treated in accordance with §502-3.14, Damaged or Defective Concrete.

Drill such that the hole diameters are in accordance with the anchoring material manufacturer’s written recommendations. Give those recommendations to the Engineer before drilling any holes. Replace worn bits when necessary to ensure the proper hole diameter is drilled.

Follow the anchoring material manufacturer’s written recommendations for cleaning the holes. Give those recommendations to the Engineer. As a minimum, clean the drilled holes with compressed air using equipment meeting 502-2.04L, Air Blasting Equipment. Insert the nozzle to the back of the hole to force out all dust and debris.

When using new cartridges of anchoring material, ensure the initial material exiting the nozzle appears uniformly mixed. If it is not uniformly mixed, waste the material until uniformly mixed material extrudes.

Place the anchoring material in the back of the hole using a nozzle of sufficient length. Push the dowel or tie into the hole while twisting such that the air pocket within the hole is heard to burst and the anchoring material is evenly distributed around the bar. Use sufficient amounts of anchoring material such that it slightly extrudes out the hole as the bar is inserted.

**502-3.07 Paving Adjacent To Existing Concrete.** Wherever paving equipment operates on existing PCC pavement that is to remain, install bolt-on track covers or rubber tired, flangeless wheels. Remove all debris on the existing PCC pavement in the equipment track. Immediately remove any concrete that spills onto the existing concrete.
When paving from (or to) a transverse construction joint or intersecting pavement, use hand-held vibrators to thoroughly consolidate any concrete inaccessible to the paving equipment vibrators. Hand finish these areas with the minimum effort required to produce an acceptable surface. Do not dump the grout box head into the pavement concrete when approaching a construction joint.

**502-3.08 Plastic Thickness Determination.** Provide the Engineer with a round, rigid, nonaluminum probe, having a 1/8 inch diameter. The Engineer will determine the plastic concrete thickness by inserting the probe and measuring the insertion depth. The Engineer will check thickness at least every 150 feet of paving and at least 2 feet from the placed edge. Keep several probes at the project.

The minimum measured plastic thickness must be equal to (-1/4 inch) or greater than the thickness required in the contract documents. Areas not meeting minimum thickness will be treated in accordance with §502-3.14, Damaged or Defective Concrete. If 2 consecutive measurements do not meet minimum thickness, stop paving and reestablish the paving operation to achieve acceptable thickness.

**502-3.09 Finishing.** Mechanically finish the pavement after consolidation and strike off. Use machine mounted finishers such as full-width finishing pans, transverse oscillating screens, longitudinal floats, pan floats or separate pieces of equipment such as tube floats. Correct bumps with a 16 foot straight edge or bump cutter specifically made for finishing concrete.

After mechanical finishing, hand finish the pavement to correct and seal minor imperfections. Provide an ACI certified concrete flatwork finisher to supervise all hand finishing. Provide proof of ACI flatwork certification to the Engineer. Hand finish with magnesium floats, lutes, and/or trowels. Keep hand finishing to a minimum. Do not use excess mortar or discarded concrete to fill low areas. Use work bridges to hand finish concrete inaccessible from the pavement edge. Do not add water to the concrete surface to close imperfections. Stop paving or reformulate the concrete mix if surface imperfections that require additional water to close routinely occur.

**502-3.10 Texturing.** Immediately after finishing and prior to applying the curing compound, texture the concrete surface using one of the following procedures in accordance with the contract documents. Apply longitudinal tining if no texturing method is designated in the contract documents. If the contract has a closed drainage system, provide a 8 - 12 inch blank in the texture along the pavement edges to enhance drainage to catch basins.

**A. Longitudinal Tining.** Texture the concrete parallel to the pavement centerline with a set of evenly spaced spring steel tines. Use rectangular tines 1/8 inch wide, 1/32 inch thick, and approximately 5 inches long at a center-to-center spacing of 3/4 inches.

Operate the tine head manually or mechanically. In either case, hold the tines as near an angle of 45° to the concrete surface as possible to minimize mortar dragging. Produce tine texture 1/16 - 1/8 inch deep with minimal dislodging of aggregate. Do not make multiple tine passes in the same area. Keep tines 2 - 4 inches from the placement edges. Keep the tines free of hardened concrete.

**B. Artificial Turf Drag.** Use a seamless strip of artificial turf drag appearing on the Department's Approved List entitled “Turf Drag” under “Equipment, Concrete Related.” Produce a consistent texture, free of ridges or gouges, parallel to the pavement centerline either by hand or by attaching a

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weighted strip to the paver, texture/cure machine, or work bridge. Periodically replace or clean the drag to remove hardened concrete paste that compromises texture.

502-3.11 Curing. Keep the curing operation close to the texturing operation such that concrete is cured immediately after it is textured. The Engineer may stop paving if curing lags. Cure concrete in accordance with Materials Bureau requirements based on the Contractor-submitted mix design and the trial batch evaluation.

A. White Pigmented Membrane Curing Compound. Typically, cure concrete with white pigmented membrane curing compound. Use equipment meeting §502-2.04F, Curing Compound Applicators. Mix the curing compound before each use and continuously agitate during use. Thoroughly and uniformly coat all exposed surfaces (including slipformed edges and formed edges immediately after form removal) at a minimum rate of 150 sf/gal such that the coated surfaces are completely white. Check the application rate after every paving day, including exposed vertical slab faces in the calculations. Apply the curing compound in 2 opposite direction passes with no longer than 15 minutes between passes.

Immediately reapply curing compound to any damaged coating areas during the curing period. During curing equipment breakdown, cure the pavement in accordance with §502-3.11B, Curing Covers. Do not apply curing compound in the rain. If rain damages the curing compound before it sets, reapply curing compound after the pavement surface dries.

B. Curing Covers. Use of curing covers is subject to the approval of the Engineer. Use quilted covers, plastic coated fiber blankets, or polyethylene curing covers. Do not use covers with tears or holes. Cover all exposed surfaces and extend the covers a minimum of 12 inches beyond the pavement edges or beyond the forms, when used. Overlap successive covers 12 inches, minimum. Secure the covers to keep them in contact with the entire surface and maintain the overlap. Wet the entire surface of quilted covers and maintain them in a wetted condition throughout the curing period.

C. Cold Weather Curing. Supply form insulating materials for winter concreting when the air temperature is expected to fall below 40°F at any time during the curing period. Use material capable of maintaining a surface temperature of 55°F and being easily removed and replaced to accommodate first-stage saw cuts. Apply the insulating material to prevent newly placed concrete from being exposed to air temperatures below 35°F for the curing period. Secure the insulation tight to the concrete surface to prevent air intrusion beneath the insulation. Extend the insulation 12 inches beyond the newly placed concrete. Insulate the pavement vertical edge and/or forms as well.

Place recording surface thermometers between the pavement surface and insulating material 12 inches from one of the placement edges wherever insulation is used. Use 4 equally spaced thermometers for each day’s paving. Do not subject the concrete to a temperature drop in excess of 50°F during the first 24 hours after removing the insulation.

502-3.12 Sealing Joints. Permanent joint sealing of new concrete pavement must be completed by November 15th of the same calendar year as placement.
First-stage sawcuts may be temporarily left unfilled if a placement is only subjected to occasional construction traffic, such as pickup trucks or cars. In this case, sweep the pavement to ensure debris does not enter the joints.

Temporarily fill unsealed first-stage cuts with jute or backer rod if a placement is:

- Subjected to consistent construction traffic.
- Used as a haul road for subsequent concrete placements.
- Temporarily opened to general traffic while final sealing has been delayed for convenience, such as to maximize sealing production.

Before cleaning, remove any temporary fillers and repair damaged joints in accordance with §502-3.14, Defective or Damaged Concrete, including chipped joints resulting from debris accumulation in an unfilled or unsealed joint.

**A. Sealing Transverse and Longitudinal Joints - Highway Joint Sealant.** Widen joints to 1/4 - 3/8 inch for a depth of 1 inch if the first-stage saw cuts are less than 1/4 inch wide to allow full-depth sealing. Immediately wash the widening cut slurry from the pavement such that it does not reenter the joint.

Clean the joints by abrasive blasting immediately before sealing. Keep the nozzle within 2 inches of the joint surfaces. The Engineer may allow pressure washing in lieu of abrasive blast cleaning if it is not allowed in the contract. When pressure washing, use (1) a 900 psi minimum pressure and (2) a maximum pressure such that no damage occurs to the concrete. Manually dislodge debris remaining in the joint after cleaning, and reclean the joint. Immediately after pressure washing, air blast the joint to remove any debris from the cut and dry the exposed faces.

Do not allow any traffic on the pavement between cleaning and sealing. Reclean the joint if it rains between cleaning and sealing or if any traffic is on the placement between cleaning and sealing. Provide the Engineer a copy of the sealant Manufacturer's written recommendations for heating and application at least 1 work day before sealing. Follow those recommendations. Unless stated otherwise, the recommended pouring temperature is 40°F below the manufacturer's designated safe heating temperature, with an allowable variation of 40°F.

Prior to sealing, discharge sealant from the applicator wand into a vessel and measure the sealant temperature. The temperature must be equal to or above the Manufacturer’s recommended minimum pouring temperature and equal to or below the Manufacturer’s recommended safe heating temperature.

Do not use sealant heated above the safe heating temperature. Sealant may be reheated or heated in excess of 6 hours if allowed by the Manufacturer’s heating and application recommendations. In these cases, recharge the melter with fresh sealant amounting to at least 20% of the sealant volume remaining in the melter.

Seal joints immediately after cleaning. Use equipment meeting the requirements of §502-2.04K, Joint Sealing, Highway Joint Sealant. Seal the joint from the bottom of the cut to within 1/2 inch of the pavement surface. Seal when the:

- Air and surface temperatures are 40°F or warmer.
- Air temperature is above the dew point.
- Pavement surface and all joint surfaces are dry.
Open to traffic after the sealant has cured to prevent tracking. Do not blot with fine aggregate.

**B. The subsection is intentionally blank.**

**C. Sealing Joints - Preformed Joint Sealers.** Make second-stage saw cuts and/or bevels in accordance with the Standard Sheets and (1) no sooner than 72 hours after concrete placement and (2) after the curing period has ended if curing covers are used. Extend the second-stage saw cut vertically down the free concrete edges. Wash the resulting slurry from the pavement and joint immediately after making second-stage saw cuts and/or bevels.

Second-stage saw cuts may be delayed for convenience, but do not leave second-stage saw cuts unsealed or unfilled while open to any traffic. Temporarily fill second-stage saw cuts with jute or backer rod if (1) they are exposed to any traffic before cleaning and sealing or (2) weather conditions are not favorable for timely (within 2 calendar days) cleaning and sealing, whether or not they are exposed to any traffic.

Clean the joints by pressure washing before sealing. Use (1) a 900 psi minimum pressure and (2) a maximum pressure such that no damage occurs to the concrete. Manually dislodge debris remaining in the joint after cleaning, and reclean the joint. Within 24 hours of pressure washing, air blast the joint to remove any debris from the cut and dry the exposed faces. Reclean the joint if it rains between cleaning and sealing. Do not allow any traffic on the pavement between cleaning and sealing.

Install the sealant in accordance with the Manufacturer’s written instructions. Give those instructions to the Engineer before any second-stage saw cutting begins. Lubricate the concrete, the sealer, or both before installation such that the lubricant fully covers the sealer/concrete interface, but not the top of the sealer.

Install one piece of transverse joint sealer in a compressed condition across the full pavement width, including concrete shoulders, and down the vertical saw cut at the free edge. Cut the longitudinal sealer where it crosses a transverse joint. Do not splice the longitudinal sealer between transverse joints. Seal the intersection between longitudinal and transverse sealers with lubricant.

Install the sealer such that it is not stretched more than 5%, nor compressed more than 2%, of the minimum theoretical length. Check the installation for stretch and compression by installing sealers in 5 transverse joints and removing the sealer immediately after installation and checking the length. An alternate method for checking stretch and compression, where applicable, may be performed by premarking or precutting the sealer to length prior to installation. If the measurement of any of these 5 sealers exhibits stretching in excess of 5% or compression in excess of 2%, modify the installation method to meet the requirements or discontinue installation.

Once sealing operations begin, remove 1 joint per 100 in the presence of the Engineer to check stretch and compression. If the sealer is found to be stretched in excess of 5% or compressed in excess of 2%, remove the sealer material from successive joints in both directions until sealers are found that meet the stretch and compression requirements. Replace all joints sealers found with excess stretch or compression. Replace joint sealers removed and found to meet the stretch and compression requirements.
502-3.13 **Pavement Protection.** Protect the pavement and appurtenances from traffic and construction operations. Protect the work and provide for traffic as indicated in the contract documents.

502-3.14 **Damaged or Defective Concrete.** The Engineer will identify all areas of damaged and defective concrete. Submit a repair plan for these areas. The repair plan is subject to the Engineer’s approval. Repair or replace all damaged or defective concrete in accordance with the approved repair plan prior to final acceptance at no cost to the State. Damage and defects include, but are not limited to, cracking, spalling, honeycombing, or imperfections caused by inadequate pavement protection, traffic, and/or construction practices. Slipformed concrete with inadequate plastic thickness as described in §502-3.08, Plastic Thickness Determination, will be rejected in 150 foot segment lengths.

502-3.15 **Hardened Surface Tolerance (Nonprofilographed Concrete).** After the concrete has hardened sufficiently, test the entire longitudinal center of each travel lane, including ramps, with a 10 foot, minimum, long straight edge laid both longitudinally and transversely. The Engineer will mark longitudinal deviations in the pavement surface exceeding 1/4 inch in 15 feet and transverse deviations exceeding ¼ inch in 10 feet. Corrective action must be taken to repair surfaces out of tolerance.

Shoulders and other areas not routinely exposed to traffic must meet ¼ inch in 10 feet both longitudinally and transversely.

502-3.16 The subsection is intentionally blank.

502-3.17 The subsection is intentionally blank.

502-3.18 **Opening to Traffic.** The pavement may be opened to general traffic if all the following apply:

- Average compressive strength of all cylinder pairs exceed 3000 psi.
- Average compressive strength of each cylinder pair exceeds 2500 psi.
- Appropriate time frame has elapsed for the entire area to be opened.
- Automobile only areas may be opened at 1500 psi.

**Project Strength Determination.** Provide an ACI Certified Concrete Field Testing Technician, Grade I, or higher, to cast all cylinders. Unless otherwise noted in the contract documents, use an agency accredited by the AASHTO Accreditation Program (AAP) in the field of construction materials testing of portland cement concrete to perform compressive strength testing. Cast and test in the presence of the Engineer, or the Engineer’s representative. Provide acceptable proof of ACI Certification and AASHTO Accreditation to the Engineer before placing any concrete.

The Engineer, or the Engineer’s representative, will complete the Concrete Cylinder Report as cylinders are cast and tested.

The Contractor may use one of the following methods for project strength determination:

1. **Strength Determination Method 1.** Cast a minimum of 3 cylinder pairs (6 total) from each 1000 feet of paving length, or fraction thereof, in accordance with Materials Method 9.2,
Field Inspection of Portland Cement Concrete. Cast each pair from different delivery trucks. Develop an Engineer-approved marking system that allows a cylinder to be readily associated with the corresponding placement location and placement time. Mark the cylinders and place them adjacent to the pavement under similar curing conditions. Determine the concrete compressive strength at the desired time in accordance with ASTM C39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

If these conditions are not met, test 3 additional cylinder pairs at a later time, provided the appropriate numbers of additional cylinders were cast.

2. **Strength Determination Method 2.** Development of a concrete maturity curve will be accepted for project strength determination in lieu of compressive strength testing described above. Develop a maturity curve in accordance with ASTM C-1074, Standard Practice for Estimating Concrete Strength by the Maturity Method.

502-4 **METHOD OF MEASUREMENT.** The Engineer will measure the following quantities for items incorporated into the finished pavement:

502-4.01 This subsection is intentionally left blank.

502-4.02 **PCC Pavement, Unreinforced.** The work will be measured for payment as the number of cubic yards of unreinforced PCC pavement satisfactorily placed based on the payment lines shown in the contract documents. Deductions in 150 feet segment lengths will be made for areas that do not meet minimum plastic thickness requirements. Deductions (and separate payment) will be made for catch basins, manholes, or other similar pavement obstructions requiring either mesh reinforced or heavily reinforced placements.

502-4.03 **PCC Pavement, Mesh or Heavily Reinforced.** The work will be measured for payment as the number of cubic yards of reinforced concrete satisfactorily placed. No deductions will be made for drainage and utility structures or other similar pavement obstructions within the placement.

502-4.04 This subsection is intentionally left blank.

502-4.05 **Constructing Transverse Joints.** The work will be measured for payment as the number of feet of transverse joints satisfactorily constructed.

502-4.06 **Constructing Longitudinal Joints.** The work will be measured for payment as the number of feet of longitudinal joints satisfactorily constructed.

502-4.07 **Sealing Transverse Joints.** The work will be measured for payment as the number of feet of transverse joints satisfactorily sealed, excluding preformed sealers turned down at the pavement edges.
ITEM 502.RLCF6011 Performance Engineered Mixture -
ITEM 502.10516011 Constructing Transverse Joints
ITEM 502.11516011 Constructing Longitudinal Joints
ITEM 502.20516011 Sealing Transverse Joints –
ITEM 502.30516011 Sealing Longitudinal Joints –

502-4.08 Sealing Longitudinal Joints. The work will be measured for payment as the number of feet of longitudinal joints satisfactorily sealed.

502-5 BASIS OF PAYMENT

502-5.01 This subsection is intentionally blank.

502-5.02 PCC Pavement, Unreinforced. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work, up to and including first-stage saw cuts, in the unit price bid for PCC Pavement, Unreinforced. No payment will be made for areas that do not meet minimum plastic thickness requirements. No additional payment will be made for Contractor-requested HES concrete mixes.

PCC Pavement, Unreinforced will be eligible for progress payments in accordance with the following:

- 90% upon satisfactory completion of all work up to, and including, first-stage saw cutting.
- The remaining 10% upon satisfactory completion of the work.

502-5.03 This subsection is intentionally blank.

502-5.04 This subsection is intentionally blank.

502-5.05 PCC Pavement, Mesh or Heavily Reinforced. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work, up to and including first-stage saw cuts, in the unit price bid for PCC Pavement, Mesh or Heavily Reinforced. No payment will be made for areas that do not meet minimum plastic thickness requirements.

502-5.06 Constructing Transverse Joints. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Constructing Transverse Joints.

502-5.07 Constructing Longitudinal Joints. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Constructing Longitudinal Joints. Placing the inside shoulder and inside lane simultaneously, at the Contractor’s option, will not generate a Significant Change in the Character of Work. No additional payment will be provided for the additional number of longitudinal joint ties associated with:

- Constructing butt joints between lanes placed separately in a slipform paving operation.
- Constructing longitudinal joints in wheelpaths.

502-5.08 Sealing Transverse Joints. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Sealing Transverse Joints.

502-5.09 Sealing Longitudinal Joints. Include the cost of all labor, material, and equipment necessary to satisfactorily perform the work in the unit price bid for Sealing Longitudinal Joints. Placing
the inside shoulder and inside lane simultaneously, at the Contractor’s option, will not generate a Significant Change in the Character of Work.

Payment will be made under:

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<th>Item No.</th>
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<td>502.RLCF6011</td>
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<td>2 – Heavily Reinforced</td>
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DESCRIPTION
Develop a Performance Engineered Mixture (PEM) for Portland Cement Concrete (PCC) pavement applications to meet specified performance criteria. The PEM shall be used at locations specified in the contract.

The Contractor shall perform all Quality Control (QC) activities, including providing a QC plan for PCC production, sampling and testing of concrete as required to produce PCC that meets all specification requirements, and provide control charts to track mixture characteristics.

MATERIALS
The provisions of §502-2 shall apply, except as modified herein.

1. Design a concrete mixture proportioned according to AASHTO PP 84, Developing Performance Engineered Concrete Pavement Mixtures, for the below specified performance criteria. The mix shall have a well graded aggregate gradation to minimize the paste content while maintaining workability. Aggregate gradation shall meet the requirements of the Tarantula curve (or Shilstone method or 8-18 method) as defined by FHWA at https://www.fhwa.dot.gov/pavement/concrete/pubs/hif15019.pdf

   Produce a homogeneous mixture of cement, pozzolan (fly ash or GGBFS), fine aggregate, coarse aggregate, air entraining agent, water-reducing and set-retarding admixture, and water using NYSDOT Approved List materials. Other admixtures may be used as approved by the Director, Materials Bureau.

2. Design a concrete mixture to meet the following requirements:
   - Hardened samples (compressive and flexural strength samples), cured as per ASTM C31
   - Compressive Strength of 3,000 psi minimum at 28 days per ASTM C39 based on ACI 214
   - Flexural Strength of 600 psi minimum at 28 days as per AASHTO T97
   - Slump as desired by contractor for workability per ASTM C143
   - Entrained Air of 5% to 10% per ASTM C231
   - Super Air Meter (SAM) number ≤0.20 using AASHTO TP118
   - Water/Total Cementitious Material Ratio of 0.40 maximum
   - Paste volume maximum 25% as defined by AASHTO PP84
   - Resistivity ≥16.5 kΩ-cm on 4”x 8” cylinders, using AASHTO T358

3. Provide a copy of the proposed mixture design(s) and test batch results to the Director, Materials Bureau, submitted through the Regional Materials Engineer. Submit sufficient data to permit an informed evaluation. Include at least the following:
   - Concrete mix proportions
   - Aggregate composition and gradation
   - Material sources. Include fineness modulus and specific gravity for all aggregates
   - Compressive Strength at desired age of opening to traffic, and 7, 14 and 28 day results
   - Flexural Strength at 28 days
   - Target slump for placement
   - Target air content of plastic concrete
4. Once the mix design has received preliminary approval, schedule a trial placement with the Department and the Contractor. The trial placement shall simulate the estimated haul times for the project and consist of a minimum 4 cubic yard batch:

- Minimum 10’ x 10’ panel to be placed and finished by the Contractor.
- Minimum of 15 – 4’’ x 8’’ cylinders for compression tests at desired opening time to traffic, 7, 14 and 28 days and resistivity testing)
- 2 – 6’’ x 6’’ x 30’’ beams for flexural tests.

Samples shall be tested and cast by an American Concrete Institute (ACI) Certified Concrete Field Testing Technician, Grade 1, or higher, provided by the Producer or Contractor. Samples shall be cured in accordance to ASTM C31.

The Certified Technician will collect the following data and provide the results to the Department:

- Slump
- Entrained Air
- SAM number
- Aggregate gradation

The Producer shall provide copies of the mix batch tickets to the Department. The concrete cylinders and beams will be taken into possession by the Department within 48 hours. The Department will carry out testing on the samples and determine final acceptability of the mix within 30 days.

Substantial changes, such as source and material substitutions to the approved mix design will not be allowed. Resubmit any proposed mixture design changes to the Regional Materials Engineer for evaluation.

CONSTRUCTION DETAILS
The provisions of §502-3 shall apply, except as modified herein:

Prior to any concrete placement, final approval of the mix designs must be received from the Director, Materials Bureau.

Quality Control
Develop and submit for approval a QC Plan (QCP) for batching and delivery of concrete to meet the defined performance criteria above and to maintain quality of the mixture during production. The QCP shall encompass all activities of production and transportation of concrete.

The QCP shall detail the operations at the production facility, describing how such operations are
in conformance with the specifications including but not limited to:

- Mixture design(s)
- Plant conditions and operations
- Delivery vehicle conditions
- Material management
  - Cements compliance
  - Aggregate stockpile management, gradation, and friction
  - Admixture condition, use, and compatibility
- Batching operations and QC
- Transportation operations and QC
- Outlining testing frequencies, testing procedures, and documentation
- Maintaining certifications and documentation

Sampling and testing at the concrete production facility shall be per Materials Method (MM) 9.1 Plant Inspection or Portland Cement Concrete (PCC).

**Quality Control (QC) Sampling and Testing**
The Contractor shall

- Perform QC sampling and testing of plastic PCC for all placements. Contractor results will not be used for acceptance.
- Ensure that all tests are in compliance with this specification and targeted values in the approved mixture design.
- Provide an American Concrete Institute (ACI) Certified Concrete Field Testing Technician, Grade 1, or higher to perform the following practices and tests when sampling and testing plastic PCC:
  - Concrete Sampling per ASTM C172
  - Concrete Temperature per ASTM C1064
  - Concrete Slump per ASTM C143
  - Concrete Air Content by Pressure Method per ASTM C231
  - SAM Number as per AASHTO TP118
- Provide acceptable proof of ACI Certification of the Concrete Field Testing Technician before placing any concrete.
- Properly maintain and calibrate all equipment prior to use by the Contractor and provide calibration records for all equipment being used.
- Develop and maintain control charts to be provided to the Department for the following:
  - w/c ratio of each batch
  - paste content of each batch
  - slump for all tests performed
  - air content for all tests performed
  - SAM number
  - aggregate gradations
  - aggregate moisture contents

Field sampling and testing rate/frequency will be daily on the first load/batch and subsequent loads/batches until consistency of production is proven. QC sampling and testing may then be gradually reduced to a frequency of one set of tests per 50 cubic yards of concrete placed.
SAM number shall be collected on every 100 cubic yards of concrete placed.

**Quality Assurance (QA) Acceptance Sampling and Testing**

Acceptance sampling and testing will be performed by the Department only after the QC testing is complete and the concrete is presented to the Department as being in compliance with contract documents. Acceptance sampling and testing will be performed at least once a day or every 200 cubic yards of concrete placed. Concrete samples will be collected from random batches.

The Department will cast 9 - 4” x 8” cylinders, 6 for compressive strength testing and 3 for resistivity testing. Test samples will be cured by the Department for 28 days following the requirements of ASTM C31, *Standard Practice for Making and Curing Concrete Test Specimens in the Field.*

Acceptance testing of the PEM Concrete consists of the following tests and requirements:

- **Air content:** 5% to 10%
- **SAM number:**
  - ≤ 0.25: Acceptable.
  - > 0.25 ≤ 0.30: Action is required to bring SAM number down.
  - > 0.30: Reject.
- **Compressive strength:** ≥3,000 psi at the required opening time to traffic, as determined by testing 6 - 4” x 8” cylinders.

**Surface Resistivity.** The Department will measure Surface resistivity for information only. Data will be collected in accordance to AASHTO T358 using 3 - 4” x 8”.

**METHOD OF MEASUREMENT**

The Quality Control work for the Performance Engineered Concrete will be measured for payment on a Dollars-Cents basis.

**BASIS OF PAYMENT**

The Department will reimburse the Contractor the fixed amount for the cost of the mixture design, laboratory testing for mixture acceptance, development of a QC Plan, QC sampling and testing throughout production, and informational data collection.

Progress payments will be made as follows:

40 percent of the quantity will be paid for after development of a QC Plan and mix design. 40 percent of the quantity will be paid for after the concrete QC has been completed. The remaining 20 percent will be paid for after data and control charts have been provided to the Department.

504.00000011  Performance Engineered Concrete Mixture  Dollars-Cents

for Pavement
DESCRIPTION
This work shall consist of Diamond Grinding concrete surfaces to an International Roughness Index (IRI) value of 70 inches/mile in accordance with the contract documents and as directed by the Engineer.

MATERIALS AND EQUIPMENT
Provide the Engineer with certification that the equipment being used meets the requirements of this specification at least 7 days before start of operation. Maintain the equipment in proper working order. Immediately replace any out-of-round wheels. Do not use equipment that causes raveling, aggregate fractures, or joint deterioration.

Production Diamond Grinding Equipment. Use a self-propelled machine specifically designed for grinding and meeting the following requirements:
- Equipped with 50 – 60 gang-mounted diamond saw blades per foot on a multi-blade arbor capable of producing a 3 foot wide, minimum, strip of ground surface
- Using blade spacers having a minimum thickness of 0.105 inches. Inform the Engineer of spacer thickness selected.
- Equipped with a vacuum system capable of removing slurry from the pavement surface, leaving the surface in a clean, near-dry condition.
- Equipment must weigh a minimum of 35,000 pounds with the grinding head.
- Having an effective wheel base (distance from the transverse pivot points of the front wheel assembly and the profile/depth-control/ground drive wheels) of 12 feet minimum.

Inertial Profiler. Use an inertial profiler and operator that are certified by the NYS DOT to collect ride data for analysis. Perform testing in accordance with AASHTO R57. Certification must be dated in the same calendar year as testing.

CONSTRUCTION DETAILS
General. Diamond grind the surface longitudinally, beginning and ending at lines normal to the surface centerline, and in full travel lane width increments. Provide surface drainage by maintaining the proper surface cross slope and by blending adjacent passes. Grind such that there is no unground surface area between passes and the passes do not overlap by more than 1 inch.

Continuously vacuum the slurry from the surface when production grinding. If roadside slurry discharge is not allowed by the contract documents, transfer the slurry into equipment capable of transporting it from the contract site without spills. Dispose of slurry in conformance with all Federal, State, and local regulations.
Do not allow slurry to enter:
- Occupied travel lanes.
- Drainage structures.
- Wetlands, streams, estuaries, or sensitive environmental resources.
After grinding, test the concrete surface using a 15 foot straightedge laid longitudinally and a 10 foot straightedge laid transversely. Re-grind any areas determined by the Engineer to exceed ¼ inch in 15 feet longitudinally and/or ¼ inch in 10 feet transversely.

**Production Grinding.** Grind the surface longitudinally such that at least 95% of the surface is diamond ground. Grind such that there is no unground surface area between passes and the passes do not overlap by more than 1 inch. Sections with overhead obstructions which prevent diamond grinding are exempt from grinding.

**Bridge Decks and Approach Slabs.** Grind surface to an approximate depth of 3/16 inch to obtain a smooth texture. Grind the surface longitudinally such that at least 95% of the surface is diamond ground. If the existing bridge joint system is to remain, feather the surface to match the existing joint elevation. Achieve a uniform cut which is flush to the existing joint.

Saw cut groove and apply penetrating sealer in accordance to the Contract documents and specifications after diamond grinding is complete. Payment for these items will be made under the appropriate items.

**Inertial Profiling.** Driving lane sections that are less than 528’ or have a posted speed limit less than 45 mile per hour will be exempt from inertial profiling requirements.

Measure and report pavement longitudinal profile for each section after diamond grinding is completed. Perform testing in accordance with AASHTO R57, Operating Inertial Profiling Systems. Provide the Engineer inertial profiler raw data, capable of being imported into PROVAL, from each wheelpath. Calculate IRI for each 528’ segment and each 25’ localized segment by averaging the wheel path IRI values within each segment. Report IRI to the Engineer. Each 528 foot segment must have an IRI of 70 in/mile or less and each 25 foot localized segment must be 140 in/mile or less.

**METHOD OF MEASUREMENT**

This work will be measured as the number of square yards of Diamond Grinding satisfactorily completed. No deductions will be made for isolated low areas, provided 95% of the surface is diamond ground.

**BASIS OF PAYMENT**

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

Payment will be made under:

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<td>Production Diamond Grinding to an 70in/mile IRI</td>
<td>Square Yards</td>
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<td>ITEM 525.X0516011</td>
<td>Diamond Grinding to an IRI Value of 70 Inches/Mile</td>
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<td>ITEM 525.X0516111</td>
<td>Diamond Grinding to an IRI Value of 70 Inches/Mile With Slurry Removal</td>
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<td>ITEM 525.X0516211</td>
<td>Bridge Deck and Approach Slab Diamond Grinding With Slurry Removal Square Yards</td>
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525. X0516111 Production Diamond Grinding to an 70in/mile Square Yards IRI With Slurry Removal
525. X0516211 Bridge Deck and Approach Slab Diamond Grinding Square Yards With Slurry Removal
ITEM 555.80010001 - CRACK SEALING BY EPOXY INJECTION (PREVENTION)
ITEM 555.80020001 - CRACK REPAIR BY EPOXY INJECTION (RESTORATION)

**DESCRIPTION:** Install injection ports, seal the crack opening, inject the crack with epoxy (full depth for restoration work, or as deep as conditions allow for prevention work), and restore the sealed surface to a flush condition in areas visible to the public. Perform the work at locations indicated on the contract plans or where directed by the Engineer.

PREVENTION - use in contaminated, cracked concrete areas to prevent movement and protect reinforcing.

RESTORATION - use in uncontaminated cracked concrete areas to restore structural integrity. Take verification cores for payment. Have an experienced epoxy manufacturer representative present until the work is acceptable to the Engineer.

**MATERIAL REQUIREMENTS:**
1. Crack Sealant - epoxy paste that completely cures in 4 hours or less and retains the injected epoxy. Any other type of crack sealant is subject to a project demonstration and approval by the Engineer.

2. Low Viscosity Injection Epoxy - Manufacturer certified to meet ASTM C881, Type I or IV, Grade 1, Class B or C (as temperature conditions require.)

3. Vertical & Overhead Patching Material (Approved List) - (for ITEM 555.80020001) §701-08

**INJECTION EQUIPMENT:** Use equipment in good working order, as approved by the Engineer, with the following features:

- Separate feed lines to the mixing chamber
- Automatic mixing and metering pump
- Ability to thoroughly mix the epoxy components in the mixing chamber
- Operator control of the epoxy flow from the mixing chamber
- Clean, legible, accurate pressure gauges easily viewable by the operator
- Ability to provide an uninterrupted pressure head to continually force epoxy into the cracks
- Injection pressure from 0 to at least 200 PSI
- Capable of metering each epoxy component to within 3.0% of the epoxy manufacturer's mix ratio

Un-reacted epoxy components may be stored overnight in separate reservoirs and feed lines.

Before starting the work, demonstrate to the Engineer the ability of the equipment to meter and mix epoxy components to the required mix ratio. Ratio accuracy may be determined by simultaneously metering each component into separate, clean, accurately graduated, volumetric containers, or another procedure approved by the Engineer. Also, activate the automatic mixing and metering pump, mix a small amount of injection epoxy, and waste it into a disposable container. The Engineer will observe this trial operation and be satisfied the equipment is working properly, and the epoxy is mixed with no streaks.

**CONSTRUCTION DETAILS:**
1. **Crack and Surface Preparation.** Remove all debris or contaminants accessible within the cracks by using hand tools, water blasting or oil-free high pressure air blasting, vacuuming, or other methods suitable to the Engineer. Epoxy resin will not penetrate: compacted, water or oil soaked debris. Allow free moisture within the crack to be absorbed before injecting epoxy. Remove all materials, including moisture, from the surface adjacent to the crack which might interfere with bonding of the crack sealant.

2. **Injection Port Installation.** Attach injection ports to the prepared surface by placing them onto (surface adapters) or into the cracks (socket ports) and affixing with crack sealant. Larger cracks may be ported by inserting an anchored tube into the crack.

   Use positive connection port designs to connect injection equipment to the ports. Other injection port designs and attachment methods, where worker fatigue would not be a problem, require approval by the Engineer.

   Use the following general guidelines for spacing injection ports when cracks are uniform in width through the structure. For cracks that get tighter with depth, double this spacing. Intermediate ports may be placed for observation. To permit maximum flow into the void, position ports on the wider crack sections and at intersections, rather than at an exact spacing.

   If these guidelines cannot be followed, use port locations approved by the Engineer. Port spacing may be modified by the Engineer as experience is gained, or when cores are taken to determine penetration.

   **FOR CRACKS COMPLETELY THROUGH A MEMBER**
   
   A. Cracks accessible from one side - space the ports not less than the thickness of the member.

   B. Cracks accessible from both sides - space the ports not less than twice the thickness of the member and stagger them relative to the ports on the opposite side. Make the stagger between ports (on opposite sides of the member) at least the thickness of the member.

   Place the endmost ports at the ends of the crack so as to insure complete filling of the crack.

   **FOR MULTIPLE CRACKS ALL OVER A MEMBER.**
   
   Space the ports as far apart as practical, but not less than 8” from one another. An 8” spacing presumes a 4” penetration in each direction, if the adjacent ports are not plugged when epoxy reaches them. For fine cracks that taper to an end, place the endmost ports about 4” from the end.

3. **Crack Seal.** After port installation, seal the crack opening with crack sealant, being careful not to plug the injection ports. Allow the crack sealant to cure completely before injecting epoxy.

   Apply crack sealant only when surface and ambient temperatures are above 50º F.
4. **Port Flushing.** Prior to any epoxy injection, flush critical ports with oil-free compressed air to verify that air exits from all the installed ports, dry the cracks, and check for leaks.

5. **Epoxy Injection.** Perform epoxy injection only when the surface and ambient temperatures are above 45º F and are not expected to fall below 45º F during the next 24 hours.

**UNIFORM WIDTH CRACKS** - start toward the middle of a horizontal crack and work outward, or the lowest point of a sloping or vertical crack and work upward.

**VARIABLE WIDTH CRACKS** - start at the widest points of all types of cracks and work outward. Secure the feed line to the first port. Initiate and continue flow until epoxy exits from the adjacent port. (Plug observation ports and continue through the same port to achieve maximum penetration.) Temporarily stop the injection process, remove the feed line, and seal the port. Attach the feed line to the adjacent port and repeat this procedure along the crack until the last port is sealed.

Generally, use higher pressures when injecting narrow deep cracks, medium to low for wider cracks, and lowest pressures when injecting a delaminated area or an area susceptible to lifting. Low pressure applied for a longer duration is often more effective than high pressure applied for a shorter duration.

Replenish the epoxy supply in the mixing equipment before it is exhausted. Thoroughly stir each epoxy component both before and after adding it to its respective component in the mixing equipment. Exercise care to assure a continuous injection operation.

Allow the epoxy to fully cure prior to performing subsequent work in the repaired area.

In the event of leakage from a crack, stop the injection process until the leak is sealed. When any work stoppage exceeds 15 minutes, clean the mixing chamber and flush the line that carries mixed epoxy. Flush with a suitable solvent, followed by air.

6. **For ITEM 555.80020001 CRACK REPAIR BY EPOXY INJECTION (RESTORATION),** take cores ranging in diameter from 1 to 4”, as approved by the Engineer, to verify full penetration by epoxy and its cure. Take a representative core from each structural element, or one from every 100 feet of crack repaired, whichever is greater, at locations approved by the Engineer. The Engineer will retain the cores and determine if they are acceptable for payment. Patch the holes with Vertical & Overhead Patching Material.

More than one core may be necessary to obtain an acceptable sample from cracks that diverge below the surface. (To avoid cutting reinforcing, the core drill may be angled to intercept a crack behind the reinforcing.)

7. **Clean Up.** In all areas visible to the public, as determined by the Engineer, remove spillage, the ports and crack sealant until flush with the adjacent surface. Remove stains and repair any damage to the satisfaction of the Engineer at no additional cost.
ITEM 555.80010001 - CRACK SEALING BY EPOXY INJECTION (PREVENTION)
ITEM 555.80020001 - CRACK REPAIR BY EPOXY INJECTION (RESTORATION)

METHOD OF MEASUREMENT: The Engineer will measure the work as the number of linear feet of crack sealed or repaired, as specified.

BASIS OF PAYMENT: Include the cost of all labor, materials, and equipment necessary to complete the work in the unit price bid per linear foot. For ITEM 555.80020001 CRACK REPAIR BY EPOXY INJECTION (RESTORATION), also include the cost of coring and repairing the core holes.

For ITEM 555.80010001 CRACK SEALING BY EPOXY INJECTION (PREVENTION), the Engineer will authorize payment after the measured length of crack has been sealed and the surface cleaned.

For ITEM 555.80020001 CRACK REPAIR BY EPOXY INJECTION (RESTORATION), the Engineer will authorize payment after the measured length of crack has been repaired as verified by cores, the core holes patched and the surface cleaned.
ITEM 557.01040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE
SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK
REQUIRED

ITEM 557.05040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE
SLAB WITH INTEGRAL WEARING SURFACE - BOTTOM FORMWORK
NOT REQUIRED

ITEM 557.07040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE
SLAB WITH SEPARATE WEARING SURFACE - BOTTOM FORMWORK
REQUIRED

ITEM 557.09040018 - LIGHTWEIGHT, HIGH - PERFORMANCE SUPERSTRUCTURE SLAB WITH
SEPARATE WEARING SURFACE - BOTTOM FORMWORK NOT REQUIRED

DESCRIPTION. Furnish and place lightweight, high performance (Class HP) concrete to construct superstructure slabs as shown in the contract documents.

MATERIALS. Use materials meeting §557-2. Perform additional work as follows:

A. Design. Design a lightweight, high-performance concrete mixture, proportioned according to the American Concrete Institute Manual of Concrete Practice, ACI 211.2, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.

1. Produce a homogeneous mixture of cement, pozzolan (Fly Ash or GGBFS), microsilica, fine aggregate, lightweight coarse aggregate, air entraining agent, normal range set-retarding, water-reducing admixture, and water, as designed.

2. Use Type I, I/II, II (§701-01) or Type SF (§701-03) cement. Use a minimum cementitious content of 675 lb/yd³. Use 15-20% pozzolan (§711-10, Flyash, or §711-12 GGBFS), and 6-10% microsilica (§711-11).

3. Use lightweight coarse aggregate conforming to §703-10, with a gradation in the 3/4 inch to No. 4 size designation in ASTM C330, Table 1.

4. Determine the cement content for each trial batch by means of a yield test according to ASTM C138.
   a. At least 10 working days prior to concrete placement, provide the Materials Engineer with a copy of the trial mix design with the following data:
      • Fine and coarse aggregate (saturated, surface dry condition) content in lb/yd³.
      • Cementitious content in lb/yd³.
      • Water content in lb/yd³.
      • Unit weight of freshly mixed concrete in accordance with ASTM C138.
      • Dry unit weight in accordance with ASTM C567.
      • 28-day compressive strengths.
      • Batch quantities of all materials as they will appear on the batch record.

   b. The Materials Engineer, or their representative, will approve the batch quantities prior to use. Use these values to manufacture all lightweight concrete for this project, and periodically correct the batch weights to account for changes in the fine aggregate fineness modulus and aggregate moisture contents in accordance with Materials Method 9.1, or current Department directives.

B. Stockpile Handling. Construct lightweight coarse aggregate stockpile(s) at the production facility so as to maintain uniform moisture throughout the pile. Continuously and uniformly sprinkle the stockpile(s) with water using a sprinkler system approved by the Materials Engineer. Soak for a minimum of 48 hours, or until the stockpile has achieved a
minimum internal moisture content of 15% by weight. If a steady rain of comparable intensity occurs, turn off the sprinkler system.

If the rain ceases prior to the end of the wetting period, restart the sprinkling system. At the end of the wetting period, or when a rainfall ceases beyond the end of the wetting period, allow stockpiles to drain for 12 to 15 hours immediately prior to use.

C. Sampling of Materials. The Materials Engineer’s representative, will take a 1 liter sample of microsilica in accordance with Materials Method 9.1, or current Department directives, for each day’s placement for testing. Sampling of other materials will be at the direction of the Regional Materials Engineer.

D. Batching. After the materials have been accepted for this work, determine the proportions for concrete and equivalent batch weights based on trials made with materials to be used in the work.

• If densified microsilica powder is used and added independently - weigh cumulatively in the following order: cement, fly ash (or GGBFS), then microsilica. Base the batching tolerance of ± 0.5 % on the total weight of cementitious material, for each material draw weight.

• If densified microsilica powder is used as part of blended cement - weigh cumulatively in the following order: blended cement, then fly ash (or GGBFS). Base the batching tolerance of ± 1% on the total weight of cementitious material, for each material draw weight.

E. Compressive Strength Determination. Achieve an average 28-day compressive strength of 3600 psi, or greater, with no individual cylinder compressive strength less than 3000 psi.

F. Density Determination. Produce concrete with an average dry unit weight ranging from 110 to 115 lb/ft³ when tested in accordance with ASTM C567.

CONSTRUCTION DETAILS. Apply the provisions of §557-3 and the following modifications:

A. Concrete Manufacturing and Transporting. Add the following to §557-3.01:

1. Use slump, unit weight and air tests as a control measure to maintain a suitable consistency. Perform slump, unit weight and air tests according to Materials Method 9.2. Determine air content by the volumetric method (roll-a-meter) as described in ASTM C173. Air content and slump placement limits are:

<table>
<thead>
<tr>
<th></th>
<th>Minimum</th>
<th>Desired</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Content (%)</td>
<td>5.0</td>
<td>6.5</td>
<td>8.0</td>
</tr>
<tr>
<td>Slump (inches)</td>
<td>2 ½</td>
<td>3-5</td>
<td>5</td>
</tr>
</tbody>
</table>
2. If the lightweight coarse aggregate moisture content at the time of batching is less than saturated surface dry (SSD), introduce the coarse aggregate, along with approximately 2% of the total mixing water, into the mixer and mix for a minimum of 10 minutes, then continue batching the remaining ingredients. If the coarse aggregate is in an SSD condition, batch the coarse aggregate routinely with the fine aggregate, admixtures, cement, fly ash (or GGBFS), microsilica, and mixing water, then mix completely.

3. Have the lightweight aggregate manufacturer supply a service representative at the site for the first two days of concrete placement operations to assist in the control of lightweight concrete mixing and placement.

B. Handling, Placing and Finishing. Handle and place concrete according to §557-3.05, except that pumping is not permitted. When an integral wearing surface is required, finish the concrete according to §557-3.07. If the concrete will be overlaid with a separate wearing surface, finish the surface according to §557-3.09.

C. Testing. Test the concrete according to Materials Method 9.2. The unit mass of the fresh concrete during placement should be compared to that which was submitted with trial mix design. Make adjustments to the concrete mix at the batching facility based on slump, unit weight and air tests. The Engineer will cast cylinders, in sets of 2 individual cylinders, at a frequency of 1 set for each 50 yd³, or fraction thereof actually placed. A minimum of 1 set will represent each day's concrete placement.

D. Curing. Cure the concrete according to §557-3.11, except that only continuous wetting is allowed. In cold weather, the provisions of §557-3.12 shall apply.

E. Repairs. Make any repairs as per the provisions of §557-3.16. Proposed repairs require Deputy Chief Engineer, Structures approval.

F. Rejection of Concrete. The Engineer will reject any concrete represented by a 28-day cylinder set with an average compressive strength less than 3600 psi, or an individual cylinder with a compressive strength less than 3000 psi.

G. Loading Limitations. The loading limitations of §557-3.14 apply, except that concrete cylinder sets designated for early loading must attain an average compression strength of 3600 psi, or greater, with no individual cylinder less than 3000 psi.

METHOD OF MEASUREMENT. Apply all of the provisions of §557-4.

BASIS OF PAYMENT. Apply all of the provisions of §557-5.
SCOPE

This specification covers field casting Ultra High Performance Concrete (UHPC). The maturity method is preferred to estimate the in-place UHPC strength. The time required before removal of the forms and loading of the structure will be determined based on the estimated in-place UHPC strength.

MATERIAL

High Molecular Weight Methacrylate (used as seal for closure pour)
The high molecular weight methacrylate (HMWM) resin shall be low viscosity and non-fuming. Acceptance is based on the manufacturer certifying that it conforms to the following, and the contractor forwarding the certification to the DCES:

- Viscosity: Less than 25 cps when measured according to ASTM D2849
- Density: Greater than 8.4 lb/gal. @ 77° F.
- Flash Point: Greater than 200° F.
- Vapor Pressure: Less than 1.0 mm Hg @ 77° F. (ASTM D 323)
- TG (DSC): Greater than 136° F (ASTM D3418)
- Gel Time: Greater than 40 minutes for a 100 gram mass
- Percent Solids: Greater than 90 % by weight
- Bond Strength: Greater than 1522.3 psi (ASTM C882)

The sand shall be commercial quality dry blast sand. 95% of the sand shall pass the #8 sieve, and 95% shall be retained on the #30 sieve.

The container shall include the following information: The name of the manufacturer, the brand name of the product, the date of manufacture.

Water shall meet the requirements of §712-01.

UHPC

Material shall consist of:
Fine aggregate
Cementitious material
Super plasticizer
Accelerator
Steel Fibers, deformed, specifically made for steel reinforcement (2% minimum, by volume)

Physical properties shall meet the following:
Minimum Compressive Strength (ASTM C39)

- High Heat-Treated*: 25 ksi
- Medium Heat-Treated**: 12 hours 12 ksi
- Not Heat-Treated***: 3 day 12 ksi
- Not Heat-Treated***: 28 day 18 ksi

* Heat-Treated - According to manufacturer’s recommendation, temperature not to exceed 250°F.
** Medium Heat-Treated – Temperature not to exceed 120°F
*** Not Heat-Treated - Cured at a temperature of 70° F ± 3°.
Prism Flexural Tensile toughness (ASTM C1018; 10 in. span) $I_{30} \geq 48$
Long-Term Shrinkage (ASTM C157; initial reading after set) $\leq 766$ microstrain
Chloride Ion Penetrability (ASTM C1202) $\leq 250$ coulombs
Chloride Ion Penetrability (AASHTO T259; 1/5 in. depth) $< 0.07$ oz/ft$^3$
Scaling Resistance (ASTM C672) $y < 3$
Abrasion Resistance (ASTM C944 2x weight; ground surface) $< 0.025$ oz. lost
Freeze-Thaw Resistance (ASTM C666A; 600 cycles) RDM $> 96$
Alkali-Silica Reaction (ASTM C1260; tested for 28 days) Innocuous

**Equipment for Maturity Testing**

Use a Maturity Meter and thermocouples that can:

- Provide a maturity value based on the Equivalent Age or Temperature Time Method as detailed in ASTM C 1074-11.
- Continuously log and store maturity data.
- Accurate to within 1°F when the meter is calibrated per the manufacturer’s instructions.
- Take readings every half hour for the first 48 hours and every hour after that at a minimum.
- Print data and/or download it into a spreadsheet.

**Methodology for Maturity Testing**

The procedure for utilizing the maturity method to determine in-place UHPC strengths includes three steps: development of the strength-maturity relationship, monitoring the maturity of the placement, and regular validation of the strength maturity relationship. Any changes in the mix design, its components, or proportions will require that a new strength-maturity relationship be developed.

The strength-maturity relationship shall be developed one month prior to construction. Continue data collection for the strength-maturity relationship after acceptance of the maturity value until the strength reaches 18 ksi.

A procedure to develop the strength-maturity relationship shall be submitted to the DCES for review and approval along with the shop drawings. The submitted procedure shall include all necessary information for the development of the strength maturity relationship. All necessary testing included in the procedure shall be conducted by an AASHTO accredited testing lab.

**CONSTRUCTION DETAILS**

**Installation Drawings**

The proposed method of mixing, placing, and curing the UHPC closure pours shall be shown on the installation drawings. The Contractor shall perform qualification testing using maturity method and the results shall be shown on the installation drawing to demonstrate that the proposed method of curing will achieve the required strength at the required time.

**Pre-Pour Meeting**

Prior to the initial placement of the UHPC, the contractor shall arrange for an on site meeting with the UHPC representative. The contractor’s staff and the NYSDOT Engineer and Inspectors shall attend the site meeting. The objective of the meeting will be to clearly outline the procedures for mixing, transporting, finishing and curing of the UHPC material.
The contractor shall arrange for a representative of the UHPC supplier to be on site during the placement of the closure pours. The representative shall be knowledgeable in the supply, mixing, delivery, placement, and curing of the UHPC material.

**Storage**
The contractor shall assure the proper storage of premix, fibers and additives as required by the supplier's specifications in order to protect materials against loss of physical and mechanical properties.

**Form Work, Batching and Curing**
The design and fabrication of forms shall follow approved installation drawings and shall follow the recommendations of the manufacturer. All the forms for UHPC shall be constructed from plywood. The forms shall be coated to prevent absorption of water.

The contractor shall follow the batching sequence as specified by the supplier and approved by the DCES. The UHPC closure pours shall be filled to 1/4 inch above the deck surface.

The UHPC in the form shall be cured per Manufacturer’s recommendations to attain the required strength shown on the contract documents.

**Quality Control**
The contractor shall measure the slump flow on each batch of UHPC. The slump flow will be conducted using a mini-slump cone. The flow for each batch shall be between 7 in. and 10 in. The slump flow for each batch shall be recorded in the QA/QC log. A copy of the log shall be given to the Engineer.

The contractor shall make four sets of compressive strength test samples for each day of placement. Each set consists of 3 cylinders 3 inches X 6 inches. All sets shall be cured in an environment similar to the material they represent.

**Estimation of In Place Strength**
Compressive strengths shall be per the maturity method or ASTM C 39. The Contract Documents may contain requirements for specific strengths to achieve construction requirements such as carrying construction loads or opening to traffic. Break cylinders or follow maturity procedures to verify these intermediate strengths and to determine final strengths.

**Maturity Method**
Two thermocouples per each UHPC closure pour, one at each end, shall be installed. The locations of these installations shall be shown on the installation drawings. These locations shall be revised if directed by the DCES. The thermocouple wiring may be connected to reinforcing steel, but probe endings may not be in direct contact with the steel. Consider structural or exposure conditions when placing thermocouples.

Listed actions are allowed when the maturity value of all the thermocouples reaches the corresponding strength values listed below.

<table>
<thead>
<tr>
<th>Action</th>
<th>Strength Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of top forms</td>
<td>10 ksi</td>
</tr>
<tr>
<td>Open Bridge deck to Traffic</td>
<td>12 ksi</td>
</tr>
</tbody>
</table>
Record and save the maturity data from the meter until the strength reaches 18 ksi. Disconnect the meter and clip all wires flush with the concrete surface.

A continuous read thermocouple or thermistor with a data logger can be used to estimate in place strength. The methodology outlined in ASTM C 1074 11 will be used. The maturity function used to estimate strength will be calculated with the same formula that is used by the maturity meter that established the initial strength maturity relationship. Copies of the calculations will be provided to the engineer.

**Validation of the Strength Maturity Relationship**
For each day of placement, perform validation tests by casting 7 cylinders. Equip one of the cylinders with a thermocouple. Test the cylinders as close as possible to the maturity value corresponding to 18 ksi. Record the maturity value immediately prior to testing. All testing shall be conducted by an AASHTO accredited testing lab. Report the results to the DCES.

If the average value of compressive strength of each pair of cylinders is within 10% of the estimated value, the strength maturity relationship will be validated. If the average cylinder value is more than 10% below the estimated value, the strength maturity relationship will need to be re established. If the first four cylinders produce acceptable results, the remainder need not be tested.

The Department may perform additional testing for research purposes. Casting and testing in addition to that required in this spec will be performed by NYSDOT personnel.

In case of loss of required data, or non-verification of the strength maturity relationship, use the cylinders cast above, one pair at a time, to verify the strength.

**Surface Finishing**
After the joint has set and before it is sealed, the UHPC joint shall be ground smooth to be flush with the adjacent surfaces.

**Closure pour Sealing and Watertight Integrity Test**
The Contractor may seal the closure pour using HMWM, or may use the following procedure to prove the closure pour does not leak.

After the closure pour has reached the required strength, a watertight integrity test shall be performed in accordance with §567-3.01.H. If leakage occurs the Contractor must seal the entire length of the leaking closure pour using HMWM at no extra cost to the State.

If a rain event occurs that meets the requirements of §567-3.01.H, the Contractor may elect to perform the watertight integrity test using the rain as the water supply.

**Sealing the Closure Pour**
Abrasive blast clean the area to be treated, removing all contaminants from the surface. Clean adjacent surfaces of the closure pours using compressed air which is free of oil and moisture.
Do not apply sealers if rain is expected within 12 hours of completion. Apply sealers to clean, dry surfaces when the surface temperature is at least 50º F, and if near 50º F, rising. The sealer shall be mixed and applied according to the manufacturer’s instructions and no more than 5 gallons at a time. Pour the sealer over the closure pours.

When the methacrylate surface will be used as a driving surface, sand must be applied to provide friction. After the resin has been applied, at least 20 minutes shall elapse before applying the sand. The sand shall be broadcast at a rate of approximately two pounds per square yard, completely covering the sealer.

The sealer must be tack-free before construction traffic is permitted to resume.

**MEASUREMENT FOR PAYMENT**

Length: Measurement will be by length of UHPC closure pours placed in feet. The length of in-place UHPC shall be calculated to the nearest foot.

Volume: Measurement will be by volume of UHPC closure pours placed in cubic feet. The volume of in-place UHPC shall be calculated to the nearest cubic foot.

**BASIS OF PAYMENT**

Payment at the contract price for the above item shall be full compensation for all labor, equipment, and material to do the work.
ITEM 557.2500NN16 - CRACK SEALING USING HIGH MOLECULAR WEIGHT METHACRYLATE - LINEAR CRACKS

DESCRIPTION
This work shall consist of furnishing and installing Crack Sealing Using High Molecular Weight Methacrylate in accordance with the contract documents and as directed by the Engineer.

MATERIALS
The high molecular weight methacrylate (HMWM) resin shall be low viscosity and non-fuming. Acceptance is based on the manufacturer certifying that it conforms to the following, and the contractor forwarding the certification to the DCES:

- Viscosity: Less than 25 cps when measured according to ASTM D2849
- Density: Greater than 8.4 lb/gal. @ 77º F.
- Flash Point: Greater than 200º F.
- Vapor Pressure: Less than 1.0 mm Hg @ 77º F. (ASTM D 323)
- TG (DSC): Greater than 136º F (ASTM D3418)
- Gel Time: Greater than 40 minutes for 3.5 ounces
- Percent Solids: Greater than 90 % by weight
- Bond Strength: Greater than 1522.3 psi (ASTM C882)

Sand: The sand shall be commercial quality dry blast sand. 95% of the sand shall pass the #8 sieve, and 95% shall be retained on the #30 sieve.

The container shall include the following information: The name of the manufacturer, the brand name of the product, the date of manufacture.

CONSTRUCTION DETAILS
Abrasive blast clean the area to be treated, removing all contaminants from the surface. Clean all surfaces and cracks using compressed air which is free of oil and moisture.

Do not apply sealers if rain is expected within 12 hours of completion. Apply sealers to clean, dry surfaces when the surface temperature is at least 50º F, and if near 50º F, rising. The sealer shall be mixed and applied according to the manufacturer’s instructions and no more than 5 gallons at a time. Pour sealer into the cracks.

After the resin has been applied, at least 20 minutes shall elapse before applying the sand. The sand shall be broadcast at a rate of approximately two pounds per square yard, completely covering the sealer.

The sealer must be tack-free before traffic is permitted to resume.

METHOD OF MEASUREMENT
This work will be measured as the number of feet of Crack Sealing Using High Molecular Weight Methacrylate satisfactorily furnished and installed.

BASIS OF PAYMENT
The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.
ITEM 557.2600NN16 - CRACK SEALING USING HIGH MOLECULAR WEIGHT METHACRYLATE - FLOODING

DESCRIPTION
This work shall consist of furnishing and installing Crack Sealing Using High Molecular Weight Methacrylate in accordance with the contract documents and as directed by the Engineer.

MATERIALS
The high molecular weight methacrylate (HMWM) resin shall be low viscosity and non-fuming. Acceptance is based on the manufacturer certifying that it conforms to the following, and the contractor forwarding the certification to the DCES:

- Viscosity: Less than 25 cps when measured according to ASTM D2849
- Density: Greater than 8.4 lb/gal. @ 77º F.
- Flash Point: Greater than 200º F.
- Vapor Pressure: Less than 1.0 mm Hg @ 77º F. (ASTM D 323)
- TG (DSC): Greater than 136º F (ASTM D3418)
- Gel Time: Greater than 40 minutes for a 100 gram mass
- Percent Solids: Greater than 90 % by weight
- Bond Strength: Greater than 1522.3 psi (ASTM C882)

Sand: The sand shall be commercial quality dry blast sand. 95% of the sand shall pass the #8 sieve, and 95% shall be retained on the #30 sieve.

The container shall include the following information: The name of the manufacturer, the brand name of the product, the date of manufacture.

CONSTRUCTION DETAILS
Abrasive blast clean the area to be treated, removing all contaminants from the surface. Clean all surfaces and cracks using compressed air which is free of oil and moisture.

Do not apply sealers if rain is expected within 12 hours of completion. Apply sealers to clean, dry surfaces when the surface temperature is at least 50º F, and if near 50º F, rising. The sealer shall be mixed and applied according to the manufacturer’s instructions and no more than 5 gal. at a time. Sweep, pour, squeegee, or spray the area to receive the sealers, allowing the sealers to flow into the cracks. If the manufacturer does not recommend an application rate, use 8.5 to 11.8 square yards per gallon, as needed.

After the resin has been applied, at least 20 minutes shall elapse before applying the sand. The sand shall be broadcast at a rate of approximately two pounds per square yard, completely covering the sealer.

The sealer must be tack-free before traffic is permitted to resume.

METHOD OF MEASUREMENT
This work will be measured as the number of square yards of Crack Sealing Using High Molecular Weight Methacrylate satisfactorily furnished and installed.

BASIS OF PAYMENT
The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.
DESCRIPTION.

Furnish and place precast concrete deck, precast concrete approach slab and integral precast concrete barrier with ultra high performance concrete (UHPC) joints. The maturity method shall be used to estimate the in-place UHPC strength. The time required before removal of the forms and loading of the structure will be determined based on the estimated in-place UHPC strength. “Panels” refers to both the concrete deck and to the approach slab.

XX = Friction Type
   01 - Type 1 Friction
   02 - Type 2 Friction
   03 - Type 3 Friction
   09 - Type 9 Friction

MATERIALS

PRECAST CONCRETE PANELS: Materials used in this work shall conform to the NYSDOT Prestressed Concrete Construction Manual (PCCM)-Current Edition and the following:

STEEL EMBEDMENTS. Steel embeddings for the panel leveling devices and hold down devices shall be installed in the shop based upon the locations shown on the shop drawings.
Leveling Bolts ASTM F568M, Class 4.6

CONCRETE
28 Day Compressive Strength 5000 psi (Minimum)
Lifting Strength 3000 psi (Minimum)
Epoxy Coated Bar Reinforcement 709-04
Stainless Steel Bar Reinforcement 709-13
Mechanical Connectors 709-10
Water §712-01
Aggregates (Friction Type) 501-202.B

PRECAST CONCRETE APPROACH SLAB
The supplier must demonstrate a system to place the approach slab using a grout bed such that the approach slab is fully supported at the proper line and grade.

HIGH WEIGHT METHYL METHACRYLATE (used as repair for leaking joint)
The high molecular weight methacrylate (HMWM) resin shall be low viscosity and non-fuming. Acceptance is based on the manufacturer certifying that it conforms to the following, and the contractor forwarding the certification to the DCES:

Viscosity Less than 25 cps when measured according to ASTM D2849
Density Greater than 8.4 lb/gal. @ 77º F.
Flash Point Greater than 200º F.
Vapor Pressure Less than 1.0 mm Hg @ 77º F. (ASTM D 323)
TG (DSC) Greater than 136º F (ASTM D3418)
Gel Time Greater than 40 minutes for a 100 gram mass
Percent Solids Greater than 90 % by weight
Bond Strength  Greater than 1522.3 psi (ASTM C882)
Sand    The sand shall be commercial quality dry blast sand.  95% of the sand shall pass the #8 sieve, and 95% shall be retained on the #30 sieve.
The container shall include the following information:
The name of the manufacturer
the brand name of the product
the date of manufacture.

INTEGRAL PRECAST CONCRETE BARRIER: The requirements of the PCCM and the following shall apply.

Tolerances:
1) Bar Reinforcement Cover        -0, + ½ inch
2) Width of Unit at the top         -0, + ¼ inch
3) Width of Unit at the bottom      -0, + ½ inch
4) Surface deviation from theoretical centerline ½ inch in 20 feet
5) Vertical Alignment (deviation from a line parallel to theoretical grade) ½ inch in 20 feet
6) Horizontal and Vertical Alignment (between adjacent units) 3/16 inch

HAUNCH AND JOINT MATERIAL UHPC: The material shall be Ultra High Performance Concrete, all components supplied by one manufacturer. Materials commonly used in UHPC are:

Fine aggregate
Cementitious material
Super plasticizer
Accelerator
Steel Fibers

UHPC material shall meet the following, 28 days unless otherwise noted:
Minimum Compressive Strength (ASTM C39)
- High Heat-Treated*  ≥ 25 ksi
- Medium Heat-Treated 12 hours**  ≥ 12 ksi
- Not Heat-Treated 14 days***  ≥ 21 ksi
- Prism Flexural Tensile toughness (ASTM C1018; 12 in. span)  $I_{30}^{*} \geq 48$
Long-Term Shrinkage (ASTM C157; initial reading after set)  ≤ 766 microstrain
Chloride Ion Penetrability (ASTM C1202)  ≤ 250 coulombs
Chloride Ion Penetrability (AASHTO T259; ½ in. depth)  < 0.07 oz/ft³
Scaling Resistance (ASTM C672)  y < 3
Abrasion Resistance (ASTM C944 2x weight; ground surface)  < 0.025 oz. lost
Freeze-Thaw Resistance (ASTM C666A; 600 cycles)  RDM > 96%
Alkali-Silica Reaction (ASTM C1260; tested for 28 days)  Innocuous

* High Heat-Treated - According to manufacturer’s recommendation, temperature not to exceed 250°F.
** Medium Heat Treated temperatures not to exceed 120°F
*** Not Heat Treated temperature not to exceed 70°F

Results of all the tests above, conducted by an AASHTO accredited testing lab shall be submitted to the DCES along with the installation drawings. Provide to the DCES a list of bridge projects in which the proposed UHPC material has been used as joint fill between precast concrete elements (within or outside
the USA). The DCES reserves the right to reject a proposed UHPC material which lacks a proven track record in precast concrete joint filling in bridge applications.

**Storage:** The contractor shall assure the proper storage of premix, fibers and additives as required by the supplier's specifications in order to protect materials against loss of physical and mechanical properties.

**Acceptance Testing:** Note: acceptance testing will be waived if the same material from the same supplier has already been tested according to this standard. The Contractor shall complete the testing of the UHPC a minimum of one month before placement of the joint. The testing sequence will include the submission of a plan for casting and testing procedures to the DCES for review and approval followed by casting and testing according to the approved plan.

Casting and testing must include the following:

A minimum of 12 cylinders 3in. x 6 in. shall be cast.

The temperature during curing shall be as per heat treatment temperature limits established in this specification. 2 cylinders shall be tested each testing interval. Testing intervals are at 10 hours, 12 hours, 14 hours, and 24 hours. The compressive strength shall be measured by ASTM C39. Only a concrete mix design that passes these tests may be used to form the joint.

**Pullout Test:** Cast 6 additional cylinders 12 in. diameter and 7.5 in. deep. Each cylinder shall have one 32 in. long epoxy-coated reinforcing bar cast in the center of the circular face. The axis of the bar shall be perpendicular to the formed surface. 3 of the bars shall be #6 bars embedded 5 in. deep and 3 of the bars shall be #4 bars embedded 3 in. deep. These cylinders will be kept wet for four days then delivered to the Materials Bureau for testing according to Test Method No. NY 701-14 E. Contact the Materials Bureau prior to casting for specific instructions on preparing the test specimens. The test will be performed as soon as practical after the corresponding compressive strength samples reach 12 ksi. Acceptance criteria for pullout testing shall be when there is complete tensile failure of the reinforcing bar, prior to pullout from the concrete or failure of the concrete.

**EQUIPMENT FOR MATURITY TESTING:**

Use a Maturity Meter and thermocouples that can:

- Provide a maturity value based on the Equivalent Age or Temperature Time Method as detailed in ASTM C 1074-11.
- Continuously log and store maturity data.
- Accurate to within +/- 1° F when the meter is calibrated as per the manufacturer=s instructions.
- Take readings every half hour for the first 48 hours and every hour after that at a minimum.
- Print data and/or download it into a spreadsheet.

**METHODOLOGY FOR MATURITY TESTING:**

The procedure for utilizing the maturity method to determine in-place UHPC strengths includes three steps: development of the strength-maturity relationship, monitoring the maturity of the placement, and regular validation of the strength-maturity relationship. Any changes in the mix design, its components,
or proportions will require that a new strength-maturity relationship be developed. The strength-maturity relationship shall be developed one month prior to construction. Continue data collection for the strength-maturity relationship after acceptance of the maturity value until the strength reaches 21 ksi.

A procedure to develop the strength-maturity relationship shall be submitted to the DCES for review and approval along with the shop drawings. The submitted procedure shall include all necessary information for the development of the strength maturity relationship. All necessary testing included in the procedure shall be conducted by an AAHSTO accredited testing lab.

**CONSTRUCTION**

**DRAWINGS FOR PRECAST CONCRETE PANELS AND BARRIER**

Shop drawings and installation drawings shall be prepared and submitted as per the requirements of the Prestressed Concrete Construction Manual, (PCCM), and the following:

The submitted drawings shall include details of lifting and handling of panels in the production facility and their storage, transportation, handling and storage at the construction site. Lifting holes and hardware will not be permitted on the top of the slab. The proposed handling and lifting shall be such that the maximum tensile stress in concrete due to handling and erection loads shall not exceed $0.15(f'ci)^{1/2}$, where $f'ci$ is the concrete compressive strength at the time being considered. Calculations showing actual concrete stresses based upon the proposed support locations and expected dynamic loading of the panels during handling, storage and transportation of the panels shall be prepared by a Professional Engineer and shall be submitted along with the drawings. These drawings and calculations shall be stamped and signed by a Professional Engineer.

Integral precast concrete barrier shall be cast integrally with the precast concrete deck prior to shipping. Proposed procedures for the casting, handling, and shipping shall be included in the drawings for the precast concrete panels.

The proposed method of mixing, placing, and curing the UHPC joints shall be shown on the installation drawings. The Contractor shall perform qualification testing using maturity method and the results shall be shown on the installation drawing to demonstrate that the proposed method of curing will achieve the required strength at the required time.

**FABRICATION OF PRECAST CONCRETE PANELS**

Fabrication shall meet the requirements of the PCCM and the following:

**Fabrication Tolerances**

1. Width (transverse direction of the bridge): +1/8, -1/8 in.
2. Length (longitudinal direction of the bridge): +1/8, -1/8 in.
3. Depth (overall): +1/8, -0 in.
4. Bulkhead alignment (deviation from square or designated skew)
   - Vertical: ¼ in.
   - Horizontal: ¼ in.
5. Horizontal alignment (deviation from straight line parallel to centerline of unit):
   - ¼ in. for 40 ft length
   - 3/8 in. for 40 ft to 60 ft length
   - 1/2 in. for greater than 60 ft length

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Welding of steel shall comply with the requirements of the New York State Steel Construction Manual.

**Placing Concrete, Curing and Finishing**
All requirements stipulated in PCCM shall apply except for the following:
After curing, all form release material and all other forming material adhering to the shear keyway and block out concrete shall be removed. Shear key faces shall be roughened and blast cleaned.

**Shipping and Handling of Precast Panels and Precast Concrete Barrier.** Shall be as per approved drawings.

**Loading of Panels.** Equipment weighing more than 2500 pounds shall not be permitted on the precast units between the initial set of the UHPC and the time the UHPC has reached a minimum strength of 10 ksi.

**Mixing and Placing UHPC Joints and Haunches.** Specifications in the PCCM and the following:
Thoroughly and continuously wet the concrete contact area for 24 hours prior to the placing of UHPC, keep wet and remove all surface water just prior to UHPC placement.

**INSTALLATION REQUIREMENTS FOR DECK SLABS**
Installation shall meet the requirements of the PCCM and the following:

1. Prior to installing panels, the supporting steel surfaces in contact with the panels or field placed concrete shall be cleaned, including removal of free water, to the satisfaction of the engineer.

2. Installation tolerances shall be as per the approved installation drawings. It is the responsibility of the contractor to develop appropriate controls during the fabrication and installation of the panels so that proper cross slopes and grades are achieved after the diamond grinding operation. Installation drawing shall show the details of the proposed controls.

**INSTALLATION REQUIREMENTS FOR APPROACH SLABS**
Bed and level slabs in accordance with the system designer’s instructions such that the vertical differential across any joint is ¼ in. or less. Slabs shall be placed on grade and have grout pumped underneath to ensure that they are completely supported.

**INSTALLATION REQUIREMENTS FOR UHPC**
The contractor shall arrange for a representative of the UHPC supplier to be on site during the placement of the joints until the Contractor’s own staff has become well-trained in the use of the material. The representative shall be knowledgeable in the supply, mixing, delivery, placement, and curing of the UHPC material.

UHPC placement shall meet the requirements of the PCCM. Details of vent and fill ports, shall be shown on the installation drawing. Required QC for the grouting also shall be listed on the drawings.

**INSTALLATION REQUIREMENTS FOR DIAMOND GRINDING.**
The depth of the grinding shall be a minimum of ¼” in order to obtain proper cross slopes and grades.
Begin and end diamond grinding lines normal to the bridge deck centerline. Grind the bridge deck longitudinally such that at least 95% of the bridge deck surface is ground and the bridge deck is in the same plane across a joint or crack when measured with a 3 foot straightedge. Provide surface drainage by maintaining the proper cross-slope on the finished surface and by blending adjacent passes. Regrind the bridge deck if an acceptable surface is not being obtained. Continuously remove slurry from the bridge deck using the vacuum system on the grinding equipment. If required, provide equipment capable of transporting the slurry from the job site without spilling.

**PRE-INSTALLATION MEETING:** Convene a preplacement meeting 7 to 14 calendar days before the planned start of slab installation. The contractor shall arrange for an on site meeting with representatives from the UHPC and the precast system suppliers. The contractor's staff and the NYSDOT Engineer and Inspectors shall attend the site meeting. The objective of the meeting will be to clearly outline the procedures for placing and leveling the precast concrete panels and for mixing, transporting, finishing and curing of the UHPC material.

**Form Work, Batching and Curing**
The design and fabrication of forms shall follow approved installation drawings and shall follow the recommendations of the manufacturer. All the forms for UHPC shall be constructed from plywood or approved equal. The forms shall be coated to prevent absorption of water using a form release agent from the Department’s Approved List of Materials.

The contractor shall follow the batching sequence as specified by the supplier and approved by the DCES. The surface of the UHPC field joints shall be filled to plus ¼ inch above the precast panels.

The UHPC in the form shall be cured according to Manufacturer’s recommendations to attain the required strength shown on the contract documents.

**Quality Control**
The contractor shall measure the slump flow on each batch of UHPC. The slump flow will be conducted using a mini-slump cone. The flow for each batch shall be between 7 in. and 10 in. The slump flow for each batch shall be recorded in the QA/QC log. A copy of the log shall be given to the Engineer.

**Estimation of In-Place Strength:**
1. Two thermocouples per each UHPC joints, one at each end, shall be installed. The locations of these installations shall be shown on the installation drawings. These locations shall be revised if directed by the DCES. The thermocouple wiring may be connected to reinforcing steel, but probe endings may not be in direct contact with the steel. Consider structural or exposure conditions when placing thermocouples.

2. Listed actions are allowed when the maturity value of all the thermocouples reaches the corresponding strength values listed below.

<table>
<thead>
<tr>
<th>Action</th>
<th>Strength Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Removal of top forms</td>
<td>10 ksi</td>
</tr>
<tr>
<td>Open Bridge deck to Traffic</td>
<td>12 ksi</td>
</tr>
</tbody>
</table>

3. Record and save the maturity data from the meter until the strength reaches 21 ksi.
Disconnect the meter and clip all wires flush with the concrete surface.

A continuous read thermocouple or thermistor with a data logger can be used to estimate in-place strength. The methodology outlined in ASTM C 1074-11 will be used. The maturity function used to estimate strength will be calculated with the same formula that is used by the maturity meter that established the initial strength maturity relationship. Copies of the calculations will be provided to the engineer.

**Validation of the Strength-Maturity Relationship:**
For each day of placement, perform validation tests by casting 7 cylinders. Equip one of the cylinders with a thermocouple. Test the cylinders as close as possible to the maturity value corresponding to 21 ksi. Record the maturity value immediately prior to testing. All testing shall be conducted by an AASHTO accredited testing lab. Report the results to the DCES.
If the average value of compressive strength of each pair of cylinders is within 10% of the estimated value, the strength-maturity relationship will be validated. If the average cylinder value is more than 10% below the estimated value, the strength maturity relationship will need to be re-established. If the first four cylinders produce acceptable results, the remainder need not be tested.

The Department may perform additional testing for research purposes. Casting and testing in addition to that required in this spec will be performed by NYSDOT personnel.

In case of loss of required data, or non-verification of the strength-maturity relationship, use the cylinders cast above, one pair at a time, to verify the strength.

**Watertight Integrity Test**
After the joint has reached the required strength, a watertight integrity test shall be performed in accordance with §567-3.01.H. If leakage occurs the Contractor must seal the entire length of the leaking joint using High Weight Methyl Methacrylate at no extra cost to the State. The Contractor may elect to seal the joint using High Weight Methyl Methacrylate instead of performing the watertight integrity test.
If a rain event occurs that meets the requirements of §567-3.01.H, the Contractor may elect to perform the watertight integrity test using the rain as the water supply.

**Repair**
Abrasive blast clean the area to be treated, removing all contaminants from the surface. Clean adjacent surfaces of the leaking joints using compressed air which is free of oil and moisture.

Do not apply sealers if rain is expected within 12 hours of completion. Apply sealers to clean, dry surfaces when the surface temperature is at least 50º F, and if near 50º F, rising. The sealer shall be mixed and applied according to the manufacturer’s instructions and no more than 5 gallons at a time. Pour the sealer over the joints.

**METHOD OF MEASUREMENT.** For precast concrete bridge decks and precast concrete approach slabs apply all the provisions of §557-4. For precast concrete bridge barrier apply all the provisions of §569-4.

**BASIS OF PAYMENT.** For precast concrete bridge decks and precast concrete approach slabs apply all the provisions of §557-5. For precast concrete bridge barrier apply all the provisions of §569-5.
ITEM 559.90030011 - FIELD APPLIED PERMANENT GRAFFITI-RESISTANT COATING

DESCRIPTION
Under this Item, the Contractor shall furnish and apply Graffiti Resistant Coating to exterior stone, brick, block, concrete, wood, or metal surfaces in accordance with O.S.H.A. Guidelines, Manufacturers Recommendations and the Plans, Specifications and directions of the Engineer.

MATERIALS
Contractor shall apply Graffiti Resistant Coatings from one of the three (3) categories listed below, depending upon the type of substrate:

A. For wood (unpainted) and metal surfaces (unpainted), the Contractor shall apply one of the following:

Graffiti Solution System (G.S.S)
as manufactured by American Polymer Corp.,Sandy, Utah 84070(800) 676-5963; local distributor: Kenseal. (718) 937-5490;

ARMAGLAZE
9000 System aliphatic urethane
as manufactured by Aquarius Coatings Inc.,7700 Pine Valley Drive, Unit 206,Woodbridge, Ont. L4L 2X4 (800) 561-6750;

GCP 1000,
by Genesis Coatings,2780 La Mirada Drive, Suite B, Vista, CA 92083,(800) 533-4273;

EN 324 & EN 325
by ENVIRO-NORTHEAST SALES CORP.,P.O.Box 975, Highland Lakes, N.J. 07422;(973) 764-4303,Contact Person -Ed Talmo;
or approved equal.

B. For new and unpainted masonry and concrete, the Contractor shall apply Professional Water Sealant (P.W.S) Coatings, as manufactured by one of the following:

Professional Products of Kansas, Inc.,Wichita, KA 67216;(800) 676-7346

ENVIRO-NORTHEAST SALES CORP.,P.O.Box 975,Highland Lakes, N.J. 07422;(973) 764-4303
ITEM 559.90030011 - FIELD APPLIED PERMANENT GRAFFITI-RESISTANT COATING
ITEM 559.90040011 - FIELD APPLIED SACRIFICIAL WAX GRAFFITI-RESISTANT COATING

Anti Graffitiant,
by Dumond Chemical, Inc.,
1501 Broadway, N.Y., N.Y., 10036
(212) 869-6350;

GCP 1000,
by Genesis Coatings,
2780 La Mirada Drive, Suite B,
Vista, CA 92083,
(800) 533-4273;

or approved equal.

C. For stained concrete –Unless otherwise directed by the Engineer, the Contractor shall apply a sacrificial wax coating manufactured by one of the following:

ENVIRO-SHEILD,
as manufactured by ENVIRO-NORTHEAST SALES CORP.,
P.O.Box 975, Highland Lakes, N.J. 07422;
(973) 764-4303

SC-101 Sacrificial Graffiti Barrier Coating,
by Dumond Chemical, Inc.,
1501 Broadway, N.Y., N.Y., 10036
(212) 869-6350;

G-PRO,
as manufactured by Great Barrier Systems,
6951 N. Ridge
Chicago, Illinois 60645,
(773) 761-1677;

Graffiti Melt Coating,
by Genesis Coatings,
2780 La Mirada Drive, Suite B,
Vista, CA 92083,
(800) 533-4273;

or approved equal.

PRODUCTS:
A. "G.S.S." COATINGS: Note: This Coating shall be applied to surfaces listed under A above. No previously painted surfaces shall receive this coating.

1. a. G.S.S.-Barrier, Standard: Sealer product; standard undercoat—not high solids version. This Standard Version shall be used with Clear Overcoat for coating wood. [* For Steel and Aluminum Surfaces, in lieu of G.S.S.-Barrier, use a water-borne urethane primer, such as Bond-Plex, as manufactured by Sherwin Williams Company (718) 426-8813.]
ITEM 559.90030011 - FIELD APPLIED PERMANENT GRAFFITI-RESISTANT COATING
ITEM 559.90040011 - FIELD APPLIED SACRIFICIAL WAX GRAFFITI-RESISTANT COATING

1. b. **G.S.S.-Barrier, High Solids**: Shall be used with Pigmented Topcoat. The High Solids Version is not recommended for use with clear top coating. High Solids barrier consists of a one component, acrylic copolymer coating.

2. a. **G.S.S.-10 Clear Coating (Low V.O.C.)**: Anti-Graffiti product; overcoat. G.S.S.-10 consists of a polymer composition; two (2) component resin and catalyst system. It is a non-sacrificial permanent coating, with flat/matte finish. G.S.S.-10 Part A is premeasured for use with Part B.

2. b. **G.S.S.- Pigmented Coating**: Anti-Graffiti product; topcoat. Two (2) component polyurethane, nonsacrificial, protective coating. Color shall be selected from either the manufacturers standard color guide, or Sherwin Williams Industrial and Marine Coatings; System 4000 color chart. Finish shall be flat/matte (not gloss) unless otherwise noted. [Pigmented coating shall be used in lieu of clear coating when directed by the Engineer.]

B. "P.W.S." COATINGS: Note: This Coating shall be applied to surfaces listed under B above.

1. **Professional Water Sealant (PWS) Low V.O.C:** Anti-graffiti protectant. Professional Water Sealant consists of a penetrating, permanent weatherproofing treatment; one component sealant, clear with flat/matte finish, formulated using Silicone Rubber (RTV).

C. **For stained concrete** - the Contractor shall apply a sacrificial wax coating as listed in C above, unless directed otherwise by the Engineer.

**CONSTRUCTION DETAILS**

Thirty (30) days prior to the start of this work, the Contractor shall submit a work schedule, for this work, to the Engineer. The contractor shall keep the top coating surface graffiti free until the coating is cured. Quality Assurance Graffiti Resistant Coating shall be applied only by an installer trained by the manufacturer of each respective product. A training session will be provided on site by a factory representative.

**PRODUCT DELIVERY, STORAGE, AND HANDLING:**

A. Contractor shall deliver materials in sufficient quantity to allow for continuity of work. Protect all materials, and equipment, during transit, delivery, storage, and handling to prevent damage and deterioration.

B. Avoid fire; open flame and sparks. Container contents, even when empty, may ignite explosively when exposed to heat, welding, cutting torch, pilot lights and other flames and ignition sources at locations distant from the material storage and handling point.

C. Avoid inhalation; ingestion; skin contact; and eye contact.

D. Protect shrubs, plants and grass, during application. Avoid wind drift which may injure passersby or damage vehicles and adjacent properties.

E. For additional cautions, human health data and protective equipment to be used (including respiratory), refer to Material Safety Data Sheets.
ITEM 559.90030011 - FIELD APPLIED PERMANENT GRAFFITI-RESISTANT COATING
ITEM 559.90040011 - FIELD APPLIED SACRIFICIAL WAX GRAFFITI-RESISTANT COATING

F. Containers shall be kept closed when not in use.

G. Dispose of excess, waste materials and empty containers in accordance with all local, state and federal regulations. Empty containers may be classified as hazardous; they retain product residues such as vapor, liquid or solid. Do not transfer contents into other containers for storage.

H. Contractor shall implement any additional requirements as per manufacturer’s recommendations.

SURFACE PREPARATION:
Surfaces shall be thoroughly dry, cleaned and free of dust, surface dirt, oil, grease and other contaminants that might prevent penetration of the coatings. Newly constructed surfaces, repointed surfaces and concrete shall be cured for at least 28 days before application. Glossy, glazed and slick troweled surfaces should be lightly etched or abraded before application of coatings. Surface defects, voids, joints or cracks must be properly sealed or filled, allowing any patching compounds to be completely cured before application. Cleaning may be accomplished by high pressure washing, sand blasting or chemical cleaning, as determined by the Engineer. When chemicals are used, they should be removed by high pressure water cleaning before application of the sealant. Use of raw acids shall not be permitted. Allow cleaned surfaces to dry completely. A test must always be made prior to application using the same cleaning and application procedures as to be used on the project. This test area shall remain available to be inspected by the Engineer. Contractor shall implement any additional requirements as per manufacturer’s recommendations.

APPLICATION PROCEDURES: as per manufacturer’s recommendations

CLEAN-UP INSTRUCTIONS: as per manufacturer’s recommendations

CURE TIME REQUIRED PRIOR TO REMOVER USE: as per manufacturer’s recommendations
The quantity of graffiti resistant coating to be paid for under this item will be the number of square meters of surfaces prepared, coated, and cured, in accordance with the Contract Drawings, Specifications and directions of the Engineer.

BASIS OF PAYMENT
The price per square meter shall include the cost of all labor, materials, equipment and incidental expenses necessary to furnish and install graffiti resistant coatings, including surface preparation, application, and proper curing of coating and protection of the surfaces from graffiti tagging until the coating is fully cured, all in accordance with the Plans, Specifications, and directions of the Engineer. No additional payment will be made for surface preparation cleaning by high pressure washing, sand blasting, or chemical cleaning as determined by the Engineer. Pre-existing graffiti shall be removed under separate pay items.
The Contractor is responsible for the protection of the traveling public and the protection of trees and vegetation at no additional cost to the State.
The training session provided on site by a factory representative will be at no additional cost to the State.

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<thead>
<tr>
<th>Item No.</th>
<th>Item Description</th>
<th>Pay Unit</th>
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<tbody>
<tr>
<td>559.90030011</td>
<td>Field Applied Permanent Graffiti-Resistant Coating Square</td>
<td>Feet</td>
</tr>
<tr>
<td>559.90040011</td>
<td>Field Applied Sacrificial Wax Graffiti-Resistant Coating</td>
<td>Square Feet</td>
</tr>
</tbody>
</table>
ITEM  559.91100010 - ANTI-GRAFFITI PROTECTIVE COATING

DESCRIPTION

Under this item, the Contractor shall clean, furnish and place anti-graffiti protective coating on noise barrier walls, retaining walls, bridge structures, barriers, or other concrete surfaces at locations indicated in the contract documents or approved by the EIC. Wood surfaces shall not be treated with anti-graffiti protective coating under this item.

The Contractor shall apply the protective coating on selected surfaces within the limits in the contract documents. In addition, the Engineer may order that certain areas receive increased coverage or new locations be added.

MATERIALS

The protective coating shall be a breathable, one component clear non-sacrificial urethane or acrylic water based formulation designed as an anti-graffiti solution.

The Contractor shall provide the manufacturer’s product literature including surface preparation data, mixing, application, spread rates, storage and Volatile Organic Compounds (VOC) compliance certification.

All materials are to be approved by the Engineer and the Regional Landscape Architect before any work can begin.

CONSTRUCTION DETAILS

1. The selected surfaces shall be thoroughly cleaned of dust, dirt, grease, oil, loose materials or other objectionable materials before applying the protective coating. No sandblasting will be allowed. Anti-graffiti coating shall be applied as soon as practicable after cleaning is completed. If in the opinion of the Engineer, the surface has become soiled, or otherwise contaminated, prior to the application of the protective coating; the surface shall be re-cleaned at no additional cost to the State.

2. Surface and material temperatures shall be a minimum of 40°F or as recommended by the manufacturer.

3. Material shall be applied by brush, roller or low-pressure spray. The rolling shall be done only on smooth surfaces and at such a pace that no spinning of the roller or throwing off of protective coating material occurs when the roller is lifted from the surface. Coverage rate shall be as recommended by the manufacturer and as approved by the Engineer.

4. The protective coating shall be applied in a uniform manner to evenly coat all pores and textured areas. Extremely textured or porous surfaces will require a second coat. Unless otherwise designated by the Engineer, the protective coating shall be applied from
ITEM  559.91100010 - ANTI-GRAFFITI PROTECTIVE COATING

column to column, post to post, and from bottom to a height of 8 feet 2.5 for noise barrier wall panels, and from joint to joint or scoremark to scoremark and from bottom to a height of 8 feet for abutments, walls or other surfaces.

5. Avoid high wind and rain, prolonged exposure in summer sunlight, and keep from freezing 12 hours after application.

6. A test panel 5 foot x 5 foot shall be provided and coated to insure suitability, number of coats required, and desired results. The test panel application and results shall be inspected and approved by the Engineer and the Regional Landscape Architect.

7. All work must conform to the OSHA standards referred to in subsection 107-05 of the Standard Specifications.

8. No dilution can happen of dilution or cleaner.

METHOD OF MEASUREMENT

This work will be measured by the number of square feet of surface covered with the anti-graffiti coating applied, in accordance with this specification. Test panels prepared under this item will not be measured for payment.

BASIS OF PAYMENT

The unit price bid per square foot shall include the cost of furnishing all labor, materials and equipment necessary to prepare the surfaces and apply the coating in accordance with the contract documents and as directed by the Engineer. The cost of providing necessary test panels shall also be included in the price bid for this item.
ITEM 566.13141501 – ELASTOMERIC EXPANSION JOINT SYSTEM
ITEM 566.13142001 – ELASTOMERIC EXPANSION JOINT SYSTEM – WITH WEAR PLATES

DESCRIPTION

This work shall consist of furnishing and installing an Elastomeric Expansion Joint System or Elastomeric Expansion Joint System – With Wear Plates, at the locations indicated in the contract plans, in accordance with this specification and the joint system Manufacturer’s instructions. The Contractor shall notify the Deputy Chief Engineer, Structures (DCES) of the name and address of the fabricator of all bridge joint systems in accordance with §106-01 Sources of Supply.

Elastomeric Expansion Joint System consists of an elastomeric slab of a specific shape to permit the required expansion and contraction of the joint system. The slab is reinforced with internal steel plates. The joint system is bolted to supporting material on each side of the joint opening. The vertical interface between the joint and the supporting material is sealed to prevent water intrusion. A flexible elastomeric drainage trough is attached to both sides of the joint and sloped transversely to drain.

Elastomeric Expansion Joint System – With Wear Plates has all the features of Elastomeric Expansion Joint System and includes aluminum skid resistance plates which are molded onto the top surface.

MATERIALS

The joint system and all its component parts shall be supplied by the Manufacturer. The Manufacturer shall certify that the following components meet the listed requirements:

All steel components of the joint system shall meet the requirements of ASTM A709, Grade 50. Use of ASTM A709, Grade 36 shall also be permitted.

All fasteners shall be stainless steel and meet the requirements of §715-16.

Flexible material for drainage troughs shall be neoprene or natural rubber meeting the requirements of ASTM D2000-12 M2BC517A14B34.

Aluminum wear plates shall be alloy 6061-T6 (ASTM B 221-73).

Shop Drawings shall be required for any joint system supplied as part of this work. Shop Drawings shall be prepared and reviewed in accordance with the applicable provisions of the SCM and this Specification and submitted to the Engineer for approval. All Shop Drawings shall note the name and address of the Joint System Fabricator, including the actual location (address) where the fabrication will take place although no shop inspection shall be required.

The joint system Manufacturer’s instructions for the proper installation of the joint system
shall be included on the Shop Drawings. Manufacturer's instructions shall include the proper width settings for various ambient temperatures. Shop Drawings which lack Manufacturer's installation instructions shall be returned without examination.

Fabrication shall not commence until the Engineer has approved the shop drawings and authorized fabrication.

The fabricated joint system will be accepted at the work site by the Engineer after a visual inspection and upon receipt of the Manufacturer's Certification Report (MCR) that the materials and the fabricating procedures were in accordance with the Approved Shop Drawings and this Specification. The Manufacturer shall submit, with the MCR, a Certified Copy of the Mill Test Report (MTR) for all steel used to fabricate the joint system.

CONSTRUCTION DETAILS

The concreting surface leveling accuracy, installation of anchoring system, installation of drainage system under the joint, and installation of elements shall be as per the joint Manufacturer’s instructions. The concrete block out and deck opening shall be based on the specific joint system used.

A minimum gap of $\frac{1}{4}$ inch ($\frac{1}{8}$ inch) shall be provided between the concrete edge and joint system and it shall be filled with silicone joint sealant per §705-05.

The drainage channel shall be bonded and bolted to the connecting parts.

The joint system shall include provisions to allow for routine maintenance including cleanout of the drainage trough.

After the joint system is permanently installed, including plates and all concrete placements, a watertight integrity test of the joint system shall be performed. The test shall be done in accordance with the requirements of §567-3.01H.

METHOD OF MEASUREMENT

This work will be measured as the number of linear feet of expansion joint system satisfactorily furnished and installed.

BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.
DESCRIPTION.
This work shall consist of furnishing and placing a polyester polymer concrete (PPC) overlay with High Molecular Weight Methacrylate (HMWM) resin primer on concrete surfaces where indicated in the Contract Documents. The work shall include the preparation of receiving surfaces.

MATERIALS.
The polyester concrete shall consist of polyester resin binder and aggregates with a compatible primer meeting the component and composite material properties specified. All components shall be supplied collectively through the same provider, qualified as defined herein, referred to as the System Provider.

1. Primer. The prepared surface shall receive a wax-free low odor, high molecular weight methacrylate (HMWM) primer consisting of a resin, initiator and promoter and conforming to the following:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatile Content*</td>
<td>30%, maximum</td>
<td>ASTM D 2369</td>
</tr>
<tr>
<td>Viscosity* (&lt;Brookfield RVT with UL adapter, 50 RPM at 77°F&gt;)</td>
<td>25 cps, maximum</td>
<td>ASTM D 2196</td>
</tr>
<tr>
<td>Specific Gravity* (&lt;at 77°F&gt;)</td>
<td>0.90, minimum</td>
<td>ASTM D 1475</td>
</tr>
<tr>
<td>Flash Point* (&lt;at 77°F&gt;)</td>
<td>180°F, minimum</td>
<td>ASTM D 3278</td>
</tr>
<tr>
<td>Vapor Pressure* (&lt;at 77°F&gt;)</td>
<td>1.0 mm Hg, maximum</td>
<td>ASTM D 323</td>
</tr>
<tr>
<td>PCC Saturated Surface-Dry Bond Strength, with primer** (&lt;at 24 hours and 70 ± 1°F&gt;)</td>
<td>700 psi, minimum</td>
<td>CA Test 551, part 5</td>
</tr>
</tbody>
</table>

*Tested prior to adding initiator.
**Initiated polyester concrete tested at 12% resin content by weight of the dry aggregates.

The prime coat promoter/initiator shall consist of a metal drier and peroxide. If shipped separately from the resin, at no time shall the metal drier be mixed directly with the peroxide – a violent exothermic reaction will occur. The containers shall be stored in a manner that will not allow leakage or spillage from one material to contact the containers or material of the other.

2. Aggregate. Aggregate for polyester concrete shall meet the following properties:
   1. Aggregate retained on the #8 sieve shall have a maximum of 45% crushed particles when tested in accordance with AASHTO Test Method T335.
   2. Fine aggregate shall consist of natural sand only.
   3. Weighted average aggregate absorption shall not exceed 1.0% as determined by AASHTO Test Methods T84 and T85.
   4. At the time of mixing with the resin, the moisture content of the aggregate, as determined by AASHTO Test Method T255, shall not exceed one half of the aggregate absorption.
   5. Aggregate shall have a minimum Mohs hardness of 7.
   6. Aggregate shall meet the following gradation:
Item 584.40000009 – Polymer Overlay Wearing Surface for Structural Slabs (PPC)

<table>
<thead>
<tr>
<th>Aggregate Gradation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sieve Size</td>
</tr>
<tr>
<td>3/8”</td>
</tr>
<tr>
<td>No. 4</td>
</tr>
<tr>
<td>No. 8</td>
</tr>
<tr>
<td>No. 16</td>
</tr>
<tr>
<td>No. 30</td>
</tr>
<tr>
<td>No. 50</td>
</tr>
<tr>
<td>No. 100</td>
</tr>
<tr>
<td>No. 200</td>
</tr>
</tbody>
</table>

Sand for abrasive sand finish shall meet the following properties:
1. Shall be a commercial-quality blast sand.
2. Shall not have less than 95% pass the No. 8 sieve and not less than 95 retained on the No. 20 sieve when tested under AASHTO T27.
3. Shall be dry at the time of application.

3. Polyester Resin Binder. The polyester binder resin shall have the following properties:
1. Be an unsaturated isophthalic polyester-styrene co-polymer suitable for a polyester concrete mixture with a resin content of 12% ± 1% of the weight of the dry aggregate.
2. Contain at least 1% by weight gamma-methacryloxypropyltrimethoxysilane, an organosilane ester silane coupler.
3. Be used with a promoter that is compatible with suitable methyl ethyl ketone peroxide and cumene hydroperoxide initiators.
4. Shall meet the following material properties:

<table>
<thead>
<tr>
<th>Polyester Resin Binder</th>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Viscosity* (RVT No. 1 spindle, 20 RPM at 77°F)</td>
<td>75-200 cps</td>
<td>ASTM D 2196</td>
</tr>
<tr>
<td></td>
<td>Specific Gravity* (at 77°F)</td>
<td>1.05 to 1.10</td>
<td>ASTM D 1475</td>
</tr>
<tr>
<td></td>
<td>Styrene Content*</td>
<td>40-50%, by weight</td>
<td>ASTM D 2369</td>
</tr>
<tr>
<td></td>
<td>Silane Coupler*</td>
<td>1.0%, by weight</td>
<td>NMR Spectrum</td>
</tr>
<tr>
<td></td>
<td>Elongation</td>
<td>35%, minimum (Type I specimen, thickness 0.25± 0.03” at Rate = 0.45 inch/minute)</td>
<td>ASTM D 638</td>
</tr>
<tr>
<td></td>
<td>Sample Conditioning: 18/25/50+5/70</td>
<td></td>
<td>ASTM D 618</td>
</tr>
<tr>
<td></td>
<td>Tensile Strength</td>
<td>2,500 psi, minimum (Type I specimen, thickness 0.25± 0.03” at Rate = 0.45 inch/minute)</td>
<td>ASTM D 638</td>
</tr>
<tr>
<td></td>
<td>Sample Conditioning: 18/25/50+5/70</td>
<td></td>
<td>ASTM D 618</td>
</tr>
</tbody>
</table>

*Tested prior to adding initiator.
5. Polyester Concrete. The polyester concrete composite mixture shall meet the following properties:

<table>
<thead>
<tr>
<th>Property</th>
<th>Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCC Saturated-Surface Dry Bond Strength, without primer* (at 24 hours and 70 ± 1°F)</td>
<td>500 psi, minimum</td>
<td>CT 551</td>
</tr>
<tr>
<td>Abrasion Resistance</td>
<td>2g weight loss, maximum</td>
<td>CT 550</td>
</tr>
<tr>
<td>Modulus of Elasticity</td>
<td>1,000 to 2,000 ksi</td>
<td>ASTM C 469</td>
</tr>
</tbody>
</table>

*Initiated polyester concrete mixture tested at 12% resin content by weight of dry aggregates.

6. Packaging and Shipment. A Safety Data Sheet shall be furnished prior to use for each shipment of polyester resin binder and high molecular weight methacrylate resin. All components shall be shipped in strong, substantial containers. Polyester resin binder and primer resin shall bear the System Provider’s label specifying lot/batch number, brand name and quantity. In addition, the mixing ratio shall be provided to the Contractor by the System Provider prior to shipment.

7. Storage of Materials. All materials shall be stored in a cool, dry location and in their original containers in accordance with the System Provider’s recommendation to ensure their preservation until used in the work. The shelf life for liquid materials stored out of direct sunlight and at temperatures 80 °F and below shall be at least twelve (12) months. All aggregates shall be stored in a clean, dry location away from moisture. Applicable fire codes may require special storage facilities for some components of the overlay system.

7. Basis of Acceptance. Project acceptance of the polyester concrete overlay materials will be based on the following:

1. Delivery of the overlay materials to the project site in acceptable containers bearing all the label information as required in 6. Packaging and Shipment.
2. System Provider certifications and written instructions submitted by the Contractor to the Engineer thirty (30) days prior to overlay placement including the following information:
   a. Materials – statement that the primer, aggregate and polyester binder are compatible with one another and meet the material requirements found under MATERIALS, 1-4
   b. Experience – documented evidence of having successfully supplied a complete polyester polymer concrete overlay system meeting this specification on at least five (5) projects of similar size and scope within the last five (5) years.
   c. Technical Representative – having successfully provided technical support on at least five (5) projects of similar size and scope within the last five (5) years
3. Approval by the Materials Bureau based on conformance with the Material requirements above.

CONSTRUCTION DETAILS.
A. General. A System Provider’s competent technical representative shall be made available for up to three (3) working days to make recommendations to facilitate the overlay installation

During surface preparation and overlay application, precaution shall be taken to assure that traffic is protected from rebound, dust and construction activities. Appropriate shielding shall be provided as
required and directed by the Engineer. The Contractor shall provide suitable coverings (e.g. heavy duty drop cloths) to protect all exposed areas not to be overlaid, such as curbs, sidewalks, parapets, etc. All damage or defacement resulting from this application shall be cleaned and, or repaired to the Engineer’s satisfaction, at no additional cost.

B. Equipment.

Surface Preparation. All equipment to be used for surface preparation shall be as specified by the overlay manufacturer and approved by the Engineer. Unless otherwise specified, the Contractor shall use automatic shot blasting units to clean pavement surfaces. In those areas not accessible to this machinery, the surface may, with the Engineer’s approval, be cleaned with sand blast cleaning equipment. Automatic shot blasting units shall be self-propelled and include a vacuum to recover spent abrasives. The abrasive shall be steel shot. Magnetic rollers shall be used to remove any spent shot remaining on the deck after vacuuming. In those areas not accessible to this machinery the surface may, with the Engineer’s approval, be cleaned with sand blast cleaning equipment.

Mixing. Polyester concrete shall be mixed in either mechanically operated mixers or continuous automated mixers meeting the following requirements:

a. Employ an auger screw/chute device capable of completely blending catalyzed binder resin and aggregates.
b. Employ a plural component pumping system capable of handling polyester binder resin and catalyst, adjustable to maintain proper ratios to achieve set/cure times within the specified limits.
c. Be equipped with an automatic metering device that measures and records aggregate and resin volumes. Record volumes at least every 5 minutes, including time and date. Submit recorded volumes at the end of shift.
d. Have a visible readout gage that displays volumes of aggregate and resin being recorded.
e. Produce a satisfactory mix consistently during the entire application process.
f. Be calibrated per Caltrans California Test CT 109 or similar. Submit current certificate of calibration to the Engineer.

Portable mechanically operated mixers of appropriate size, as recommended by the System Provider and approved by the Engineer, may be used unless otherwise noted on the Plans.

Application and Finishing. Polyester concrete shall be placed by a vibratory screed on preset forms or rails or by self-propelled slip-form paving machine, which is modified or specifically built to effectively place polyester concrete overlays in a manner meeting the following requirements:

a. Employ a vibrating pan to consolidate and finish the polyester concrete overlay.
b. Be fitted with hydraulically controlled grade automation to establish the finished profile. The automation shall be fitted with substrate grade averaging devices on both sides of the new placement; the device shall average 15 feet in front and behind the automation sensors; or the sensor shall be constructed to work with string-line control. It is acceptable to match grade when placing lanes adjacent to previously placed polyester overlay.
c. Have sufficient engine power and weight to provide adequate vibration of the finishing pan while maintaining consistent forward speed.
d. Be capable of forward and reverse motion under its own power.

Roller screeds will not be permitted.
C. Trial Application. Prior to constructing the overlay, one or more trial applications shall be placed on the prepared substrate to demonstrate proper initial set time and the effectiveness of the surface preparation, mixing, placing and finishing equipment proposed. Each trial application shall be at least 10 feet long and at the planned paving width and specified overlay thickness. The location(s) of the trial applications shall be approved by the Engineer.

If the cleaning practice, materials, installation, finishing and/or texturing are not acceptable, the Contractor shall remove the failed trial application and reinstall the trial application at no additional cost to the Department until satisfactory results are obtained.

The number of trial applications required shall be as many as necessary for the Contractor to demonstrate the ability to construct an acceptable trial overlay section and competency to perform the work. The installer, System Provider and/or proposed equipment/techniques may be rejected by the Engineer if not shown to be acceptable after three (3) failed trial applications.

Vertical axis pull test shall be performed twenty-four (24) hours after the placement of the trial application in accordance with ASTM C 1583 to assure that the overlay adheres to the prepared surface. The test result shall be the average of 2 successful tests. Test cores shall be drilled through the overlay and into the substrate a minimum of 0.25". The minimum tensile pull strength on normal weight concrete substrates shall be 250 psi. An acceptable test will demonstrate that the overlay bond strength is sufficient by producing a concrete subsurface failure area greater than 50% of the test area. The Contractor shall repair all bond test locations with polyester concrete in accordance with this specification.

D. Surface Preparation. All structural slab surfaces that will be in contact with the overlay shall be prepared by shotblasting in order to remove all existing grease, slurry, oils, paint, dirt, striping, cure compound, rust, membrane, asphalt, weak surface mortar or any other contaminants that could interfere with the proper adhesion of the overlay system.

The final prepared surface shall meet the following requirements:

Areas to receive the polyester overlay shall be cleaned by shotblasting. Areas that cannot be accessed by shotblast may be cleaned by abrasive sandblast. Cleaning shall not commence until all work involving the repair of the concrete substrate surface has been completed and repair materials have cured. All contaminants shall be picked up and stored in a vacuum unit, and dust shall not be created during the cleaning operation that will obstruct the view of motorists. The Contractor shall determine the size of shot, flow of shot, forward speed of shot blast machine and number of passes necessary to provide a surface free of weak or loose surface mortar, exposing the aggregates within the substrate concrete and visibly changing the color of the substrate concrete. Mortar which is sound and firmly bonded to the coarse aggregate must have open pores due to cleaning to be considered adequate for bond.

Cleaned surfaces shall not be exposed to vehicular traffic unless required by the overlay operation and approved by the Engineer. Cleaned concrete substrates that have been contaminated such that contaminants might interfere with the bonding or curing of the overlay must be cleaned to the satisfaction of the Engineer prior to placing the overlay at no additional cost to the Department. The cleaned concrete substrate shall be dry at the time of application of the primer and overlay.

All steel surfaces that will be in contact with the overlay shall be cleaned in accordance with SSPC-SP No. 10, Near-White Blast Cleaning, except that wet blasting methods shall not be allowed.
**E. Application.** Prior to the primer and overlay application, moisture content reading must be ≤ 5.0% using a moisture meter, or you can use ASTM D4263 - Indicating Moisture in Concrete by the Plastic Sheet Method for a minimum of 2 hours. If using ASTM D4263, no visible moisture is considered acceptable. The substrate surface temperature shall be between 40-100°F at the time of primer and overlay placement. Night work may be required when temperatures cannot be met during the day.

1. **Prime Coat**
   Prior to applying the HMWM prime coat, the area shall be completely dry and blown clean with oil-free compressed air. Primer shall be mixed and applied in accordance with the System Provider’s recommendations. Primer shall be applied within 5 minutes of mixing initiator and resin at a rate of approximately 90-100 ft²/gal or as otherwise recommended by the System Provider.

   Primer shall be applied by flooding and uniformly spread to completely cover all surfaces to receive overlay, including any adjacent vertical surfaces. Care should be taken to avoid heavy application that results in excess puddling. Excess material shall be removed or distributed to meet the recommended application rate. Primer shall be reapplied to any areas that appear visibly dry prior to overlay placement.

2. **Polyester Concrete.**
   The polyester concrete shall be mixed and applied in accordance with the System Provider’s recommendations. The polyester concrete shall be placed prior to gelling or within 15 minutes after the addition of the initiator, whichever occurs first, or as recommended by the System Provider. Polyester concrete shall be placed no sooner than 15 minutes and no later than 2 hours after the beginning of the application of the primer.

   The polyester concrete mixture shall achieve an initial set time between 30 minutes and 90 minutes. For the purposes of this specification, initial set is defined as when the in-place polyester concrete cannot be deformed when firmly pressed with a finger. Material not achieving initial set within this time frame shall be removed and replaced at no additional cost.

   The polyester concrete shall be consolidated and finished using placement equipment as defined herein to strike off the polyester concrete to the required grade and cross-section as shown in the Contract Plans.

   The polyester overlay shall be placed at a profile necessary to meet the desired grade and cross-section as shown in the Plans with a minimum thickness of 0.75 inch. Termination edges of the overlay may require application and finishing by hand trowel due to obstructions such as a curb. Expansion joints shall be adequately isolated prior to overlaying or may be sawed within four (4) hours after overlay placement, as approved by the Engineer.

3. **Abrasive Finish Sand.**
   **Immediately** following the overlay placement and before gelling, a layer of abrasive finish sand shall be evenly spread over the entire overlay surface such that the surface is completely covered and no wet spots are visible. The surface shall be continuously monitored to ensure sufficient finish sand coverage until initial set has occurred. If wet area(s) become visible through the sand, the Contractor shall apply, to refusal, additional finish sand on surface. After the overlay has cured, use an electric broom and/or compressed air to remove excess sand prior to opening the bridge to traffic. Any buildup of sand on the roadway shoulders or drainage shall be completely cleaned before closing the job.
4. Texturing.
   When full diamond grinding of the riding surface is required, the requirements of §502-3.17 shall be followed. Longitudinally saw cut the PPC surface in accordance with section 558.02 - Longitudinal Saw-Cut Grooving of Structural Slab Surface. Grooving shall occur 24-hours after placement or anytime thereafter. No tining is allowed.

5. Curing.
   The overlay shall be allowed to cure sufficiently before being subjected to loads or traffic of any nature that may damage the overlay. Cure time is dependent on ambient and substrate temperatures and also initiator/accelerator levels used at the time of mixing. The overlay shall be considered cured to a traffic ready state after four (4) hours following finishing or when a minimum reading of twenty-five (25) on a properly calibrated Schmidt hammer is achieved, whichever occurs first.

F. Surface and Thickness Requirements. Variable thickness overlay placement may be required to account for variations in substrate profile to meet the desired grade and cross-section as shown in the Plans. Unless otherwise noted on the Plans the overlay surface shall not vary more than ¼ inch from the lower edge of a 12′± 2″ long straight edge placed in any direction. Surface area larger than 30,000 ft² may require an inertial profiler as indicated in the Plans. Any surfaces which fail to conform to the specified tolerance shall be re-profiled by diamond grinding in accordance with the requirements of 502-3.17. Diamond grinding shall not occur until at least 24 hours after placement of the overlay.

If the Engineer determines that the minimum thickness has not been attained, an additional layer shall be applied after the overlay has cured for a minimum of four (4) hours. This layer shall be a minimum of ¼” and shall be applied as recommended by the System Provider and approved by the Engineer at no additional cost to the State.

To ensure adequate pavement friction, the completed overlay surface shall be free of any smooth or glassy areas such as those resulting from insufficient quantities of abrasive finish sand. Any such surface defects shall be repaired as recommended by the System Provider and approved by the Engineer at no additional cost to the State. Areas less than 4.0 ft² shall be ground using a hand grinder. Larger areas and frequency representing more than 20% of the surface shall be diamond-ground in accordance with Full Diamond Grinding of Structural Slab and Structural Approach Slab with Slurry Removal specification. If material remains protruding above the diamond ground surface sufficient to interfere with the sawcut grooving, that material shall be removed and cleaned to the Engineer’s satisfaction.

Surface cracks in sound, bounded polyester concrete overlays may be filled with properly catalyzed HMWM primer material.

METHOD OF MEASUREMENT.
The polyester concrete overlay will be measured by the square foot as shown in the Plans.

BASIS OF PAYMENT.

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>584.40000009</td>
<td>Polymer Overlay Wearing Surface for Structural Slabs (PPC)</td>
</tr>
</tbody>
</table>

The unit price bid per square foot shall include the cost of all labor, materials, equipment, and incidentals necessary to complete the work. The unit price bid shall also include the cost of having the polymer manufacturer’s representative present as required.
ITEM 584.50010018 – THIN POLYMER (EPOXY) OVERLAYS FOR STRUCTURAL SLABS

DESCRIPTION
Furnish and apply a two course thin polymer (epoxy) overlay wearing surface on an existing bridge deck surface in accordance with the Contract Documents and as directed by the Engineer.

MATERIALS
A. Thin Polymer (Epoxy) Overlay System. Shall meet Materials Requirements of 734-01.

B. Packaging and Shipment. All components shall be shipped in appropriate containers, bearing the manufacturer's label specifying date of manufacture, batch number, brand name, quantity, and date of expiration or shelf life.

CONSTRUCTION DETAILS
A. General. The Materials Details and Material Safety Data Sheets (MSDS) for the thin polymer (epoxy) overlay system are readily available on the Department Approved List on the internet @ www.dot.ny.gov under Approved List of Materials and Equipment. The materials details will provide the following:
   • Product Information
   • Surface Preparation
   • Application Procedure
   • Curing Procedure
For Epoxy and Aggregate Suppliers, use NYSDOT Materials and Equipments Approved List: Thin Polymer (Epoxy) Overlays for Structural Slabs

A technical representative from the overlay manufacturer shall be on-site during all phases of the work to make recommendations and to facilitate the overlay installation. This shall include, but not be limited to, surface preparation, deck surface repairs, overlay application, and overlay cure.

Contractor shall provide adequate shielding to protect traffic and surrounding environment from rebound and dust during surface preparation and shot-blast cleaning work. Any spent shot blast beads, shot blast waste shall be removed from the project by the end of the day.

Contractor shall provide suitable coverings (e.g. heavy duty drop cloths) during overlay application to protect all exposed areas not to be overlaid, such as curbs, sidewalks, parapets, expansion joints, etc. Any damage or defacement resulting from this application shall be thoroughly cleaned and/or repaired to the Engineer's satisfaction and at no additional cost to the State.

B. Storage of Materials. All materials will be stored in accordance with the Materials Details.
ITEM 584.50010018 – THIN POLYMER (EPOXY) OVERLAYS FOR STRUCTURAL SLABS

C. Installation Procedure:

1. Surface Preparation. The Contractor will perform all necessary deck repair work prior to placement of the epoxy overlay. Once the required repair area(s) have been identified, confer with the preapproved selected supplier of the Thin Polymer (Epoxy) Overlay system to ensure that the repair material is compatible with the selected system. Allow for all repair materials to properly cure prior to placement of Thin Polymer (Epoxy) Overlay system. The deck repairs will be made where indicated on the plans or where directed by the Engineer. Repairs will be paid for under the appropriate structural concrete removal item. Concrete patches will be completely cured prior to placement of the epoxy overlay. After deck repairs are completed, cured and prior to placement of the overlay, the Contractor will blast the entire deck surface to remove asphaltic materials, oil, grease, dirt, sealers, rust, laitance, curing compounds, paint and weak concrete materials that would inhibit successful bonding of the epoxy overlay to the wearing surface.

Automatic shot-blast units will use a vacuum to recover spent abrasives. Magnetic rollers or other devices will be used to remove any spent shot remaining on the deck after vacuuming. Traffic paint lines shall be completely removed prior to placement of the overlay and reapplied upon completion of the overlay. Freshly repaired and cured concrete areas will be cleaned per Section 584-3.02A of the Standard Specifications. All steel surfaces that will be in contact with the overlay will be cleaned according to SSPC-SP No.10, Near-White Blast Cleaning. A profile of CSP5-6 is desired.

The bridge deck surface must be dry prior to the application of the thin polymer (epoxy) overlay system. No visible moisture shall be present on the bridge deck at the time of placement. Prior to overlay application, moisture content reading must be ≤ 5.0% using a moisture meter, or you can use ASTM D4263 - Indicating Moisture in Concrete by the Plastic Sheet Method for a minimum of 2 hours. If using ASTM D4263, no visible moisture is considered acceptable.

Do not apply overlay if rain is expected during installation or curing time.

Bond Strength to structure: Acceptability of the surface preparation may be determined by the use of a vertical axis pull bond test. Test shall be performed in accordance to ACI 503R-30 or ASTM C1583/C1583M and shall have a minimum bond strength of 250 psi or achieve failure of the concrete. The test should be performed every 100 linear feet (LF) minimum or 300 LF maximum. Minimum 4 pull-off tests are required per structure. The Engineer will determine the test locations or per manufacturer representative recommendation.

Immediately prior to application of the overlay, the Contractor shall request and receive approval to proceed from the Engineer to assure that the surface is acceptable for application of the thin polymer (epoxy) overlay.
ITEM 584.50010018 – THIN POLYMER (EPOXY) OVERLAYS FOR STRUCTURAL SLABS

2. Application The thin polymer (epoxy) overlay shall be applied in accordance with this specification and the Manufacturer Materials Detail Sheets (MDS).

**Epoxy Resin Application Rate:**
Course #1: Epoxy rate is 30 ft²/gal
Course #2: Epoxy rate is 20 ft²/gal

**Aggregate Application Rate:** Approximately ~ 1.5 lb/ft² or to refusal per course.

The two courses of the thin polymer (epoxy) overlay shall be applied within 24 hours following final surface preparation. If the overlay is not applied within 24 hours, or the accepted prepared surface is opened to traffic and/or contaminated in any way, the pavement shall be re-cleaned to the satisfaction of the Engineer at no additional cost to the State. Traffic may be allowed prior to completion of 2nd course at discretion of EIC and manufacturer’s representative.

Expansion joints shall be protected from contaminates by masking or other methods as approved by the Engineer. Consult with manufacturer’s representative and approved Material Details to address details at joints and drainage structures. The Contractor will demonstrate that these requirements are met to the Engineer’s satisfaction.

3. Finishing The Contractor shall use methods and equipment for finishing the overlay materials in accordance with the Materials Details. The completed overlay surface shall be free of any smooth or "glassy" areas such as those resulting from insufficient quantities of surface aggregate. Contractor shall repair such surfaces as recommended by the manufacturer and approved by the Engineer at no additional cost to the State.

4. Surface and Thickness Requirements. The specified thickness requirements will be verified by the manufacturer’s representative to the Engineer’s satisfaction.

D. **Curing.** The thin polymer (epoxy) overlay will be cured before subjecting it to traffic or any loads that would damage the overlay. Cure time is dependent upon both ambient and deck temperatures. Material shall not be placed if ambient temperature is less than 50°F or is expected to fall below 50°F during the placement period. The degree of cure and suitability of the overlay for traffic loads shall be determined by the manufacturer representative and approved by the Engineer.

**METHOD OF MEASUREMENT**
This work will be measured as the number of square feet of thin polymer (epoxy) overlay system satisfactorily applied as determined by deck measurements and as shown in the Contract Documents.

**BASIS OF PAYMENT**
The unit price bid per square foot shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work. The unit price bid shall include the cost of having the epoxy overlay manufacturer's representative onsite during the work as required.
ITEM 603.95120011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING,
12 IN DIA (NYC)

ITEM 603.95160011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING,
16 IN DIA (NYC)

ITEM 603.95180011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING,
18 IN DIA (NYC)

ITEM 603.95200011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING,
20 IN DIA (NYC)

ITEM 603.95240011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING,
24 IN DIA (NYC)

DESCRIPTION

This work shall consist of the construction of ductile iron pipe storm drains in accordance with this specification and the contract plans.

MATERIALS

Ductile iron pipe shall be Class 56 unless otherwise indicated and meet the requirements of ANSI A21.51. Pipe shall be centrifugally cast Ductile Iron Pipe, 60-42-10 grade cement lined in accordance with ANSI A21.51. Laying lengths shall not exceed twenty (20) feet. All inside surfaces of ductile, iron pipes shall be cement lined in accordance with ANSI specification A21.4. All outside surfaces of ductile iron pipe shall be shop-coated with an approved bituminous enamel applied hot in conformity with AWWA specification 203.

Joints shall be of the restrained push-on type and shall be in accordance with ANSI specification A21.11. The joint shall provide a positive axial lock between the two pipe segments joined. For each bell, there shall be furnished a rubber gasket. Restrained push-on joints shall be the TRFlex Joint of U.S. Pipe and Foundry Company, the Flex Ring Joint of the American Cast Iron Company, the Snap Lok Joint of Amstead Industries or approved equal.

Ductile Iron Pipe shall be accepted on the basis of the Manufacturer’s certification that the material conforms to the requirements of this specification. The certification shall accompany the material delivered to the job site.

Broken stone shall be hard, unweathered stone uniformly graded from ¼ inch to 3/4 inch diameter and shall conform to the requirements of Subsection 703-02 of the Standard Specifications (USC Edition).

CONSTRUCTION DETAILS

Pipe shall be laid on a bed of compacted stone for the full trench width to the limits shown on the details of the drawings. Pipe joints shall be restrained push-on type and shall be installed in accordance with the manufacturer’s instructions for assembling pipe. All other requirements of Subsection 603-3 “Construction Details” of the Standard Specifications (USC Edition) shall apply.

METHOD OF MEASUREMENT

The quantities of Ductile Iron Pipe on Crushed Stone Bedding to be measured for payment shall be the number of linear feet of each sized measured horizontally along the center line of sewer from inside face of manhole to inside face of manhole.
ITEM 603.95120011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 12 IN DIA (NYC)
ITEM 603.95160011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 16 IN DIA (NYC)
ITEM 603.95180011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 18 IN DIA (NYC)
ITEM 603.95200011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 20 IN DIA (NYC)
ITEM 603.95240011 – DUCTILE IRON PIPE ON CRUSHED STONE BEDDING, 24 IN DIA (NYC)

BASIS OF PAYMENT

The requirements of Subsection 603-5 “Basis of Payment” of the Standard Specifications (USC Edition) shall apply. The broken stone bedding shall be paid for separately under Item 623.13 Crushed Stone.
ITEM 604.02010011 - CATCH BASIN - TYPE 1 (NEW YORK CITY)
ITEM 604.02020011 - CATCH BASIN - TYPE 2 (NEW YORK CITY)
ITEM 604.02030011 - CATCH BASIN - TYPE 3 (NEW YORK CITY)

DESCRIPTION: This work shall consist of the construction of Catch Basins - Type 1, Type 2 and Type 3 (New York City) at the locations shown on the plans or as directed by the Engineer.

MATERIALS: Section 604-2.01 of the Standard Specifications shall apply with the following modifications and an addition: Catch Basins shall be built of Cast-in-Place Concrete - Class A or rectangular Precast Reinforced Concrete Manhole Units.

CONSTRUCTION DETAILS: Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply. Catch Basins - Type 1, Type 2 and Type 3 shall be as shown on New York City Department of Water Resources Drawings T71, T72 and New York City Department of Environmental Protection Drawing 42, respectively, except that concrete cradles and encasement for pipes will not be required.

METHOD OF MEASUREMENT: Section 604-4.01 of the Standard Specifications shall apply.

BASIS OF PAYMENT: Section 604-5 of the Standard Specifications shall apply with the following additions:
A. Hooks and Hoods. Hooks and Hoods, when called for on the plans, will be paid for separately.
B. Plugging Pipes. The cost of all materials and labor necessary to plug pipe as called for on the plans shall be included in the price bid for "Plugging Pipes and Conduits."
ITEM 604.04020011 - NYC STANDARD FOR 4 FOOT DIAMETER PRECAST MANHOLE

DESCRIPTION
This work shall consist of the construction of 4 Foot Diameter Precast Manholes (NYC) at the locations shown on the plans or as directed by the Engineer.

MATERIALS
Section 604-2.01 of the Standard Specifications shall apply with the following modification and or addition:
Manholes shall be built of circular Precast Reinforced Class “A” Concrete Manhole Units.

CONSTRUCTION DETAILS
Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply.
Manholes shall be as shown on the following New York City Department of Environmental Protection SEWER DESIGN STANDARDS, (October 1997 or later).
Page Drawing Description
28A NYC STANDARD FOR 4 FOOT DIAMETER PRECAST MANHOLE (LOOSE TOP SLAB AND MONOLITHIC BASE SECTION)
28B NYC STANDARD FOR 4 FOOT DIAMETER PRECAST MANHOLE (MONOLITHIC TOP SECTION AND ALTERNATE LOOSE BOTTOM SLAB)
28C NYC STANDARD FOR 4 FOOT DIAMETER PRECAST MANHOLE (MISCELLANEOUS DETAIL, NOTES AND SCHEDULE)

METHOD OF MEASUREMENT
The quantity to be paid for will be the number of linear feet of height measured to the nearest tenth of a foot from the bottom of the base to the top of the masonry.

BASIS OF PAYMENT
The unit price bid per linear feet shall include the cost of all labor, equipment and materials necessary to complete the work, except as follows:

A. Necessary excavation will be paid for under Trench and Culvert excavation.
B. Bar reinforcement (except in reinforced concrete pipe and precast reinforced concrete units) will be paid for under Uncoated Bar Reinforcement for Concrete Structures.
C. Frames, covers, and gratings will be paid for under the appropriate items.
D. Temporary sheeting, if necessary, will be paid for under their appropriate items.
ITEM 604.04030011 – NYC STANDARD FOR 5 FOOT DIAMETER PRECAST MANHOLE

DESCRIPTION

This work shall consist of the construction of 5 Foot Diameter Precast Manholes (NYC) at the locations shown on the plans or as directed by the Engineer.

MATERIALS

Section 604-2.01 of the Standard Specifications shall apply with the following modification and or addition:

Manholes shall be built of circular Precast Reinforced Concrete Manhole Units.

CONSTRUCTION DETAILS

Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply.

Manholes shall be as shown on the following New York City Department of Environmental Protection SEWER DESIGN STANDARDS, (September 2007 or later).

<table>
<thead>
<tr>
<th>Page</th>
<th>Drawing Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>29A</td>
<td>NYC STANDARD FOR 5 FOOT DIAMETER PRECAST MANHOLE (LOOSE TOP SLAB AND MONOLITHIC BASE SECTION)</td>
</tr>
<tr>
<td>29B</td>
<td>NYC STANDARD FOR 5 FOOT DIAMETER PRECAST MANHOLE (MONOLITHIC TOP SECTION AND ALTERNATE LOOSE BOTTOM SLAB)</td>
</tr>
<tr>
<td>29C</td>
<td>NYC STANDARD FOR 5 FOOT DIAMETER PRECAST MANHOLE (MISCELLANEOUS DETAIL, NOTES AND SCHEDULE)</td>
</tr>
</tbody>
</table>

METHOD OF MEASUREMENT

The quantity to be paid for will be the number of linear feet of height measured to the nearest tenth of a foot from the bottom of the base to the top of the masonry.

BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of all labor, equipment and materials necessary to complete the work, except as follows:

A. Necessary excavation will be paid for under Trench and Culvert excavation.
B. Bar reinforcement (except in reinforced concrete pipe and precast reinforced concrete units) will be paid for under Uncoated Bar Reinforcement for Concrete Structures.

C. Frames, covers, and gratings will be paid for under the appropriate items.

D. Temporary sheeting, if necessary, will be paid for under their appropriate items.
DESCRIPTION

This work shall consist of the construction of manholes – Type A-1 (NYC) and Drop Pipe Manholes (NYC) at the locations shown on the plans or as directed by the Engineer.

MATERIALS

Section 604-2.01 of the Standard Specifications shall apply with the following modification and an addition:

Manholes shall be built of Cast-in-Place Concrete - Class “A” or rectangular Precast Reinforced Concrete Manhole Units.

CONSTRUCTION DETAILS

Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply.

Manholes shall be as shown on the following New York City Department of Environmental Protection SEWER DESIGN STANDARDS (September 2007 or later).

<table>
<thead>
<tr>
<th>Page</th>
<th>Drawing Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>STANDARD FOR MANHOLE ON 8” DIA. TO 30” DIA. PIPE SEWERS IN DRY LOCATION, TYPE A-1 (12’ MAX. COVER) AND TYPE A-2 (25’ MAX. COVER)</td>
</tr>
<tr>
<td>35</td>
<td>STANDARD FOR REMOVABLE PRECAST REINFORCED CONCRETE SLAB</td>
</tr>
<tr>
<td>24</td>
<td>STANDARD FOR DROP PIPE MANHOLE (TYPE I) ON 10” DIA. TO 24” DIA. PIPE SEWERS (25’ MAX. COVER)</td>
</tr>
<tr>
<td>36</td>
<td>STANDARD FOR REMOVABLE PRECAST REINFORCED CONCRETE SLAB FOR DROP PIPE MANHOLE (TYPE I)</td>
</tr>
</tbody>
</table>

METHOD OF MEASUREMENT

The quantity to be paid for will be the number of linear feet of height measured to the nearest tenth of a foot from the bottom of the base to the top of the masonry.
BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of all labor, equipment and materials necessary to complete the work, except as follows:

A. Necessary excavation will be paid for under Trench and Culvert excavation.

B. Bar reinforcement (except in reinforced concrete pipe and precast reinforced concrete units) will be paid for under Uncoated Bar Reinforcement for Concrete Structures.

C. Frames, covers, and gratings will be paid for under the appropriate items.

D. Safe operation and temporary steel sheet piling, if necessary, will be paid for under their appropriate items.
ITEM 604.04890011 — NYC STANDARD MANHOLE TYPE A-3

DESCRIPTION

This work shall consist of the construction of manholes – Type A-3 (NYC) at the locations shown on the plans or as directed by the Engineer.

MATERIALS

Section 604-2.01 of the Standard Specifications shall apply with the following modification and addition:

Manholes shall be built of Cast-in-Place Concrete - Class “A” or rectangular Precast Reinforced Concrete Manhole Units.

CONSTRUCTION DETAILS

Section 604-3.01, 3.02, 3.05 and 3.11 of the Standard Specifications shall apply.

Manholes shall be as shown on the following New York City Department of Environmental Protection SEWER DESIGN STANDARDS (September 2007 or later).

<table>
<thead>
<tr>
<th>Page</th>
<th>Drawing Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>STANDARD FOR SHALLOW MANHOLE ON 8 INCH DIA TO 30 INCH DIA PIPE SEWERS, TYPE A-3 (LESS THAN 4’-0” COVER)</td>
</tr>
<tr>
<td>35</td>
<td>STANDARD FOR REMOVABLE PRECAST REINFORCED CONCRETE SLAB</td>
</tr>
</tbody>
</table>

METHOD OF MEASUREMENT

The quantity to be paid for will be the number of linear feet of height measured to the nearest tenth of a foot from the bottom of the base to the top of the masonry.

BASIS OF PAYMENT

The unit price bid per linear foot shall include the cost of all labor, equipment and materials necessary to complete the work, except as follows:

A. Necessary excavation will be paid for under Trench and Culvert excavation.

B. Bar reinforcement (except in reinforced concrete pipe and precast reinforced concrete units) will be paid for under Uncoated Bar Reinforcement for Concrete Structures.

C. Frames, covers, and gratings will be paid for under the appropriate items.

D. Safe operation and temporary steel sheet piling, if necessary, will be paid for under their appropriate items.
ITEM 604.5102 - STORMWATER TREATMENT SYSTEM (SWTS)

DESCRIPTION:

This work shall consist of designing, furnishing and installing a Stormwater Treatment System (SWTS) in accordance with this specification, as shown in the contract documents and as directed by the Engineer. The system shall also be routinely inspected, cleaned, and maintained for the duration of the contract.

MATERIALS:

All precast concrete elements shall meet the requirements of Section 704-03 - Precast Concrete - General, of the Standard Specifications except the concrete shall have a minimum compressive strength of 5000 psi (35 Mpa) at 28 days, unless otherwise noted on the approved fabrication drawing. Precast units shall be fabricated at facilities approved by the Department.

Manhole frames and covers shall comply with the requirements of Section 655 – Frames, Grates and Covers.

The stormwater treatment system components, inserted or cast into precast concrete units, shall be one of the following:

- Vortechs™ as manufactured by CONTECH Construction Products Inc.
  9025 Centre Pointe Drive, suite 400
  West Chester, OH 45069
  1-800-925-5240

- Downstream Defender™ as manufactured by Hydro International
  94 Hutchins Drive
  Portland, ME 04102
  Phone (207) 756-6212

- Stormvault™ as manufactured by CONTECH Construction Products Inc.
  9025 Centre Pointe Drive, suite 400
  West Chester, OH 45069
  1-800-925-5240

Or an approved equal.

The contractor shall provide the manufacturer’s standard sheets, installation details, and operations and maintenance manuals to the Engineer ten days prior to the installation. Units shall be designed to withstand an MS-18 highway loading. Design calculations and fabricator working drawings shall be stamped by a Professional Engineer licensed and registered to practice in New York State. Fabricator working drawings, prepared in accordance with the requirements of Section 704-03, Precast Concrete - General, of the Standard Specifications, shall be supplied to the Materials Bureau for approval prior to fabrication of the precast concrete units. The structure(s) must meet the following performance specifications: (1) the manufacturer must document a sediment removal efficiency of 80% for all particles entering the structure (as determined by third party independent scientific study) at the flow rate associated with the Water Quality Volume as indicated in the contract documents; (2) the manufacturer shall determine the
rise in Hydraulic Grade Line (HGL) of the drainage system upstream of the SWTS. This shall consist of a stage-discharge table indicating the water surface elevation at the entrance of the SWTS for the full range of flows that may pass through the system. Documentation of these performance standards must be submitted to the Engineer.

Sizing of the unit shall be determined by the manufacturer based on the maximum flow rate through the structure (i.e. the flow associated with water quality volume for 10-year, 24-hour storm event) as indicated in the contract documents and shown in Table 1. If units cannot pass the 10-year, 24-hour storm event, the SWTS shall be installed off of the main drainage system (off-line installation). The configuration of the unit with respect to the drainage system (on-line vs. off-line) shall be as shown in the contract documents. Inlet, bypass, and outlet pipe diameters will be as required by the manufacturer and/or as indicated on the plans. All pipe sizes and invert elevations determined by the manufacturer shall be verified by the contractor prior to installation of pipes at the unit.

**Table 1**

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Maximum Flow Capacity (cfs)/(l/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>604.51020115</td>
<td>1.6 (45)</td>
</tr>
<tr>
<td>604.51020215</td>
<td>2.8 (80)</td>
</tr>
<tr>
<td>604.51020315</td>
<td>4.5 (125)</td>
</tr>
<tr>
<td>604.51020415</td>
<td>6.0 (170)</td>
</tr>
<tr>
<td>604.51020515</td>
<td>8.5 (240)</td>
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<tr>
<td>604.51020615</td>
<td>11.0 (315)</td>
</tr>
<tr>
<td>604.51020715</td>
<td>14.0 (400)</td>
</tr>
<tr>
<td>604.51020815</td>
<td>17.5 (495)</td>
</tr>
<tr>
<td>604.51020915</td>
<td>25.0 (710)</td>
</tr>
</tbody>
</table>

**CONSTRUCTION DETAILS:**

The contractor shall follow the procedures established by the manufacturer for installation and field testing.

The contractor shall be responsible for cleaning the system when needed, maintaining performance / efficiency, and keeping a record of maintenance inspections for the duration of the contract. If the system is not functioning as outlined in the Operation and Maintenance Manual for the system, then the contractor, with the Engineer’s approval, shall take the necessary steps to diagnose and correct problems at no additional cost to the State.

Final approval of the installation will be made by the Engineer verifying that the system has been installed, field tested and functioning as outlined in the Operation & Maintenance Manual for the system.
ITEM 604.5102nn15 - STORMWATER TREATMENT SYSTEM (SWTS)

METHOD OF MEASUREMENT:

This work will be measured as the number of Stormwater Treatment Systems installed in accordance with this specification, and approved by the Engineer.

BASIS OF PAYMENT:

The unit price bid for each Stormwater Treatment System shall include the cost of all labor, materials, equipment necessary to complete the work, including manhole frames and covers; all necessary excavation, backfill, sheeting; and necessary maintenance for the duration of the contract.

The cost of the outlet/inlet pipes will be paid for under their respective items.

Seventy-five percent of the price bid for this item will be paid upon satisfactory installation of the SWTS units. The remaining percentage will be paid after the SWTS is satisfactorily cleaned at the completion of the contract.
ITEM 607.41010010 - TEMPORARY PLASTIC BARRIER FENCE

DESCRIPTION
This work shall consist of furnishing, installing, and maintaining Temporary Plastic Barrier Fences of the type and at the locations shown in the plans or where directed by the Engineer.

MATERIALS
Materials for Temporary Plastic Barrier Fences shall meet the following requirements:
- **Fence**: High-density polyethylene mesh, ultraviolet-stabilized min. 2 years; minimum height 4.0 feet. Color: high-visibility orange or green. When used to protect trees or other vegetation, color shall be high-visibility orange.
- **Posts**: Rigid metal or wood posts, minimum length 6.0 feet.
- **Ties**: Steel wire, #14 gauge or nylon cable ties.
- **Warning signs**: Sheet metal, plastic or other rigid, waterproof material, 1.5 feet by 2.0 feet with 4 inch black letters on a white background. Text shall be: "Protected Site - Keep Out" unless otherwise specified.

CONSTRUCTION DETAILS
Fences shall be erected prior to moving construction equipment onto any area designated for protection.

The line of fences as indicated on the plans shall be staked or marked out on the ground by the Contractor and approved by the Engineer before any fence is installed. Where used for protection of individual trees, fence shall be placed at the drip line (extent of canopy). If not possible, placement shall be as close to the drip line as possible and in no case less than 5.0 feet away from the tree trunk.

On approval of the stakeout, posts shall be securely driven on 6.0 foot-maximum centers, normal to the ground, to a depth 1/3 of the total post length. Plastic barrier fence shall be placed along the side of all posts. Ends of fencing segments shall overlap a distance of at least one half the fence height.

Fencing shall be secured to posts with wire or cable ties at top, middle and bottom of post. Fastener shall be tight enough to prevent the fencing from slipping down. Overlaps shall also be securely fastened.

Barrier fence which is not orange in color shall be flagged at 6.0 foot intervals with red or orange florescent tape. Warning signs shall be mounted on the fence at no more than 100 foot intervals.

Maintenance shall commence immediately after erection of the fence and continue until one week prior to acceptance of the contract, and shall consist of: replacing damaged post(s) and fencing; re-fastening and tightening fencing; and restoring fence to its intended height.

Fencing used for tree or other vegetation protection shall not be temporarily removed to allow equipment access over a protected area, except as required for items of work specifically shown on the plans and approved by the Engineer in writing.
ITEM 607.41010010 - TEMPORARY PLASTIC BARRIER FENCE

METHOD OF MEASUREMENT
The quantity to be measured for payment will be the number of feet of Temporary Plastic Barrier Fence erected, measured along the top, to the nearest whole foot.

BASIS OF PAYMENT
The unit price bid shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work. Relocation of a fence from one location to another as directed by the Engineer shall be considered as a new location and will be separately paid.

Seventy percent (70%) of the price bid will be paid after satisfactory installation of the fence. The remaining Thirty percent (30%) will be paid after complete removal of the fence.
DESCRIPTION.
This work will consist of the fabrication, installation, and painting of steel fences, gates, handrail and metal tree pit guard as described, and at the locations indicated in the contract documents, and as directed by the Engineer.

Gate(s) shall include Park Leaf (for double gates), gate posts and all associated hardware (lock bolt, padlock, gate stop, gate latch, galvanized steel chain, hinges, etc.).

MATERIALS.
The following sections of the standard specifications shall apply:

Concrete Grouting and Anchoring Material 701-05
Steel Castings 715-02
Iron Castings 715-05
Steel Forging 715-06
Malleable Iron Casting 715-09
High Strength Bolts, Nuts and Washers 715-14

with the following modifications:

§715-02 Steel Casting – Unless otherwise specified, all steel castings shall be Grade 65-35, fully annealed. Test specimens shall show a fracture having a silky or fine granular structure throughout, easily machined and meet all chemical and physical requirements of this specification. Casting shall be true to pattern, free from cracks, gas holes, flaws and excessive shrinkage. Large castings, if required, shall be suspended and hammered all over. No cracks, flaws or other defects shall appear after such treatment. No sharp, unfilleted angles or corners will be allowed. One tension test and one bend test shall be made from each melt in each heat treatment charge and from each casting weighing five hundred pounds or over.


§715-06 Steel Forgings – Structural forgings shall be Class C carbon steel, unless specified otherwise. Machinery forgings shall be Class C carbon steel, Class E carbon steel, or Class H nickel steel, as specified. All forgings shall be thoroughly annealed. The yield point of Class C forgings shall be not less than 33,000 lbs psi. The tensile requirements for forgings from 20 to 30 inches in diameter shall conform to the requirements for forgings 12 to 20 inches in diameter. All forgings shall meet the bend test requirements of paragraph S3, supplementary requirements of ASTM A668.
ITEM 607.7XXYN39 – STEEL FENCE AND GATE– NYCDPR

The following ASTM specifications shall apply:

Standard Specification for General Requirements for Steel Bars
Carbon and Alloy, Hot-Wrought
ASTM A29

Standard Specification for Carbon Structural Steel
ASTM A36

Standard Test Methods for Measuring Adhesion by Tape Test
ASTM D3359

General: Steel fences, gates and metal tree pit guards shall be constructed of solid bars, posts, and rails of the sizes shown in the contract documents unless specifically noted. All fence, gate and tree pit guard material shall conform to ASTM A36.

Steel handrail shall be steel bar in accordance with ASTM A29 or ASTM A36. All handrail shall be delivered in “assembly ready” condition. No field fitting or cutting will be allowed. Handrail shall be from one of the following manufacturers:

Julius Blum & Co., Inc
P.O. Box 816
Carlstadt, NY 07072
201-438-4600
www.juliusblum.com
Architectural Iron Designs
950 South 2nd Street
Plainfield, NJ 07063
800-784-7444
www.archirondesign.com

The Lawler Foundry
P.O. Box 320069
Birmingham, AL 35232
800-624-9512
www.lawlerfoundry.com

or equal as approved by the Engineer.

Fabrication: Fences, gates, handrail and metal tree pit guards shall be fabricated in strict accordance with the contract documents and approved shop drawings. Posts and rails shall be formed into panels of the shapes indicated in the contract documents. Panel and handrail joints shall be completely welded with welds of proper size and shape all welds ground smooth to a neat finish with no sharp edges. Connection shall be provided as indicated in the contract documents.

Welding: Welding shall be done in accordance with the Standard Welding Procedure Specifications of the American Welding Society. Welding shall be done by the electric arc method or other approved method and the welding operators shall be experienced in this particular class of work. All slag shall be removed from finished welds and they shall show uniform section, smoothness of weld metal, feather edges without overlaps and freedom from porosity and clinkers. Visual inspection at edges and ends of fillets and butt joint welds shall indicate good fusion with, and penetration into, base metals.
ITEM 607.7XXYVN39 – STEEL FENCE AND GATE– NYCDPR

Paint: The fences, gates, handrail and metal tree pit guards shall receive three (3) coats of paint. The first coat shall be shop applied. Refer to the construction details section of the specification for information on preparing the fences, gates and metal tree pit guards for and applying the second and third coats.

Cleaning Treatment: Cleaning treatment shall be performed with a solvent such as mineral spirits, xylol, or turpentine.

First Coat (Shop Applied): The primer shall be a fast drying, 53% - 61% weight solids, low VOC, rust inhibiting, modified alkyd metal primer with a dry film thickness of 1.75 - 5 mils and shall be from one of the following manufacturers:

- Super Spec HP® D.T.M. (direct to metal)
- Alkyd Semi-Gloss P24
- as manufactured by
- Benjamin Moore & Co.
- 101 Paragon Drive
- Montvale, NJ 07645
- 201.573.9600
- www.benjaminmoore.com

or equal as approved by the Engineer.

Paint requires up to two (2) to two and a half (2 ½) hours drying time before recoating (with alkyds).

Second Coat and Third Coats (Field Applied): The topcoat shall be a silicone alkyd, semi or high gloss coating having a dry film thickness of 1.75 - 3 mils and shall be from one of the following manufacturers:

- Super Spec HP® D.T.M. (direct to metal)
- Alkyd Semi-Gloss P24, Safety Black
- as manufactured by
- Benjamin Moore & Co.
- 101 Paragon Drive
- Montvale, NJ 07645
- 201.573.9600
- www.benjaminmoore.com

or equal as approved by the Engineer.

Paint requires up to thirty (30) hours drying time @ 50° F; up to sixteen (16) to eighteen (18) hours drying time @ 77°F. Paint adhesion shall be 100% retention in accordance with ASTM D3359, classification 5B.
ITEM 607.7XXYN39 – STEEL FENCE AND GATE – NYCDPR

All coats of paint shall be produced by the same manufacturer. Selection of undercoat colors is left to the discretion of the Contractor unless specified otherwise.

Hinges: The Hinges shall a Heavy Duty Steel Ball Bearing Hinge, 5” X 6” from one of the following:

- #BB855
  - Heavy Duty Pressed Steel Hinge
  - as manufactured by Stanley Hardware
  - Manufactured by Shannon Fence and Painting
  - 480 Myrtle Street
  - 900 Long Island Ave
  - New Britain, CT 06053
  - Deer Park, NY 11729
  - 800-337-4393
  - 631-254-0314
  - www.stanleyhinges.com
  - www.shannonfencing.com

  or equal as approved by the Engineer

Lock Bolt (Double Gates): Shall be a drop rod bar arranged to engage the gate stop. Locking device shall be constructed so that the drop rod cannot be raised when the gate is locked. The locking bolt and bolt catch hardware shall be constructed as shown in the contract documents. The locking device shall have provisions for a padlock. All necessary fittings and gate holders to lock gates in both open and closed positions shall be furnished. The locking device shall be as manufactured by:

- Internal Locking Device Drop Rod
  - as manufactured by Boundary Fence and Railing Systems, Inc
  - Shannon Fence and Painting
  - 131-02 Jamaica Ave.
  - 900 Long Island Ave
  - Richmond Hill, NY 11418
  - Deer Park, NY 11729
  - 800-377-4393
  - 631-254-0314
  - http://boundaryfence.net
  - www.shannonfencing.com

  or equal as approved by the Engineer.

Gate Stop: The gate stop shall be as shown in the contract documents.

Gate Latch (Single Gates): Shall be a lockable stirrup type. Latch shall be constructed of steel bars and blocks with a stainless steel pin, as shown on the drawings. The ends of stirrups shall be treated with a heavy-duty flexible, rubberized coating.

Padlock: The Contractor shall furnish one padlock for each single gate and each leaf of double gates. All padlocks for the same park facility shall be keyed alike, with 2” wide by 3/4” thick brass body, maximum security, five (5) pin tumblers with hardened alloy steel chrome plated shackle no less than 3/8” diameter and 2” clearance (elongated shackle). The Contractor shall furnish two (2) keys for each padlock.
ITEM 607.7XXYN39 – STEEL FENCE AND GATE– NYCDPR

Galvanized steel chain: A galvanized steel chain, 9” long shall be fastened to the gate and body of the lock. The chain shall be 5/16” by 1-3/8”.

Cast Iron NYCDPR Parks Leaf for Double Gates: The NYCDPR retains exclusive right to the use of the leaf pattern. The Park Leaf casting shall be as manufactured by:

<table>
<thead>
<tr>
<th>Park Leaf</th>
<th>Park Leaf</th>
</tr>
</thead>
<tbody>
<tr>
<td>as manufactured by</td>
<td>as manufactured by</td>
</tr>
<tr>
<td>Wemco Castings, LLC</td>
<td>A&amp;T Ironworks, Inc/ORSOGRIL®</td>
</tr>
<tr>
<td>20 Jules Court, Suite 2</td>
<td>25 Cliff Street</td>
</tr>
<tr>
<td>Bohemia, NY 11716-4106</td>
<td>New Rochelle, NY 10801</td>
</tr>
<tr>
<td>631-563-8050</td>
<td>800-253-0973</td>
</tr>
<tr>
<td><a href="http://www.wemcocastingllc.com">www.wemcocastingllc.com</a></td>
<td><a href="http://www.atironworks.com">www.atironworks.com</a></td>
</tr>
</tbody>
</table>

or equal as approved by Engineer.

Leaf castings are to be fabricated from Ductile Iron 65-45-12. The small 9 1/2” leaf shall weigh approximately 6 lb. each. The back of the leaf casting is to be flat and the front face shall be contoured with the veins of the leaf shown in relief. See contract documents for structural details.

Park leaves shall be shop welded to each leaf of the steel gate. Field welding will not be permitted.

Grout: Grout for fence posts shall be non-shrink, cement based grout, as manufactured by:

<table>
<thead>
<tr>
<th>Master Flow 100</th>
<th>SikaGrout 212</th>
</tr>
</thead>
<tbody>
<tr>
<td>as manufactured by</td>
<td>as manufactured by</td>
</tr>
<tr>
<td>BASF Building Systems, Inc</td>
<td>Sika Corporation</td>
</tr>
<tr>
<td>889 Valley Park Drive</td>
<td>201 Polito Ave</td>
</tr>
<tr>
<td>Shakopee, MN 55379</td>
<td>Lyndhurst, NY 07071</td>
</tr>
<tr>
<td>952-496-6000</td>
<td>800-933-SIKA</td>
</tr>
<tr>
<td><a href="http://www.buildingsystems.basf.com">http://www.buildingsystems.basf.com</a></td>
<td><a href="http://usa.skia.com">usa.skia.com</a></td>
</tr>
</tbody>
</table>

Five Star High Strength Grout

as manufactured by

Five Star Products, Inc. 750 Commerce Drive
Fairfield, CT 06825
800-243-2206
[www.fivestarproducts.com](http://www.fivestarproducts.com/)

or equal as approved by the Engineer.
ITEM 607.7XXYN39 – STEEL FENCE AND GATE– NYCDPR

Note: All gypsum (Calcium Sulfate, CaSO4) based grout will be rejected.

Sealant: Sealant around fence post shall be one part polyurethane, elastomeric adhesive as provided by the following:

MasterSeal CR195 as manufactured by BASF Building Systems, Inc.
899 Valley Park Drive Shakopee, MN 55379 952-496-6000 http://www.buildingsystems.basf.com
or equal as approved by Engineer.

DynaTred as manufactured by Pecora Corporation 165 Wambold Road Harleysville, PA 19438 800-523-6688 www.pecora.com/

CONSTRUCTION DETAILS
The following sections of the standard specification shall apply:

Structural Steel Painting: Field Applied – Total Removal 573-3

General: The Contractor shall mark and obtain approval of the proposed fence alignments, gate and/or handrail and/or metal tree pit guards locations prior to proceeding with shop drawings, fabrication, or installation.

Preparation for Painting: Immediately prior to painting, all surfaces of fences, gates, handrails and metal tree pit guards shall be thoroughly free of debris. All surfaces that are rust free shall be treated in accordance with §573 - 3.02 “Surface Preparation” A.2. Solvent Cleaning SP-1. Treatment shall remove all dirt, grease and foreign matter. Surfaces that show evidence of scale and rust shall be cleaned in accordance with SP-2, Hand Tool Cleaning, a method generally confined to wire-brushing, sandpaper, hand scrapers or hand impact tools or SP-3, Power Tool Cleaning, a method generally confined to power wire brushes, impact tools, power sanders, and grinders in order to achieve a sound substrate.
ITEM 607.7XXYN39 – STEEL FENCE AND GATE– NYCDPR

Paint: All paints shall be applied with ambient air temperature is 50°F minimum and rising. No painting shall be allowed below the minimum ambient temperature. Surfaces to be painted shall be moisture free. In addition, no painting will be allowed below the temperature at which moisture will condense on surfaces.

The fences, gates, handrails and metal tree pit guards shall receive three (3) coats of paint. The first coat shall be shop applied; the second and third coats shall be field applied.

Fence and Gate Installation:

General Installation: The Contractor shall erect the fences in holes that have been formed or drilled in concrete or stone footings, curbs, or walls as required by the contract documents. The Contractor shall support each fence or gate post in a manner that will keep it plumb, smoothly aligned with the other posts, and at the elevation required by the contract documents. The annular space surrounding each post shall be filled with the specified non-shrink, cementitious grout. The grout shall be flush with the footing, curb, wall or other foundation. After the grout has cured, the Contractor shall install a sealant around the fence post. The sealant shall be gunned in between the base of the fence post and the footing, curb, wall or other foundation. Application of both the grout and sealant shall be in strict accordance with the manufacturer’s instructions and shall be tooled as required.

Fence and gate rails shall be set at slopes conforming to the slope of the finish grade beneath the fence or gate unless specifically shown otherwise in the contract documents.

Pickets shall be vertical (plumb). Rails, bars and handrails shall be parallel to grade as shown in the contract documents. Panels shall be curved as required by the work. Braces shall be required at two-thirds (2/3) of the way up each post when fence is ten feet (10’) high or over. Connections between panels and posts shall be provided as indicated contract documents.

Any fences and gates not set plumb and true to line and grade shall be removed and replaced at the Contractor’s expense. The Contractor shall maintain the fences and gates during the life of the contract and shall repair replace all members that are disturbed, damaged, or destroyed.

All paint spatters, metal scraps, and metal fillings shall be removed from the site before the work will be accepted.

Double and Single Gate Installation:

- Gates shall include gate posts, locking devices, padlocks and steel chain.
- Each gate installed shall include a padlock with a 9” long galvanized steel chain fastened to the gate and the body of the lock, a lock bolt, and all necessary fittings to hold and lock the gate in both open and closed positions.
- Each single gate installed shall include a lockable stirrup type gate latch.
- Each double gate installed shall include a gate stop. Gate stops shall be provided at the locations indicated in the contract documents or at locations indicated in the field.
Metal Tree Pit Guard:

**General Installation:**
- Tree guards shall be installed three sided leaving the street side open and shall not be embedded into concrete.
- Tree guards shall be set back at least 12 inches from the curb.

**Submittals:**

**Shop Drawings:** The Contractor shall measure the space where the fence, gate, handrail or metal tree pit guard will be located and shall use this information to create accurate shop drawings. A least 15 calendar days prior to starting work and before manufacturing the fence, the Contractor shall submit two (2) sets of shop drawings for approval. If revisions are required, two (2) paper sets of all required revised drawings must be submitted for approval.

**Structural Steel:** The Contractor shall furnish certified copies of the manufacturer’s tests results.

**Foundry Certificate:** A certificate verifying the quality of ductile iron for the Parks Leaf shall be submitted. Certificate shall be on Manufacturers’ letterhead, dated and signed by the company President with Contract Number, Contract Title, Contractor Name, and Class of Ductile Iron provided.

**Samples:** The Contractor shall submit for approval, finished samples of parts of the fence, gate, handrail and/or metal tree pit guard. The workmanship and finish of the final product shall be equal to the approved samples.

If the proposed manufacturer is other than the two listed in this specification, a full sized sample must be submitted for approval for the gate latch (single gate), padlock and cast iron parks leaf.

**Paint Substitution:** A written request for paint substitution must be formally submitted. The Contractor shall submit this request, along with Material Safety Data Sheets (MSDS) for approval, a minimum of two (2) weeks prior to the intended date of paint application. All paint substitutions must be approved in writing prior to use.

**METHOD OF MEASUREMENT**

The work will be measured as the number of feet to the nearest inch of steel fences and/or tree pit guard fabricated, installed and painted.

The work will be measured as the number of each steel gate fabricated, installed and painted.

The work will be measured as the number of linear feet of handrail fabricated, installed and painted.
ITEM 607.7XXYYN39 – STEEL FENCE AND GATE– NYCDPR

BASIS OF PAYMENT

The unit price bid per linear foot of fence and/or tree pit guard fabricated, installed and painted shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

The unit price bid per each gate, fabricated, painted and installed shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

The unit price bid per linear foot of handrail fabricated, painted and installed shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work.

All concrete work, excavation and clearing and grubbing will be paid for separately under their respective items.

Payment will be made under the following items:

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>607.70206139</td>
<td>Steel Picket Fence, 2’-6” high - NYCDPR</td>
<td>FT</td>
</tr>
<tr>
<td>607.70400139</td>
<td>Steel Picket Fence, 4’-0” high - NYCDPR</td>
<td>FT</td>
</tr>
<tr>
<td>607.70500139</td>
<td>Steel Picket Fence, 5’-0” High – NYCDPR</td>
<td>FT</td>
</tr>
<tr>
<td>607.70700139</td>
<td>Steel Picket Fence, 7’-0” High - NYCDPR</td>
<td>FT</td>
</tr>
<tr>
<td>607.70206239</td>
<td>Single Steel Picket Gate, 2’-6” high, Opening as Specified – NYCDPR</td>
<td>EA</td>
</tr>
<tr>
<td>607.70400239</td>
<td>Single Steel Picket Gate, 4’-0” high, Opening as Specified – NYCDPR</td>
<td>EA</td>
</tr>
<tr>
<td>607.70500239</td>
<td>Single Steel Picket Gate, 5’-0” High, Opening as Specified - NYCDPR</td>
<td>EA</td>
</tr>
<tr>
<td>607.70700239</td>
<td>Single Steel Picket Gate, 7’-0” High, Opening as Specified - NYCDPR</td>
<td>EA</td>
</tr>
<tr>
<td>607.70400339</td>
<td>Double Steel Picket Gate, 4’-0” high, Opening as Specified - NYCDPR</td>
<td>EA</td>
</tr>
<tr>
<td>607.70500339</td>
<td>Double Steel Picket Gate, 5’-0” High, Opening as Specified - NYCDPR</td>
<td>EA</td>
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<tr>
<td>607.70700339</td>
<td>Double Steel Picket Gate, 7’-0” High, Opening as Specified - NYCDPR</td>
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<td>607.70000439</td>
<td>Metal Tree Pit Guard</td>
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<tr>
<td>607.70000539</td>
<td>Handrail</td>
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</tr>
</tbody>
</table>

Where:
XXYY is equal to the height of the fence and gate in feet (XX) and inches (YY).
Additional payment items may be required based on the height of the fence/gate required.
ITEM 607.98010111 - TEMPORARY CHAIN-LINK FENCE

DESCRIPTION:

This work shall consist of furnishing, erecting, moving and removing chain link fencing and metal gates of the size and type shown on top of the temporary concrete barriers, and in sidewalk and roadway areas at the locations as shown on the plans and where directed by the Engineer.

Fence Types: The types of the fences to be used may be one of the following:

- Galvanized Steel Chain-Link Fencing on Steel Frame
- Vinyl Coated Steel Chain-Link Fencing on Steel Frame
- Vinyl Coated Steel Chain-Link Fencing on Plastic Coated Frame Fence Gates

MATERIALS:

Materials shall conform to the requirements specified in the following subsections of Section 700-Materials:

- Galvanized Steel Fence Fabric 710-02
- Vinyl Coated Steel Fence Fabric 710-03
- Steel and Iron Posts, Rails, Braces and Fittings for Chain-Link Fence 710-10
- Plastic Coated Posts, Rails, Braces and Fittings for Chain-Link Fence 710-12

Fence Gates:

Gate frames shall be composed of tubing braced with rods, bars or angles and filled with wire mesh, meeting the requirements of the Specifications for the type of fencing with which the gate is to be used, all as detailed on the Plans or Standard Sheets.

Portland Cement Concrete for Basis:

Portland cement concrete used for basis shall be Class A or C, conforming to the requirements of Section 501, Portland Concrete-General, except that requirements for automated batching shall not apply.

CONSTRUCTION DETAILS:

General:

The Contractor shall install fence posts on the concrete barrier in 1 ½ inch diameter, 12 inch deep drilled or formed holes near each end of each section of barrier. In addition, if the
ITEM 607.98010111 - TEMPORARY CHAIN-LINK FENCE

Concrete barrier is furnished in lengths exceeding 10 feet, it will be necessary for the Contractor to provide an additional hole at the center of the section to permit the installation of an intermediate post.

Line posts and corner and end posts on grade shall be installed in accordance with Standard Sheet 607-10 and 607-11 and gate posts shall be installed in accordance with Standard Sheet 607-12.

Heights of the posts and fencing shall conform to the dimensions shown on the Plans.

The Contractor shall perform such clearing and grubbing as may be necessary to construct the fence to the required grade and alignment.

At locations where breaks in a run of fencing are required, or at interactions with existing fences, appropriate adjustments in post spacing shall be made to conform to the requirement for the type of closure indicated.

When the Plans require that the posts, braces, or anchors be embedded in concrete, the Contractor shall install temporary guys or braces, as may be required to hold the posts in proper position until such time as the concrete has set sufficiently to hold the posts. Unless otherwise permitted, no materials shall be installed on posts or strain placed on guys or bracing set in concrete until seven days elapsed from time of placing the concrete.

All posts shall be set vertically and to the required grade and alignment. Cutting of the tops of the posts will be allowed only with the approval of the Engineer and under conditions specified by the Engineer.

Fence fabric of the size and type required shall be firmly attached to the posts and braces in the manner indicated. All fence fabric shall be stretched taut and installed to the required elevations.

At each location where an electric transmission, distribution or secondary line crosses any of the types of fences covered by these Specifications, the Contractor shall furnish and install a ground conforming to the requirements of Subsection 9 of the National Electric Safety Code.

Fence shall generally follow the contour of the ground, with the bottom of fence fabric no less than 2 inch nor more than 6 inch from the ground surface. Grading shall be performed where necessary to provide a neat appearance. Line posts shall be spaced equidistant in the fence line at the spacing shown on the Plans, Standard Sheets or as directed by the Engineer. End, corner, and intermediate posts shall be placed at the locations indicated on the Plans, Standard Sheets or where directed by the Engineer, and shall be braced as shown on the Plans and Standard Sheets.

When chain-link fence is on a long curve, intermediate posts shall be evenly spaced so that the strain of the fence will not bend the line posts.
ITEM 607.98010111 - TEMPORARY CHAIN-LINK FENCE

All end, corner, and intermediate posts shall be set plumb in concrete bases of the depth and diameter shown on the Plans or Standard Sheets. The Contractor shall have the option of setting the line posts in concrete bases or using methods of driving and anchoring specified by the fence manufacturer and approved by the Engineer.

The concrete bases shall be rough cast in the ground around the posts. The top surface shall be domed to shed water and provide a neat appearance when completed. Extensions of up to 45 minutes for the allowed time for pouring the concrete will be permitted.

Chain Link Fencing With Top Rail:

Posts shall be set so they are equidistant with a maximum of 10 foot centers.

All top rails shall pass through the base of the post caps and shall form a continuous brace from end to end of each stretch of fence. Top rail lengths shall be joined with sleeve couplings with expansion sleeves provided at 100 foot intervals. Top rails shall be securely fastened to end posts by means of approved rail end connectors. Horizontal braces shall be provided at all intermediate posts, midway between the top rail and ground as shown on the Plans or Standard Sheets.

Diagonal truss rods shall be installed with the horizontal braces as indicated in the Plans or Standard Sheets.

Fence fabric shall be installed approximately 2 inch above the ground level and securely fastened along the bottom and to all braces, top rails, line and pull posts, at the intervals indicated on the Standard Sheets by approved methods. The fabric shall be secured to all end, corner, and gate posts with stretcher bars fastened to the posts, with stretcher bands spaced at a maximum of 14 inch and in a manner permitting adjustment of the fabric tension.

If the Contractor elects the option of using pieces, roll-formed sections, the fence fabric shall be integrally woven into the fabric loops on the end, corner, pull and gate posts. The fabric shall be attached to the end, corner and line posts as shown on the Standard Sheets.

Chain Link Fencing With Top Tension Wire:

The construction details specified in Chain-Link Fencing with top Rail shall apply with the following modifications:

A. Top tension wire shall be installed as shown on the Plans Standard Sheets, or as directed, by the Engineer.

B. All posts shall be spaced equidistant in the fence line on a maximum of 8 foot centers,
ITEM 607.9801111 - TEMPORARY CHAIN-LINK FENCE

except that a 10 foot spacing will be permitted on concrete barriers.

C. Additional pull posts shall be placed at locations indicated on the Plans or Standard Sheets. Brace assemblies shall be installed at each intermediate post as indicated on the Plans or Standard Sheets.

Vinyl Coated Chain-link Fencing on Plastic Coated Frame:

The construction details specified on Chain-Link Fencing with Top Rail or Chain-Link Fencing with Top Tension Wire shall apply with the following addition:

If any of the resin clad material specified under item has the protective resin coating is damaged so its effectiveness to prevent corrosion of the base material is impaired, the Contractor shall repair such parts by applying one coat of an approved compound of color to match original material.

Fence Gates:

The Contractor shall construct metal fence gates of the type and size as indicated on the Plans or Standard Sheets, and in the location shown on ordered by the Engineer.

Upon removal, fence gates shall become the property of the Contractor and shall be removed by it from the project site.

METHOD OF MEASUREMENT:

This work will be measured as the number of linear feet of the chain-link fencing installed as measured along the top of fencing, including gates, center to center of end posts.

BASIS OF PAYMENT:

The unit price bid per linear feet for temporary chain-link fencing shall include the cost of all labor, materials, tools and equipment necessary to satisfactorily install the fencing, and gates and to subsequently remove them, and shall include all necessary clearing, grubbing, excavation and disposal, fill, concrete, anchoring, posts, hardware, fencing, gates, gate posts, locks, bracing, drilling or forming holes in concrete barriers as necessary, repair of material damaged by the Contractor's operations and all other materials.

Upon completion of construction, all materials installed under this item shall become the property of the Contractor and shall be removed by the Contractor from the site of work.

After placement, payment will be made for ninety (90) percent of the quantity of chain-link fencing and gates furnished and erected in accordance with contract requirements.
ITEM 607.98010111 - TEMPORARY CHAIN-LINK FENCE

remaining will be paid upon removal.
ITEM 611.19010024 - POST-PLANTING CARE WITH REPLACEMENT - MAJOR
DECIDUOUS TREES
ITEM 611.19020024 - POST-PLANTING CARE WITH REPLACEMENT - MINOR
DECIDUOUS TREES
ITEM 611.19030024 - POST-PLANTING CARE WITH REPLACEMENT - CONIFEROUS TREES
ITEM 611.19040024 - POST-PLANTING CARE WITH REPLACEMENT - DECIDUOUS SHRUBS
ITEM 611.19050024 - POST-PLANTING CARE WITH REPLACEMENT - EVERGREEN SHRUBS
ITEM 611.19060024 - POST-PLANTING CARE WITH REPLACEMENT – VINES, GROUNDCOVERS
ITEM 611.19070024 - POST-PLANTING CARE WITH REPLACEMENT - HERBACEOUS PLANTS

DESCRIPTION

This work consists of the care of newly planted and transplanted trees, shrubs, vines, groundcovers and other plants and replacement of plants in kind and as necessary, in accordance with the contract documents and as directed by the Engineer.

MATERIALS

Materials shall meet the requirements of the following subsections of Section 700 Materials and Manufacturing.

Water  712-01
Topsoil  713-01
Mulch for Landscape Bedding  713-05
Trees, Shrubs and Vines  713-06
Materials for the Protection of Plants  713-08
Pesticides  713-13

CONSTRUCTION

Post-Planting Care. The Contractor shall perform all work as specified under Standard Specification section 611-3.05 Post-Planting Care.

Replacement Planting. Plants that die, become diseased or badly impaired during Post-Planting Care shall be removed and replaced in kind once with new, healthy plant material, in the same location as the initial planting. Replacement planting shall occur within the planting seasons shown in Standard Specification Table 611-1. For any plants replaced during the Post-Planting Care period, Post-Planting Care shall continue to the end of the period.

Replacement plants shall be planted, maintained and accepted per Standard Specification Section 611-3.01. Planting soil used in the initial planting shall be reused for replacement plants and shall be supplemented with topsoil at no additional cost if additional material is needed to meet grade and surface finish. Watering shall accompany backfilling, at no additional cost. No replacement tree shall be staked, guyed or anchored.
ITEM 611.19010024  - POST-PLANTING CARE WITH REPLACEMENT - MAJOR DECIDUOUS TREES
ITEM 611.19020024  - POST-PLANTING CARE WITH REPLACEMENT - MINOR DECIDUOUS TREES
ITEM 611.19030024  - POST-PLANTING CARE WITH REPLACEMENT - CONIFEROUS TREES
ITEM 611.19040024  - POST-PLANTING CARE WITH REPLACEMENT - DECIDUOUS SHRUBS
ITEM 611.19050024  - POST-PLANTING CARE WITH REPLACEMENT - EVERGREEN SHRUBS
ITEM 611.19060024  - POST-PLANTING CARE WITH REPLACEMENT – VINES, GROUNDCOVERS
ITEM 611.19070024  - POST-PLANTING CARE WITH REPLACEMENT - HERBACEOUS PLANTS

METHOD OF MEASUREMENT.

The quantity to be measured for payment will be the number of plants of each type cared for and, if necessary, replaced in kind.

BASIS OF PAYMENT.

The unit price bid shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

Payment will be made under:

<table>
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<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
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</thead>
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<tr>
<td>611.19010024</td>
<td>Post Planting Care with Replacement - Major Deciduous Trees</td>
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<tr>
<td>611.19020024</td>
<td>Post Planting Care with Replacement - Minor Deciduous Trees</td>
<td>Each</td>
</tr>
<tr>
<td>611.19030024</td>
<td>Post Planting Care with Replacement - Coniferous Trees</td>
<td>Each</td>
</tr>
<tr>
<td>611.19040024</td>
<td>Post Planting Care with Replacement - Deciduous Shrubs</td>
<td>Each</td>
</tr>
<tr>
<td>611.19050024</td>
<td>Post Planting Care with Replacement - Evergreen Shrubs</td>
<td>Each</td>
</tr>
<tr>
<td>611.19060024</td>
<td>Post Planting Care with Replacement – Vines, Groundcovers</td>
<td>Each</td>
</tr>
<tr>
<td>611.19070024</td>
<td>Post Planting Care with Replacement - Herbaceous Plants</td>
<td>Each</td>
</tr>
</tbody>
</table>
ITEM 613.70XX0011 - BIRD REPELLANT SYSTEM

DESCRIPTION
This work shall consist of furnishing and installing a bird repellant system(s), at the locations indicated in the contract documents, in accordance with the contract documents, and as directed by the Engineer.

MATERIALS
Bird repellant spike, coil, or netting systems, shall be from the following manufacturers:

Bird-Flite
as manufactured by
Bird Barrier America Inc.,
74 Henry Street
Secaucus, NJ 07094
1-800-503-5444
www.birdbarrier.com

Spikes System
as manufactured by
BIRD-X Inc.,
300 N Oakley Blvd
Chicago, IL 60612
1-800-735-0496
www.bird-x.com

StealthNet System
as manufactured by
Bird Barrier America Inc.,
74 Henry Street
Secaucus, NJ 07094
1-800-503-5444
www.birdbarrier.com

or equal as approved by the Engineer.

Bird repellant systems shall be attached to structural steel and concrete surfaces through the use of adhesive compounds recommended by the manufacturer of the approved system.

CONSTRUCTION DETAILS
The Bird Repellant Systems shall be installed in strips. Refer to the contract documents for additional information/details.

Horizontal and sloped surfaces underneath bridge superstructures that may be used as nesting sites shall be protected.

The adhesive compound shall be applied in accordance with the manufacturer’s specifications. Recommendations regarding the adhesive compounds’ drying time, if any, shall be strictly followed.

Care shall be taken that all required surfaces are covered. Netting systems shall be installed to provide complete enclosures of the undersides of bridge superstructures.

The Contractor shall not drill holes in any structural steel or concrete for this application without
ITEM 613.70XX0011 - BIRD REPELLANT SYSTEM

the written permission.

METHOD OF MEASUREMENT
This work will be measured:
- as the total linear feet of bird repellant systems (spike or wire coil) satisfactorily installed in accordance with this specification, OR
- as the total square feet of bird repellant system, netting satisfactorily installed in accordance with this specification.

BASIS OF PAYMENT
The unit price bid per linear foot or square foot of bird repellant system (spike or netting), shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

Payment will be made under:

<table>
<thead>
<tr>
<th>Pay Item</th>
<th>Description</th>
<th>Unit</th>
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<td>613.70010011</td>
<td>Bird Repellant System, Single Row Spike</td>
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<td>613.70020011</td>
<td>Bird Repellant System, Double Row Spikes</td>
<td>Feet</td>
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<tr>
<td>613.70030011</td>
<td>Bird Repellant System, Triple Row Spikes</td>
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<td>613.70040011</td>
<td>Bird Repellant System, Triple Row Extra Wide Spikes</td>
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<td>613.70050011</td>
<td>Bird Repellant System, Wire Coils</td>
<td>Feet</td>
</tr>
<tr>
<td>613.70060011</td>
<td>Bird Repellant System, Netting</td>
<td>Square Feet</td>
</tr>
</tbody>
</table>
ITEM 615.0101NN10 – LITTER (TRASH) RECEPTACLE

DESCRIPTION
The work shall consist of furnishing and installing litter (trash) receptacles in accordance with the contract documents and as directed by the Engineer.

MATERIALS
The materials for this work shall conform to the requirements listed here and in the contract documents, unless otherwise approved.

Litter (trash) receptacles shall be as manufactured by the Manufacturers listed in the contract documents or approved equals. Litter (trash) receptacles that are received chipped, scratched, bent, dented or damaged in any way will not be accepted and shall be removed and replaced with new containers or parts which are free from all defects.

CONSTRUCTION DETAILS
Prior to ordering litter (trash) receptacles, the Contractor shall submit catalog cuts and/or shop drawings along with color samples for approval and shall verify the quantity and location of each type of litter receptacle with the Engineer.

Litter (trash) receptacles shall be installed in the positions and manner shown on the plans, according to the Manufacturer's instructions, and as approved by the Engineer.

METHOD OF MEASUREMENT
This work will be measured as the number of litter (trash) receptacles installed in accordance with the contract documents and as directed by the Engineer.

BASIS OF PAYMENT
The unit bid price for each litter (trash) receptacle shall include the cost of furnishing all equipment, hardware, materials and labor necessary to complete the work.

Payment will be made under

<table>
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<tr>
<td>615.01010210</td>
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<tr>
<td>615.01010310</td>
<td>Litter (Trash) Receptacle Type 3</td>
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<tr>
<td>615.01010410</td>
<td>Litter (Trash) Receptacle Type 4</td>
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<tr>
<td>615.01010510</td>
<td>Litter (Trash) Receptacle Type 5</td>
<td>Each</td>
</tr>
</tbody>
</table>
ITEM 615.08XXNN39 – WORLD’S FAIR BENCH – RPL SLATS - NYCDPR

DESCRIPTION
This work includes furnishing and installing World’s Fair Bench – RPL Slats in accordance with the contract documents and as directed by the Engineer.

MATERIALS
The following sections of the standard specifications shall apply:

| High Strength Bolts, Nuts And Washers | 715-14 |
| Galvanized Coatings and Repair Methods | 719-01 |

The following ASTM Specifications shall apply:

| Standard Specifications for Ductile Iron Castings | ASTM A536 |
| Standard Specifications for Polyethylene Plastics Extrusion Materials for Wire and Cable | ASTM D1248 |
| Standard Test Methods for Measuring Adhesion by Tape Test | ASTM D3359 |
| Standard Test Method for Compressive Properties of Plastic Lumber and Shapes | ASTM D6108 |
| Standard Test Method for Bulk Density and Specific Gravity of Plastic Lumber and Shapes by Displacement | ASTM D6111 |
| Standard Test Methods for Compressive and Flexural Creep and Creep Rupture of Plastic Lumber and Shapes | ASTM D6112 |
| Standard Test Methods for Mechanical Fasteners in Plastic Lumber and Shapes | ASTM D6117 |
| Standard Test Method for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Lumber Shapes Between -30 and 140 °F (-34.4 and 60°C) | ASTM D6341 |
ITEM 615.08XXNN39 – WORLD’S FAIR BENCH – RPL SLATS - NYCDPR

1964 World Fair Benches shall be from one of the following manufacturers:

No. 6733A, 6733, 6731A or 6731
Manufactured by
Kenneth Lynch & Sons,
114 Willenbrock Road
Oxford, CT 06478
203-264-2831
www.klynchandsons.com

“1964 World’s Fair Bench”
Manufactured by
Kevin G. Lindelow Quality Site Furnishings
1352 NJ-12
Frenchtown, NJ 08825
908-996-7575

#64-WF-RPL
Manufactured by
All City Play Equipment, Inc.
135 58th Street
Brooklyn, NY 11220
888-258-9600
www.allcityproducts.com

or equal as approved by Engineer.

Type “A” Worlds Fair Bench shall be from one of the following manufacturers:

No. 6737 or 6736
as manufactured by
Kenneth Lynch & Sons,
114 Willenbrock Road
Oxford, CT 06478
203-264-2831
www.klynchandsons.com

“Liberty Bench”
as manufactured by
Kevin G. Lindelow Quality Site Furnishings
1352 NJ-12
Frenchtown, NJ 08825
908-996-7575

World’s Fair Bench
as manufactured by
All City Play Equipment, Inc.
135 58th Street
Brooklyn, NY 11220
888-258-9600
www.allcityproducts.com

or equal as approved by the Engineer
ITEM 615.08XXNN39 – WORLD’S FAIR BENCH – RPL SLATS - NYCDPR

Standards: Bench standards shall be of cast ductile iron. The tensile strength shall meet a minimum of 65,000 psi, in accordance with ASTM A536, Grade 65-45-12. Standards shall be:
- 1964 World’s Fair Bench - hot dipped galvanized, painted or powdercoated as noted in the contract documents,
- Type ‘A’ Bench – painted or powdercoated as noted in the contract documents.

Steel Supports:
- 1964 World’s Fair Bench - Steel supports for recycled plastic lumber shall be hot-rolled carbon steel flat bars and channels of the sizes indicated in the contract documents and secure to the plastic slats with vandal resistant screws. All steel supports shall be either hot dipped galvanized, painted or powdercoated as noted in the contract documents.
- “Type A” Bench – Steel back supports, steel supports and cross bars shall be steel bar and channel of sizes as indicated in the contract documents, formed to the curve of the back and seat and secured to the recycled plastic slats with vandal-resistant stainless steel screws.

Finishes for Cast Ductile Iron Standards: The Contractor shall supply either hot dipped galvanized, powder coated or painted bench standards as noted in the contract documents. The types of finishes are outlined below:
1. Hot Dipped Galvanized (1964 World’s Fair Bench only): All surfaces of the cast iron bench standards, bars and brace rods shall be hot dipped galvanized in accordance with ASTM A153. Any resulting dimples or sharp points shall be ground smooth.
2. Powder Coating (1964 World’s Fair Bench or ‘Type A’ Worlds Fair Bench): All surfaces of the cast iron bench standards, bars and brace rods shall be powder coated with a polyester thermosetting powder coating such as manufactured by:

   Tiger Drylac
   1090 Commons Blvd.
   Reading, PA 19605
   800-243-8148
   www.tiger-coatings.us

   Spraylat Corporation
   143 Sparks Ave.
   Pelham, NY 10803
   914-438-1600
   www.spraylat.com

   Alesta Powder Coatings
   Manufactured by
   DuPont Coating Solutions
   1007 Market Street.
   Wilmington, DE 19898
   www2.dupont.com/Powder/en-us

   or equal as approved by Engineer.

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July 2016
Color of the finish coat shall be:

- ‘Type A’ Bench – Gloss Black

or as specified in the contract documents. Powder coating shall be applied to the metal in such a manner that the coating will not peel off. Ensure surfaces to be coated are clean and dry and free of grease, dust, rust, etc. All surfaces shall first receive phosphating and chromatizing treatments to improve the adhesion of the surface coating.

Powder coating shall be applied at a film thickness of 3 to 4 mils by electrostatic spray process and bake finished per the manufacturer’s directions. It shall be applied without voids, tears or cuts that reveal the substrate and shall thoroughly adhere to the metal without peeling when scratched with a pick device or knife blade point. Nuts, washers and ends of all bolts shall be painted with touch-up paint as described below.

**Touch-up and Repair:** For minor damage caused by installation or transportation, touch-up finish in conformance with manufacturer’s recommendations. Provide touch-up such that repair is not visible from a distance of six feet (6’).

**Laboratory Test For TGIC-Polyester Powder Coat:** Upon request, a sample TGIC-Polyester powder coated bench standard shall be laboratory tested for bonding of the powder coating to the metal. Test shall be the Cross Hatch test per ASTM D3359, Method B. Failure to satisfactorily pass this test shall be a basis for rejection.

3. **Painting (1964 World’s Fair Bench or ‘Type A’ Worlds Fair Bench):** All metal surfaces of the cast iron bench, including standards, hardware, bars and brace rods, shall receive three (3) coats of shop applied paint. All coats of paint used shall be produced by the same manufacturer. Selection of undercoat colors is left to the discretion of the Contractor except that each single paint coat shall be a color different from the others and shall be approved.

Immediately prior to painting, all surfaces shall be thoroughly clean. All surfaces that are rust free shall be cleaned in accordance with SP-1, Solvent Cleaning. Cleaning shall be performed with a solvent such as mineral spirits, xylol, or turpentine to remove all dirt, grease, and foreign matter. Surfaces that show evidence of scale and rust shall be cleaned in accordance with SP-2, Hand Tool Cleaning, a method generally confined to wirebrushing, sandpaper, hand scrapers, or hand impact tools, or SP-3, Power Tool Cleaning, a method generally confined to power wirebrushes, impact tools, power sanders, and grinders in order to achieve a sound substrate. After the standards have been cleaned and prepared, they shall be painted as follows:
ITEM 615.08XXNN39 – WORLD’S FAIR BENCH – RPL SLATS - NYCDPR

First Coat: Primer shall be a phenolic alkyd flat finish coating having a dry film thickness of 2 mils. Paint requires one (1) to two (2) hours drying time before recoating. Primer shall be from one of the following manufacturers:

- Universal Metal Primer M07, White as manufactured by Benjamin Moore
- Kem Bond HS Metal Primer, B50NZ3, Red Oxide as manufactured by Sherwin Williams Company

51 Chestnut Ridge Road
Montvale, NJ 07645
201 – 573- 9600
www.benjaminmoore.com

or equal as approved by Engineer

Second Coat: Primer shall be a Primer be a D.T.M. (Direct to Metal) Alkyd semi gloss. The coating is a modified alkyd having a dry film thickness of 2 mils for each coat. Paint requires eight (8) hours drying time before recoating. The paint shall be from one of the following manufacturers:

- D.T.M. Alkyd Semi-Gloss as manufactured by Benjamin Moore
- Kem Bond HS Metal Primer, B50NZ3, Red Oxide as manufactured by Sherwin Williams Company

51 Chestnut Ridge Road
Montvale, NJ 07645
201 – 573- 9600
www.benjaminmoore.com

or equal as approved by Engineer

Third Coat: Shall be a D.T.M. (Direct to Metal) Alkyd semi gloss. The coating is a modified alkyd having a dry film thickness of 2 mils for each coat. Paint requires eight (8) hours drying time before recoating. The paint shall be from one of the following manufacturers:

- D.T.M. Alkyd Semi-Gloss as manufactured by Benjamin Moore
- Steel Master 9500 Silicone Alkyd, Black as manufactured by Sherwin Williams Company

51 Chestnut Ridge Road
Montvale, NJ 07645
201 – 573- 9600
www.benjaminmoore.com

or equal as approved by Engineer.
ITEM 615.08XXNN39 – WORLD’S FAIR BENCH – RPL SLATS - NYC DPR

All three (3) coats shall be shop painted. All paints shall be applied when the ambient air temperature is forty-five (45) degrees F and rising and when surfaces to be painted are moisture free. No painting will be allowed below the minimum ambient air temperature. In addition, no painting will be allowed below the temperature at which moisture will condense on surfaces.

Bench Slats – Recycled Plastic Lumber (RPL): All slats for benches shall be fabricated from a minimum ninety percent (90%) post consumer recycled plastic. The RPL dimensions shall be as indicated in the contract documents. Recycled plastic lumber shall be manufactured by:

Selectforce
Bedford Technology, LLC
2424 Armour Rd.
Worthington, MN 56187
507-372-5558
www.plasticboards.com

PolyTuf
Tangent Technologies, LLC
1001 W. Sullivan Rd.
Aurora, IL 60506
630-264-1110
www.tangentusa.com

or equal as approved by the Engineer.

Color to be Cedar or Weathered Wood unless otherwise indicated in the contract documents.

Recycled plastic lumber slats shall comply with or be tested in accordance with provisions of the following ASTM specifications:

- ASTM D6108
- ASTM D6109
- ASTM D6111
- ASTM D6112
- ASTM D6117
- ASTM D1248

RPL shall be fabricated from recycled High Density Polyethylene (HDPE) and recycled Low Density Polyethylene (LDPE). HDPE resins shall meet the requirements of ASTM D1248 for Type II, III or IV (high density), Grade G7. Lumber shall contain no toxic materials, but shall contain UV-inhibited pigments. Recycled plastic lumber shall not absorb moisture, corrode, rot, warp, splinter, or crack and shall not contain fiberglass or any material that will be irritating in contact with skin. Composition and mechanical properties shall be as follows:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Recycled Content</td>
<td>90%</td>
</tr>
<tr>
<td>Minimum High Density Polyethylene</td>
<td>70%</td>
</tr>
<tr>
<td>Maximum Percentage of Materials other than Polyolefins</td>
<td>5%</td>
</tr>
<tr>
<td>Minimum Specific Gravity (ASTM D6111-09)</td>
<td>0.02 lbs-in³</td>
</tr>
<tr>
<td>Minimum Flexural Modulus (ASTM D6109)</td>
<td>85,000 psi</td>
</tr>
</tbody>
</table>
Minimum Nail Pull-out Strength (ASTM D6117) 700 lbs

Flame Spread, Class C or better, tested in accordance with ASTM E84.

Coefficient of Thermal Expansion (ASTM D6341), in the range of 14 degrees F 86 degrees F, shall not exceed 70 x 10^-6/°F.

The State reserves the right to independently test samples of slats from the job site. Upon request, random samples must be supplied to the State for identification. Should the slats provided on the job site not be as previously approved, the Contractor shall replace all the incorrect slat lumber at no extra cost to the State.

Additional RPL requirements for Type A benches: Recycled plastic lumber slats shall be internally reinforced or externally supported with additional steel bar and channel supports. The Contractor shall submit shop drawings showing all external supports if non-reinforced plastic lumber is used. Both types (internally reinforced and externally supported) of RPL shall comply with and be tested in accordance with the provisions listed above.

Reinforced plastic slats shall be precision machined to receive the internal steel support bars and allow expansion and contraction of the slats. The slats with supports on minimum forty-six inch (46”) centers and a one-and-one-half inch by one quarter inch (1-½” X ¼”) steel support strap midway between the legs, shall be capable of bearing a five hundred pound (500 lb) load for a minimum twenty four hours with a maximum deflection of one-quarter inch (¼”) with the weight in place and one-sixteenth inch (1/16”) with the weight removed. As-equal submittals will require test data confirming this tolerance.

The different coefficients of expansion require sufficient play in the slot and spacing of fasteners to prevent cracking and splitting. Internal steel reinforcement bars shall be made of A36 electric furnace mild steel from recycled steel scrap. Steel dimension shall be one-quarter inch by one inch (¼” X 1”), secured with stainless steel set screws, countersunk with the resulting cavity filled with recycled plastic plugs.

The steel bars shall be hot-dipped galvanized and powdercoated to match the color of the recycled plastic lumber slats.

Hardware:

**Type A and 1964 Bench:** Bolts, locknuts, and washers used to secure slats to standards shall be stainless steel. Bolt or wood screw used for mid section steel support strap (RPL only) shall be a vandal resistant type, either stainless steel or hot-dipped galvanized. Type and dimensions of all bolts, nuts, and washers shall be as indicated in the contract documents. Anchor bolts used to secure the benches to pavements may be either stainless steel or hot-dipped galvanized steel. Bolts for securing slats shall be provided with nylon lock nuts so as to render the connection vandal resistant.
ITEM 615.08XXNN39 – WORLD’S FAIR BENCH – RPL SLATS - NYCDPR

Type A Bench: Steel support straps shall be secured with $\frac{3}{8}$” hot-dipped galvanized or stainless steel screws with vandal resistant heads.

CONSTRUCTION DETAILS
Assembly and Installation: Benches shall be assembled before being installed. Refer to the contract documents for the installation location. After assembly, benches shall be surface-mounted in their final position and secured in place, as indicated in the contract documents and as per manufacturer’s instructions.

Fabrication Tolerances (Type A and 1964): Ends shall be smooth with clean cuts, cross-sections shall not have voids greater than 1/2” dia. Voids of 1/2” dia. or less shall be filled with a matching color of silicone caulk, as per manufacturer’s specifications. All edges shall be eased. Maximum variation from flat surface across section shall be 1/8”.

Delivery and Storage (Type A and 1964): Keep materials protected at all times against exposure to extreme heat or impact. All material shall be bundled and fully supported during shipping and storage to prevent creep. Any lumber that is damaged or excessively scratched will be rejected and replaced with new. All slat material must be straight and true when bolted to the standards.

Touch-up and Repair: For minor damage caused by installation or transportation, touch-up finish in conformance with manufacturer’s recommendations. Provide touch-up such that repair is not visible from a distance of six feet (6’).

Submittals:
1. Shop Drawings - The Contractor shall submit Shop Drawings when required.
2. Foundry Certificates - Certifying Ductile Iron used in bench standards shall be submitted. The certificate shall be on foundry letterhead, dated and signed by the manufacturer with the
   - Contract No.,
   - Contractor name, and
   - Class of Ductile Iron provided.
3. Sample - The Contractor shall submit a twelve inch (12”) sample of the recycled plastic lumber slat for surface and color approval. Required test results shall be submitted for unreinforced recycled plastic lumber slats.
4. Paint Submission - A written request for any paint substitution must be submitted. The Contractor shall submit manufacturer’s data sheets and installation instructions for approval of any proposed as-equal product no less than two (2) weeks prior to application.

METHOD OF MEASUREMENT
This work will be measured as the number of feet, measured in place along the front slat, of World’s Fair Bench – RPL Slats, furnished and installed.
ITEM 615.08XXNN39 – WORLD’S FAIR BENCH – RPL SLATS - NYCDPR

BASIS OF PAYMENT
The unit price bid per linear foot of World’s Fair Bench – RPL Slats shall include the cost of all labor, materials, and equipment necessary to satisfactorily complete the work.

Excavation and concrete for footings or concrete slab shall be paid for separately under their respective items.

Payment will be made under:

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>615.08010139</td>
<td>Type ‘A’ World’s Fair Bench – RPL Slats - NYCDPR</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>615.08010239</td>
<td>Type ‘A’ Backless World’s Fair Bench – RPL Slats - NYCDPR</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>615.08020139</td>
<td>1964 World’s Fair Bench – RPL Slats – (Backless and Armless) - NYCDPR</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>615.08020239</td>
<td>1964 World’s Fair Bench – RPL Slats – with Back and Arms- NYCDPR</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>615.08020339</td>
<td>1964 World’s Fair Bench – RPL Slats – with Back (Armless) - NYCDPR</td>
<td>Linear Foot</td>
</tr>
<tr>
<td>615.08020439</td>
<td>1964 World’s Fair Bench – RPL Slats – with Arms (Backless) - NYCDPR</td>
<td>Linear Foot</td>
</tr>
</tbody>
</table>
ITEM 615.33XX0011 - TEMPORARY WOODEN TREE GUARD - NYCDPR

DESCRIPTION
This work shall consist of furnishing, installing, maintaining and removing temporary wooden tree guards around existing trees in accordance with the contract documents and as directed by the Engineer.

Definition: Temporary wooden tree guard with (or without) tree wrap is intended to protect individual trees. Temporary wooden tree guard for groves shall enclose a group (or grove) of several trees.

MATERIALS
The following sections of the standard specifications shall apply:

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>594-2</td>
<td>Timber and Lumber</td>
</tr>
<tr>
<td>709-01</td>
<td>Bar Reinforcement, Grade 60</td>
</tr>
<tr>
<td>709-04</td>
<td>Epoxy-Coated Bar Reinforcement</td>
</tr>
</tbody>
</table>

**Tree Guard:** Lumber shall be Yellow Pine, Douglas Fir or Spruce. In addition to the requirements found in §712-13, lumber shall be free of cracks, deformities and bark. No paint will be required.

**Hardware:** Galvanized or stainless steel screws.

**Tree Wrap:** “Snow fencing” composed of High Density Polyethylene (HDPE) mesh.

**Line Post/Stake:** Line post/Stake shall be No. 4 rebar. Rebars shall be uncoated conforming to §709-01 or can be epoxy coated conforming to §709-04.

CONSTRUCTION DETAILS
**General:** Temporary wooden tree guards shall be furnished and installed before commencing work on the site.

When directed, branches of existing trees shall be tied up to prevent tree injury during construction.

If temporary wooden tree guards or wrap are damaged before the authorized removal, they shall be immediately repaired, or replaced by a new temporary wooden tree guard or wrap at no additional expense.

**Tree Wrap:** When indicated for use in the contract documents,

The tree wrap shall be carefully wrapped around the trunk of the tree above the root flare and secured with steel or aluminum tie wire. Tree wrap shall be installed prior to the installation of the tree guards.
ITEM 615.33XX0011 - TEMPORARY WOODEN TREE GUARD - NYCDPR

Temporary Wooden Tree Guards: Temporary wooden tree guards shall be installed at the locations shown in the contract drawings. Posts for temporary wooden tree guards for individual trees shall be installed at the corners of the square enclosure as shown in the contract documents.

Posts for temporary wooden tree guards for groves shall be installed every eight feet on center (approximately), unless otherwise noted in the contract documents. Temporary wooden tree guards shall be installed with line post/stakes securely attached with galvanized or stainless steel screws to the wooden posts and driven 18” into the ground, without damage to existing trees.

Temporary wooden tree guards and wrap shall remain in place and not be moved or removed until,
- written permission is granted, AND
- all work which might cause damage or defacement has been completed.

Upon completion of the work, the Contractor shall remove and dispose of all temporary wooden tree guards and tree wrap.

METHOD OF MEASUREMENT
Temporary Wooden Tree Guard With and/or Without Tree Wrap: The work will be measured as the number of each wooden tree guard with and/or without wrap furnished, installed, maintained and removed.

Temporary Wooden Tree Guard For Groves: The work will be measured as the number of linear feet to the nearest whole linear foot of temporary wooden tree guard for groves furnished, installed, maintained and removed. Linear feet will be measured along the top edge of the temporary wooden tree guard.

BASIS OF PAYMENT
Temporary Wooden Tree Guard With and/or Without Tree Wrap: The unit bid price for each temporary wooden tree guard with and/or without wrap shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work. Tying of tree branches, as directed, is included in the cost of work.

Temporary Wooden Tree Guard For Groves: The unit bid price for each temporary wooden tree guard for groves shall include the cost of all labor, materials and equipment necessary to satisfactorily complete the work. Tying of tree branches, as directed, is included in the cost of work.
ITEM 615.33XX0011 - TEMPORARY WOODEN TREE GUARD - NYCDPR

Progress Payments: Progress payments shall be made at the unit price bid for 75 percent of the quantity of temporary wooden tree guard with and/or without tree wrap and temporary wooden tree guard for groves installed. The remaining 25 percent will be paid upon final removal.

The work will be paid under the following payment items:

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Description</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>615.33010011</td>
<td>Temporary Wooden Tree Guard without Tree Wrap – NYCDPR</td>
<td>EA</td>
</tr>
<tr>
<td>615.33020011</td>
<td>Temporary Wooden Tree Guard with Tree Wrap – NYCDPR</td>
<td>EA</td>
</tr>
<tr>
<td>615.33030011</td>
<td>Temporary Wooden Tree Guard for Groves</td>
<td>LF</td>
</tr>
</tbody>
</table>
ITEM 615. 43000011 – GROUND SURFACE PROTECTION MATS

DESCRIPTION: The work shall consist of furnishing, placing, maintaining, and removing Ground Surface Protection Mats for construction equipment access at work sites with soft soil conditions or for the protection of tree root systems at the locations shown in the plans or where directed by the Engineer.

MATERIALS: Ground Surface Protection Mats shall meet the following requirements:

- Manufactured from high-density polyethylene (HDPE).
- Each mat shall be approximately 7.87 foot by 13.78 foot (nominal),
- Each mat is to be equipped with a lip on two sides that creates an overlapping joint with an adjoining mat to allow for effective load distribution between adjacent mats.
- The interlocking mechanism shall consist of multiple connection points uniformly spaced along the full length of the overlapping lips of adjacent mats, fixed with locking pins.
- Manufacturer test data shall be submitted to demonstrate that each mat has a minimum compressive load bearing capacity of 570 pounds/ inch² when tested with a clear span of 7.87 foot minimum.

Mulching Material shall conform to Subsection 713-05 Wood Chips and the following:

- Mulch may be either wood chips or shredded bark.
- Wood chips shall be Type A composted (aged).
- Shredded bark shall be from hardwood trees which has been milled and screened to a maximum 3 inch particle size. Shredded bark shall be free from leaves, twigs, wood shavings, sawdust, toxic substances, and any foreign materials.
- Geotextile Fabric shall conform to Subsection 207-2 Materials, Geotextile Stabilization, Strength Class 1.

CONSTRUCTION DETAILS: The Contractor shall prepare a layout plan indicating the type and setup of construction equipment at each work site designated for protection to the Regional Landscape Architect for approval. The placement of the Ground Surface Protection Mats shall be supervised by ISA Certified Arborist.

All debris and foreign objects shall be removed from the area to be protected by the mats. When turf exists, the area to be protected shall be mowed to a height of 8 inch to 10 inch.

After mowing, the Contractor shall place a geotextile fabric upon the ground surface of the protection area. 100 to 150 mm of mulching material shall be evenly spread upon the geotextile fabric surface. Ground Surface Protection Mats shall be placed upon the mulching material as directed by the ISA Certified Arborist.
ITEM 615. 43000011 – GROUND SURFACE PROTECTION MATS

Upon completion of construction operations at the site, the Contractor shall remove the Ground Surface Protection Mats, mulching material, and geotextile fabric. The ground surface shall be raked by hand.

The Contractor shall perform additional surface restoration, including re-seeding grassed areas, shall be performed under the applicable landscape items as indicated on the plans and as directed by the Engineer.

METHOD OF MEASUREMENT: Ground Surface Protection Mats shall be measured in place by the number of square feet to the nearest square foot of protection mat surface installed and satisfactorily removed from the site.

BASIS OF PAYMENT: The unit price bid per square foot shall include the cost of furnishing all labor, materials and equipment, including Ground Surface Protection Mats, mulching material, geotextile fabric, and all disposal costs necessary and required to complete the work in accordance with the plans and specifications and as directed by the Engineer. Permanent Landscaping will be paid for under their respective items.
ITEM 619.22970011 - TRAFFIC ENFORCEMENT AGENTS

DESCRIPTION

Under the item, professionally trained Traffic Enforcement Agents (TEAs) from the Police Department shall be provided in order to properly maintain the flow of traffic in the vicinity of the construction site, as specified in the contract documents and as determined and ordered by the Engineer. A boiler plate of formal agreement, as developed during the design phase of the project in consultation with the NYPD shall be executed by the Contractor as a final agreement with the Traffic Control Division/Office of Construction Mitigation and Coordination-Streets (OCMC) following the award of the contract, as provided in the special provisions.

MATERIALS

The contractor shall arrange for TEAs to be provided by the NYPD with a uniform readily identifiable to the traveling public. Each TEA will be equipped with all items, to be provided by NYPD, necessary to carry out their assigned duties.

CONSTRUCTION DETAILS

The TEAs will be deployed to provide adequate traffic control throughout the construction site. The location, hours and days to be worked by the TEAs shall be according to contract plans or as evaluated and determined by the Engineer in Charge before the start of the contract.

METHOD OF MEASUREMENT

The dollars-cents sum shown in the bid proposal for this item shall be considered the price bid including equipment & uniform cost although actual payment will be based on the work performed. The dollars-cents sum is not to be altered in any manner.

It is agreed that all work shall be based on the actual number of hours that each TEA performs at a post in addition to travel time. Travel time will not exceed two hours per day. For every four TEAs on duty there shall be one relief TEA. Relief TEAs are required to provide coverage for regularly posted TEAs during their staggered lunch or dinner period and breaks. They shall be paid for actual relief hours at the same rate as the agents they are relieving that day. Total estimated costs shall include the actual cost of fringe/leave benefits for each TEA and Supervisor.

The hours of supervisory personnel will be based on a percentage basis of man-hours worked by TEAs including travel time. Supervision will consist of level I, level II, and level III supervisors. Payment will be made based on work as follows: level I at 12.5%, level II at 2.5%, and level III at 1.33% of all hours worked by TEAs. Supervisory personnel hours are not subject to audit.

The hourly rate paid shall be the actual yearly salary, divided by the normal hours paid, including leave and holiday hours for TEAs. Those TEAs working overtime, including
ITEM 619.22970011 - TRAFFIC ENFORCEMENT AGENTS

weekends and holidays will be paid one and a half times their regularly hourly rate. Those TEAs starting work prior to 8:00AM and/or working beyond 6:00PM shall be entitled to a 10% night shift differential. An additional 5% of the total hours (TEA man hours worked including travel time and supervision hours) will be allowed for bookkeeping services in processing TEA time sheets.

BASIS OF PAYMENT

The contract price for this item shall be a dollars-cents price for the work performed under this item and shall be equal to the sum total of all vouchers submitted to the Contractor by the New York City Police Department (NYPD), as approved by the Engineer, for payment by the Contractor for the cost incurred in providing Traffic Enforcement Agents. Each TEA will be required on a daily basis to sign a time sheet showing date, time and the hours worked at each assigned location. These time sheets along with the report which shall contain the name of the agent, badge number and in-out will be submitted to the Engineer, on a daily basis, for verification. Payment under this item, will not be made until the Contractor has furnished satisfactory evidence (check etc.) to the Engineer that he has reimbursed the Police Department for said costs in providing Traffic Enforcement Agents.

The total estimated cost of this item is the “dollars-cents” amount shown for this item in the Bid Schedule. No guarantee is given that the actual dollars-cents cost for this item will in fact be the “dollars-cents” amount. The “dollars-cents” amount is included in the total bid solely to insure that sufficient monies will be available to pay the Contractor for these services.

The Contractor shall maintain separate books of accounts and shall not charge any portion of the cost of Traffic Enforcement services to another part of the work.

The voucher for the payment shall be submitted to the Engineer for approval on a monthly basis and shall include the signed copies of the daily summary time sheet.

Payment for this item shall be on a monthly basis upon submission of voucher to be verified by the Engineer. Payment to NYPD shall be prompt & should be treated separately from the payment made to subcontractors.

The “dollars-cents” is for bidding purposes only and shall not be varied in the bid. The contractor will be paid for the actual amount paid to NYPD and a 5% overhead as an administrative fee regardless of the dollars-cents, which may be more or less than the dollars-cents amount.
ITEM 634.90030011- RODENT AND VERMIN CONTROL - INITIAL SURVEY.
BAITING AND SANITATION

ITEM 634.90040011 - RODENT AND VERMIN CONTROL - MAINTENANCE PROGRAM

DESCRIPTION

A. Under these items the Contractor shall perform and satisfy the rodent and vermin control (extermination) and site sanitation requirements within construction areas as designated by the engineer.

B. The contractor shall maintain a cooperative dialogue with appropriate agencies and management representatives of neighborhood properties.

C. The contractor shall perform the rodent and vermin control tasks described herein and also respond to other pest control needs when directed by the Engineer.

MATERIALS

1. Products

   A. Furnish and use only pesticide formulations registered by the U.S Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (DEC) where appropriate, according to label directions and as acceptable to the Engineer.

   B. Furnish and use devices and supplies (e.g., traps and bait stations) to facilitate the effectiveness and safety of the pest control program as appropriate and as acceptable to the Engineer.

2 Containers

   A. Use heavy duty refuse containers with tight-fitting domed lids, with a spring loaded flap, for disposal of all garbage and trash associated with food. Maintain these containers so there are no opening that allow access by rodents or vermin.

   B. If a dumpster is necessary for the temporary storage of garbage and trash associated with food, it shall not have openings that allow access by rodents or vermin. The dumpster shall have a drain plug if a drain is present, and the doors shall be maintained tightly closed.

CONSTRUCTION DETAILS

This work is to be performed prior to the start of construction and also throughout construction, so that Rodents (rats and mice) and Vermin (cockroaches, beetles, and other insects) do not disperse from or infest construction area or adjacent residential areas.

1. Submittals
ITEM 634.90030011 - RODENT AND VERMIN CONTROL - INITIAL SURVEY.
BAITING AND SANITATION

ITEM 634.90040011 - RODENT AND VERMIN CONTROL - MAINTENANCE
PROGRAM

A. Submit to the Engineer copies of pesticide applicators certification and licenses within ten (10) days of their issuance or renewal for the duration of this Contract

B. After performing the survey described under Construction Details Section 6 and before initiating baiting, submit to the Engineer a written description of proposed pest control procedures, indicating materials, quantities, methods, and time schedule. For all pesticide be used, submit a copy of pesticide manufacture’s EPA - approved pesticide label with application directions.

C. Submits to the Engineer documentation of pest control activities and results as follows:

1. Monthly - Submits data sheets with location of sites treated, methods and data application, amounts and types of bait used, pesticides dosage, number and types of traps set, survey and inspection results, sanitation condition complaints calls investigated, any problems that occurred and signature of applicator.

2. Monthly — submit a map that shows bait station, manholes and catch basins where baits are being maintained.

D. At least 10 days prior to occupancy of Contract area, submit to the Engineer for review a written description of the sanitation procedures to be used.

2. Qualifications:

A. The Contractor shall perform this work at all times in accordance with the following minimum standards and as acceptable to the Engineer.

B. The Contractor, key personnel and applicator shall have experience and/or training in vertebrate pest management and integrated pest management; have experience with various rodent and vermin control techniques, equipment, and strategies; and have knowledge of and experience with techniques to reduce non-targets hazards.

C. Applicators shall be licensed and certified by New York State DEC.

3. Coordination:

A. The contractor shall not proceed with the construction designated on the Plans until written release is issued by the Engineers, after successful completion of the initial phase of rodent and vermin control.

B. Initiate the work before field mobilization begins for the construction designated on the Plans and within adequate timing to achieve control before
ITEM 634.90030011- RODENT AND VERMIN CONTROL - INITIAL SURVEY.
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environmental disruption and site work. Provide a maintenance program until
construction is completed and all equipment and materials are removed, as
determined by the Engineer.

C. Perform this work in such a manner and post warning signs such that toxicants
or other control tools do not pose hazards to persons, domestic animals, or non-
targets wildlife.

4. Permits:
   A. Obtain and maintain in coordination with the Engineer appropriates permit(s)
      from city or state agencies for pest control activities associated with this work.
   B. Obtain and maintain in coordination with the Engineer all right of entry permits
      required for the performance of this work. This includes all utilities and private
      properties to which entrance is required.

5. Meetings:
   A. Before proceeding with the work, all pest control personnel shall attend a two
      hour orientation session held by the Engineer and discuss planned pest control
      methods and coordination.

6. Survey:
   A. Prior to baiting, survey the proposed construction area with representatives of
      adjacent buildings and record signs of rodent and vermin activity and sanitation
      conditions. Maintain survey in the manner described under Construction Details
      Section 10.
   B. Thoroughly inspect construction areas and accessible or observable bordering
      area designated herein, and any nearby area designated by the Engineers, for
      rodent and vermin activity and sanitation deficiencies monthly throughout the
      duration of this contract and in accordance with the work schedule. Maintain
      inspection records in the manner described under Construction Details Section
      10.

7. Application for Rodent and Vermin Control:
   A. Apply rodenticide and insecticide in strict accordance with EPA-approved label
      directions and NYSDEC and NYCDEP regulations. Maintain records of all bait
      placements in the manner described under Construction Details Section 10.
   B. Where appropriate, use properly secured and tamper-resistant bait stations
      consistent with EPA regulations, Remove manhole covers and ventilate
      manholes according to requirements of appropriate municipal agencies and
utility companies. Use a police, or utilities details as appropriate. Coordinate the work with appropriate municipal agencies and utility companies. Individually number and property identify all bait stations.

C. Baited area must be posted with warning signs advising the public that bait has been placed in the area. The signs are to be large (18 inches X 22 inches) and clearly printed at all bait stations.

D. Surface Applications
   1. Initial Surface Baiting
      Rid the construction area of all detectable rodents and vermin before construction begins, as acceptable to the Engineer. Bait all observable rodent burrows and areas of vermin infestation. Install and secure bait stations at regular and appropriate intervals and locations, and document rodent or vermin activity (burrows, dropping, bait consumed, dead rodents). Replenish bait and shift stations as necessary to ensure complete control of rodent and vermin populations. Bait edge and accessible bordering areas designated on the Plans as necessary to ensure that rodents and vermin shall not infest work areas.

   2. Maintenance Surface Baiting
      Establish a maintenance baiting program prior to the start of construction. This includes construction areas and accessible bordering areas designated herein, as acceptable to the Engineer. Check bait placements weekly. Use survey and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute bait and bait stations as appropriate to ensure continuous control.

E. Subsurface Applications
   1. Initial Subsurface baiting
      Apply appropriate baits to control rodent and vermin populations in manholes and catch basins. This shall involve suspending and securing bait using noncorrosive wire (e.g., 24 gauge plastic coated). Place bait in all accessible manholes and catch basins within the construction work area. In addition, bait an appropriate set of manholes and catch basins in the blocks bordering the work area as designated herein and as acceptable to the Engineer. Identify all baited manholes and catch basins with a standardized paint mark on the street and, a numbered tag to be
ITEM 634.90030011 - RODENT AND VERMIN CONTROL - INITIAL SURVEY.
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attached to the suspending wire. Approximately seven days after completion of the first baiting, check all manhole and catch basin baits and record estimates on the amount of bait consumed. Replenish or increase the amount of bait applied according to the amount consumed and as acceptable to the Engineer. Repeat this process again approximately fourteen days later and until there is little or no bait consumed. Check manholes and catch basins weekly when they repeatedly have 100 percent of the bait consumed.

2. Maintenance Subsurface Baiting

Prior to the start of construction, establish a maintenance baiting program appropriate for the rodent or vermin infestation patterns identified during initial program appropriate for the rodent or vermin infestation patterns identified during initial subsurface baiting. This program shall ensure continued control and shall be performed acceptable to the Engineer. Maintain bait in manholes and catch basins that have rodent or vermin activity and those that had activity during initial baiting as necessary. Check each bait weekly or more often according to rodent or vermin activity levels and the recent history of bait consumption. Use utility maps and baiting data to determine the most effective distribution of baiting locations and bait quantities. Shift and distribute baiting locations as necessary to ensure adequate interception option points for controlling immigrating rodents or vermin.

F. Cleanup

1. Remove visible rodent carcasses and dispose of them daily consistent with the pesticide label directions and applicable codes, laws, and regulations.

2. Upon completion of any pest control operations at the site, remove remaining bait and dispose of it according to the pesticide label and applicable codes, laws, and regulations. Also remove all wires used for subsurface baiting and any bait stations or traps.

8. Sanitation:

Prior to construction and throughout the duration of this Contract, identify and document harborage and food sources available to rodents on the construction site and in observable bordering areas designated herein. This includes any littering or improper or insufficient use of trash receptacles in construction or structural deficiencies that violate City or State sanitation codes.
ITEM 634.90030011 - RODENT AND VERMIN CONTROL - INITIAL SURVEY.
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Maintain records of sanitation conditions in the manner described under Construction Details Section 10.

A. Maintain Construction and laydown areas and their perimeters free of trash, garbage, weeds, debris and unnecessary or deteriorated hay and straw bales. Provide and enforce proper use of refuse containers to ensure that rodents and other pests are not harbored or attracted.

B. Designate specific locations as lunch and coffee break areas to prevent random disposal of garbage and trash. Keep those areas free of litter and garbage, and provide refuse containers. Keep refuse containers upright with their lids shut tight.

C. Have all refuse containers (described in Materials Section 2), emptied daily to maintain site sanitation. If a dumpster is used (as described in Materials Section 2) empty it at least weekly and keep the area under and around it clean.

D. Notify the Engineer within 24 hours whenever rodents (rats or mice) or signs of rodent activity (burrows or droppings) or vermin are observed in construction or laydown areas.

9. Complaint Calls

A. During construction, respond to pest-related complaints from the adjacent neighborhood within 12 hours when directed by Engineer. Inspect the particular premises and adjacent areas for sanitation and structural deficiencies and also signs of historic and recent pest activity. Provide sanitation and structural maintenance information to the property owner or manager. Use pesticides or traps as necessary and appropriate to resolve the complaint when there is a relationship between the pest infestation and construction activities, or when directed by the Engineer.

B. Maintain records of all complaints investigated, including location, contact person, inspection results, and actions taken. Document the relatedness of the pest infestation to construction activities.

10. Record Keeping

A. Use standard data sheets provided or approved by the Engineer to maintain accurate records of date, placement, type, and amount of pesticides or other control tools (e.g., traps) applied. Similarly, maintain records of surveys, inspection, changes in pest activity, sanitation conditions, or when directed by the Engineer.
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ITEM 634.90040011 - RODENT AND VERMIN CONTROL - MAINTENANCE PROGRAM

METHOD OF MEASUREMENT

The quantity to be paid for under the item Initial Survey, Baiting and Sanitation, will be on a lump sum basis for the initial work completed in accordance with the plans, specifications and direction of the Engineer.

The quantity to be paid for under the item, Maintenance Program, will be on a per month basis for the maintenance program completed in accordance with the plans, specifications and direction of the Engineer.

Extermination work to be performed under Item 202.01nnnn - Disposal of Buildings will be measured and paid for under Item 202.01nnnn - Disposal of Buildings.

BASIS OF PAYMENT

The lump sum price bid for the item, Initial Survey, Baiting and Sanitation, shall cover the cost of all labor, material and equipment necessary to complete the initial survey, planning, documentation, baiting and inspection of the construction and adjacent areas both surface and subsurface as well as sanitation inspection, documentation and corrective measures.

The unit price bid per month for the item, Maintenance Program, shall cover the cost of all labor, materials and equipment necessary to complete the weekly inspections, rebaiting, cleanup and rodent and vermin control documentation, garbage disposal cleanup and sanitation documentation as well as to receive, document and respond to complaints.
ITEM 634.99010017 – BUILDING CONDITION SURVEY
ITEM 634.99020017 – VIBRATION MONITORING (NONBLASTING)

DESCRIPTION

A. Building Condition Survey. This work shall consist of performing a building condition survey(s) and preparing permanent records as indicated in the contract documents prior to the commencement of work, after completion of work, and at locations and times during construction as directed by the Engineer.

B. Vibration Monitoring (Nonblasting). This work shall consist of performing vibration monitoring of background and construction activities and preparing daily and summary report(s) of vibration readings.

MATERIALS

A. Building Condition Survey. Provide general photography and video equipment, analog or digital, capable of superimposing the date and time on all images.

B. Vibration Monitoring (Nonblasting). Provide a 3-component seismograph, capable of measuring particle velocity data in three mutually perpendicular directions. Annual factory calibration is required throughout the duration of the work.

CONSTRUCTION DETAILS

A. General. The Contractor shall engage the services of a firm capable of furnishing a New York State licensed Professional Engineer to conduct a condition survey of the existing building(s) indicated in the contract documents in the Special Note entitled Vibration Criteria and an experienced vibration monitoring Consultant to measure peak particle velocities prior to, and during, construction operations. Submit as proof to the Deputy Chief Engineer Technical Services (DCETS) the experience and qualifications of the firm’s personnel conducting the work.

B. Building Condition Survey. Provide, as a minimum, the following information:

1. Photographic and videotape documentation of the interior and exterior condition of the building(s).
2. Extent and location of existing signs of building distress such as cracks, spalling, signs of settlement, flooding, leaking, etc.

The Engineer may accompany the Contractor on each building condition survey for verification of the data recorded. Provide two copies of all documentation of each building condition survey to the Engineer.

C. Vibration Monitoring (Nonblasting). The DCETS may waive the requirements of vibration monitoring based on the results of the building condition survey.

Perform continuous vibration monitoring during construction operations when adjacent construction activities make monitoring prudent. The Contractor shall perform contract work in
a manner that will limit construction vibration at the specified locations to within the limits set within the contract documents.

1. **Submittal of Written Vibration Monitoring Plan.** Prior to performing work adjacent to specified locations, a written Vibration Monitoring Plan prepared by the Contractor shall be submitted to the Engineer a minimum of 10 work days in advance for approval. The Engineer will send a copy of the Vibration Monitoring Plan to the Geotechnical Engineering Bureau, Engineering Geology Section, for review and written comment. The vibration monitoring plan may be returned to the Contractor for revision or clarification.

The vibration monitoring plan shall include the necessary information to outline the recording collection. The vibration monitoring plan shall include, but not be limited to, the following items:

a. **Contract Designations**
   - The name of vibration monitoring specialist(s).
   - The scheduled start date and length of construction operations which require vibration monitoring.
   - The limits of vibration monitoring work, including sites on or off State-owned right-of-way.
   - The location of all structures to be monitored in proximity to the construction operation.
   - The location of any underground utilities in proximity to the construction operation.

b. **Experience and Equipment**
   - Submit proof and details, as references, of two projects in the past five years where the vibration monitoring consultant performing the work has satisfactorily monitored construction operations by recording maximum peak particle velocities (PPVs). Include contact information for each reference.
   - Submit information on the required 3-component seismograph, capable of measuring particle velocity data in three mutually perpendicular directions, including: the manufacturer’s name, model number, and documentation of factory calibration performed within the last 12 months.

c. **Methods and Procedures**
   - The location of adjacent structures to be monitored and maximum allowable PPVs as indicated in the contract documents. If not otherwise specified, a maximum allowable PPV in accordance with the United States Bureau of Mines (USBM) Vibration Criteria (Figure 1) shall be observed at all structures.
   - The location of seismograph(s) placements, as directed by the Contractor’s Professional Engineer. Recording seismographs may be installed on selected structures.
   - Appropriate details for anchoring the geophone(s).
The procedure for tracking PPV throughout construction operations (e.g., Pile Driving Operations: pile tip vs. vibrations may be correlated through time of day. A record of the time of day at each depth interval, included on the pile driving records, would be required to correlate to a time-based readout of PPV).

**Figure 1**—Safe Vibration Limit Recommendations for Residential Structures

*Figure 1 – USBM Vibration Criteria (after Siskind et al, 1980)*
The figure provides a “threshold damage” limit, defined as cosmetic damage (e.g., cracking) within the structure, categorized by both frequency ranges and particle velocity.
ITEM 634.99010017 – BUILDING CONDITION SURVEY
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2. Measuring Vibrations. The Contractor shall inform the Engineer immediately each time measured particle velocities exceed 85% of the allowable peak particle velocity. The Contractor shall make equipment or procedural modifications as required to avoid exceeding the allowable vibration intensity.

If the measured velocities exceed the maximum allowable PPVs, the Contractor shall stop operations immediately and revise equipment and procedures to reduce vibrations to allowable levels.

The Contractor shall be in communication with his monitoring firm’s personnel during vibration monitoring at all locations to verify the data recorded.

The Contractor shall provide the Engineer with the results of daily vibration monitoring, one work day after the readings are taken. Upon completion of the construction operations for those locations requiring vibration monitoring, the daily submittals shall be synthesized into a final report.

If the seismographs show any indication of damage or vandalism, the seismographs shall be immediately recalibrated or replaced.

METHOD OF MEASUREMENT

A. Building Condition Survey. This work will be measured on a lump sum basis.

B. Vibration Monitoring (Nonblasting). This work will be measured on a lump sum basis.

BASIS OF PAYMENT

The unit price bid for building condition survey(s) and vibration monitoring shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work.

Vibration Monitoring (Nonblasting). Progress payments will be made for this item paid proportionally in accordance with the amount of work completed, measured on a workday basis.

Payment will be made under:

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<th>Item No.</th>
<th>Item</th>
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<tr>
<td>634.99020017</td>
<td>Vibration Monitoring (Nonblasting)</td>
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ITEM 637.31XX0020 – INSPECTION VEHICLES (MAXIMUM BID)

DESCRIPTION
This work shall consist of providing and maintaining motor vehicle(s) for exclusive use by the Engineer and the Inspection Staff.

MATERIALS
The vehicles(s) provided shall not be over 4 years old or have over 50,000 miles on the odometer as of the delivery date. The vehicle(s) shall be properly registered and be provided with an owner’s policy of liability insurance in conformance with §107-06B. Insurance Requirements. The vehicles shall be in safe and serviceable operating condition with automatic transmissions and air conditioning.

A. Compact Sedan. The Contractor shall provide a Ford Focus or similar compact sedan.

B. Midsize/Intermediate SUV. The Contractor shall provide a Jeep Patriot or similar midsize/intermediate SUV. The SUV shall have all-wheel, or 4-wheel drive capability.

C. Small/Standard Pickup Truck. The Contractor shall provide a Chevrolet Colorado or similar small/standard pickup truck. The pickup truck shall have 4-wheel drive capability.

CONSTRUCTION DETAILS
Prior to the start of any contract work, the Contractor shall make the inspection vehicle(s) available for inspection by the Engineer. The Contractor shall make arrangements for delivery to the site on a date agreed to by the Engineer. If more than one vehicle is required, the number required will be shown in a Special Note entitled Contractor Supplied Inspection Vehicles.

Inspection vehicles will be operated by Department and consultant inspection staff possessing a valid driver’s license as authorized by the Engineer and for official State business purposes only. The vehicle operator is personally liable for any traffic infractions, including parking tickets, or EZ Pass violations.

The Contractor shall provide all proper and scheduled maintenance (oil changes, tires) to keep the vehicle(s) in safe and serviceable operating condition and undertake all repairs as required, including repairs arising from vandalism, accidents or other damages. If a vehicle becomes unavailable for any reason or requires maintenance or repairs which cannot be completed on the same day, a comparable replacement vehicle shall be provided while the vehicle is out of service. The Department will provide fuel and EZ Pass for the vehicle(s).

METHOD OF MEASUREMENT
Each inspection vehicle will be measured for payment on a monthly basis, measured to the nearest 0.25 months.

BASIS OF PAYMENT
The unit price bid per month shall include all costs in connection with furnishing properly registered vehicle(s), maintaining and repairing the vehicles as required and providing an owner’s policy of liability insurance for the vehicles in conformance with §107-06B. Insurance Requirements. A deduction of 1/30 of a month will be made for each 24-hour period, or portion thereof, during which the vehicle is unavailable to the Engineer, regardless of the reason for the vehicle's unavailability. Payment may be terminated on a specified date prior to contract final acceptance by written notification from the Engineer that a vehicle will no longer be required.
**ITEM 637.31XX0020 – INSPECTION VEHICLES (MAXIMUM BID)**

*Payment will be made under:*

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<td>Inspection Vehicles, Small/Standard Pickup Truck</td>
<td>Month</td>
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**MAXIMUM BID ITEM**

The maximum bid allowed per vehicle(s) per month shall be that shown in the proposal. The Contractor may bid less than the maximum bid, but any bid exceeding the maximum bid will be disregarded and changed to the amount shown in the proposal.
ITEM 637.4000nn20 - WEBCAM SYSTEM

DESCRIPTION
This work shall consist of providing, installing, maintaining and removing a webcam system, with a
camera mounted on wood utility pole. A single website for image storage and online access may be used
for multiple cameras, provided the images are organized and available for each camera separately.

MATERIALS
The webcam system shall meet the following material requirements:

Camera
- The high definition camera and lens assembly shall take high resolution (minimum 16
  megapixel - 4928 x 3264) digital still color images and have digital pan, tilt, and zoom
capabilities
- Imager: 23.6 X 15.6 CMOS.
- Auto Features: Focus, Shutter, ISO, and white balance.
- Powered by 120 VAC electrical supply, GFCI protected (provided, installed, maintained and
  removed by Contractor).

Camera Enclosure
- The camera enclosure shall be UL compliant and shall meet NEMA Type 3R standards.
- Include provisions for a fixed installation to a pole or wall.
- Shall include a thermal insulation package, heater, blower, window defroster kit, sun shroud
  and shall operate within a minimum temperature range of -10°F to 110°F.
- Powered by 120 VAC electrical supply, GFCI protected (provided, installed, maintained and
  removed by Contractor).

Interface and Online Access
- The system must provide wireless cellular modem as an option for uploading the digital still
  images.
- The online interface system shall allow viewing of all high-definition digital still images
captured and stored during the duration of the contract over the internet with password-
protection.
- The still images shall be in a non-proprietary format that can be freely viewed with most image
  viewing software (.bmp, .jpeg, .tif or .gif)
- Navigation: Calendar based navigation system for selecting specific images on specific days.
- Capable of viewing actual live video.
- HD Snapshot on Demand: HDR (High Dynamic Range) Imaging and Additional Special
  Effects Including Architectural Miniature, Artistic Color Sketch and Cinematic Black & White
- Graphical mark-up tools for detailing and creating overlays on images.
- Graphical weather applet displaying ten points of local weather data and 48-hour forecast.
- Remote cellular monitoring screen displaying connectivity, network traffic and modem
  temperature.
- Remote wireless radio monitoring screen displaying connectivity, network traffic and Google
  Map features including wireless radio locations.
- Image Comparison: Capability to choose and overlay images from two different dates in the
  same viewing window
- Zoom: Pan and zoom capability for zooming into the high definition images.
- Fullscreen: Screen maximizing the view of the images on the users monitor.
- Slideshow: Capability to browse through images, moving forward and backward in time by
  individual image and by day.
- Picture in Picture to view live video, while viewing high definition images.
ITEM 637.4000nn20 - WEBCAM SYSTEM

- All Images are the Copyright of the Department and Protected on Secure Servers Owned and Operated by the System Vendor.

Embedded Wood Utility Pole
- The pole shall me a minimum 60 feet in length, Southern pine and meet the requirements of ANSI #05.01 for Class 4 utility type poles.
- The pole shall be given a water borne preservative treatment in accordance with §708-31.

CONSTRUCTION DETAILS
The Contractor shall provide, install and maintain a fully functional webcam system including an electrical power supply, camera hardware, mounting pole and equipment, data connections, image storage, online interface for the system and technical support. The Contractor is required to have the webcam system’s vendor made available for support services and equipment maintenance/repairs.

The Contractor shall provide, install, maintain and remove the webcam system. The Contractor shall coordinate with the Engineer to install the camera in an approved location and provide password access to the webcam system’s Internet site. The camera shall be installed so that the position of the sun or any man-made light source does not point directly into the camera. The camera shall be tested at the site both prior to and subsequent to installation, including having the webcam system’s vendor remotely confirm both successful tests. The Contractor shall clean the installed components in accordance with manufacturer’s recommendations at least monthly, or as needed to ensure image clarity.

The pole shall be installed plumb, in a hole of sufficient depth to allow for a minimum of 10 feet embedment. The area around the pole shall be backfilled with suitable material and thoroughly compacted. The Contractor shall restore, in kind, all areas which were disturbed by the pole installation operation.

The webcam system shall consist of all-weather, tamper/impact resistant, fixed mounted camera enclosure with integrated, fixed high definition camera. The camera shall have the ability to take a high-resolution digital still color image of the construction site at a set time interval, at least every fifteen (15) minutes, and securely upload the still images to a secure, password-protected website. The image data shall be the property of the State. The digital still images shall be stored on a remote server (with sufficient storage capacity to store all images taken on the contract) and be made available for viewing on the website in chronological order. The website shall provide the ability to zoom in on the images. Password access to the website shall be granted to those parties specified by the Engineer (Department staff and the Contractor, at a minimum). The Contractor shall provide the Department with an archive in DVD or external hard drive format of all the digital still images in a sortable/identifiable format. The still image file names shall include the date and time taken.

The Contractor shall maintain all equipment in working condition and shall provide replacement due to breakdown, damage, or theft within two (2) work days. The Contractor’s webcam system vendor shall proactively monitor the webcam system and if no system connection is made within normal working hours, not to exceed 24 hours, the vendor shall notify the Contractor and begin troubleshooting.

The Contractor shall remove all webcam system equipment and wood utility pole within ten (10) work days after the Engineer requests the removal in writing. The webcam system equipment and pole shall remain the property of the Contractor. The State shall retain ownership of all data collected by the webcam system.

The webcam system shall be operated in accordance with the “Policy for the Operation of Webcam Systems on Construction Contracts”, a copy of which will be provided to the Contractor by the Engineer.
METHOD OF MEASUREMENT
The webcam system will be measured for payment on a monthly basis, measured to the nearest 0.25 months.

BASIS OF PAYMENT
The unit price bid per month for the webcam system shall include the cost of all labor, materials and equipment, including services to provide, install, maintain and remove all components of the webcam system and wood utility pole. A deduction of 1/30 of a month will be made for each 24-hour period, or portion thereof during which the webcam system is not operational. Payment will begin the first month the webcam system is installed, operational and made available for use, including having the website established and functional. Monthly payments will be terminated no later than two (2) weeks after written notification by the Engineer that the webcam system will no longer be required.
ITEM 651.10010011 - INSTALL FIRE ALARM FOUNDATION AND POST (NEW YORK CITY)

Description:

This work shall consist of furnishing and installing fire alarm posts, concrete foundations and other appurtenances, at the locations shown on the plans or where ordered by the Engineer.

Materials:

Fire alarm post bases, sub-bases, hanging bars and hardware will be purchased and picked up by the Contractor at the Fire Department designated storehouse. All other materials shall be furnished by the Contractor and shall conform to the requirements of the "Specifications for Installation of Underground Conduits and Posts," latest revision contained in the publication "City of New York SPECIFICATIONS - Compiled 1970 for Use with State of New York Department of Transportation Construction Contracts" and Fire Department Standard Drawing 141.

Construction Details:

The fire alarm posts, concrete foundations and appurtenances shall be installed in accordance with the plans, Fire Department Standard Drawing 141 and the "Specifications for Installation of Underground Conduits and Posts." Excavation and backfill shall conform to Section 206, "Trench, Culvert and Structure Excavation," of the Standard Specifications (English Edition).

The Contractor shall take special precautions to prevent damage to the fire alarm post bases, sub-bases, hanging bars and hardware during transporting and installing, and shall replace with new and equal material acceptable to the Engineer and the Fire Department at his own expense, all parts damaged or missing.

Method of Measurement:

This work shall be measured by the number of fire alarm posts, complete with foundations and appurtenances, installed in accordance with the plans, specifications and as directed by the Engineer.
ITEM 651-10010011 — INSTALL FIRE ALARM FOUNDATION AND POST (NEW YORK CITY)

Basis of Payment:

The unit price bid shall cover the cost of the purchase, loading and transporting the base, sub-base, hanging bars and hardware from the Fire Department storehouse; installing the base, sub-base, hanging bars and hardware; furnishing and installing the concrete foundation and appurtenances including boiler tubing sleeves with concrete encasement, 90° bends, nipples, bushings, caps and plugs; furnishing and installing subsidiary conduits; restoring sidewalk or constructing concrete slab; excavation and backfill, cinders, sandfill, labor, equipment and all other materials necessary to complete the work.
DESCRIPTION

This work shall consist of the installation of underground fire alarm cable in accordance with the contract documents and as directed by the Engineer.

MATERIALS

All material shall meet the requirements in the current Specifications for Installation of Underground Cable issued by the Fire Department, City of New York, Bureau of Fire Communications.

CONSTRUCTION DETAILS

All work to be done in accordance with the current Specifications for Installation of Underground Cable issued by the Fire Department, City of New York, Bureau of Fire Communications.

METHOD OF MEASUREMENT

This work will be measured by the number of feet of cable installed in accordance with the contract documents or as directed by the Engineer.

BASIS OF PAYMENT

The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work. Work Zone Traffic Control will be paid for separately.
ITEM 655.00XX0011 – CAST FRAMES AND GRATES AND MANHOLE COVERS

DESCRIPTION
This work shall consist of furnishing and installing Cast Frames and Grates and Manhole Covers, in accordance with the contract documents and as directed by the Engineer.

MATERIALS
All the provisions of §655-2.01 Castings shall apply, and in addition, the requirements shown on the following drawings shall also apply:

REGION 11 DESIGN GUIDE SHEET, DRAINAGE DETAILS, FRAMES, GRATES & STEPS
REGION 11 DESIGN GUIDE SHEET, DRAINAGE DETAILS, FRAME WITH CURB BOX

N.Y.C. DEPARTMENT OF ENVIRONMENTAL PROTECTION, SEWER DESIGN STANDARDS,
• STANDARD FOR 27” DIAMETER CAST IRON FRAME AND MANHOLE COVER
• STANDARD FOR CAST IRON FRAME FOR CATCH BASINS (WITH CURB PIECE)
• STANDARD FOR CAST IRON GRATING, BACK PLATE, AND CURB PIECE FOR CATCH BASINS

N.Y.C. DEPARTMENT OF PARKS AND RECREATION, STANDARD DETAILS,
• DRAINAGE DETAILS – NO. 1
• PARKS LEAF MANHOLE AND CATCH BASIN COVERS

CONSTRUCTION DETAILS
All the provisions of §655-3 CONSTRUCTION DETAILS shall apply, and in addition, the requirements shown on the appropriate New York City drawings shall also apply.

METHOD OF MEASUREMENT
This work will be measured as the number of Cast Frames and Grates, or Cast Frames and Manhole Covers, satisfactorily furnished and installed.

BASIS OF PAYMENT
The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work, including the cost of any field repair work for improperly fitting castings, or to render the frame and grate non-rocking.

Payment will be made under:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>655.00010011</td>
<td>Cast Frame for Catch Basin (Region 11)</td>
<td>Each</td>
</tr>
<tr>
<td>655.00020011</td>
<td>Cast Frame and Curb Box for Catch Basin (Region 11)</td>
<td>Each</td>
</tr>
<tr>
<td>655.00030011</td>
<td>Cast Grate for Catch Basin (Region 11)</td>
<td>Each</td>
</tr>
<tr>
<td>655.00040011</td>
<td>Cast Grate for Catch Basin (NYCDEP)</td>
<td>Each</td>
</tr>
<tr>
<td>655.00050011</td>
<td>Cast Frame for Manhole (NYCDEP)</td>
<td>Each</td>
</tr>
<tr>
<td>655.00060011</td>
<td>Cast Cover for Manhole (NYCDEP)</td>
<td>Each</td>
</tr>
<tr>
<td>655.00070011</td>
<td>Rectangular Cast Frame for Catch Basin (NYCDPR)</td>
<td>Each</td>
</tr>
<tr>
<td>655.00080011</td>
<td>Cast Grate for Catch Basin(NYCDPR)</td>
<td>Each</td>
</tr>
<tr>
<td>655.00090011</td>
<td>Cast Grate for Catch Basin(NYCDPR, ADA)</td>
<td>Each</td>
</tr>
<tr>
<td>655.00100011</td>
<td>Round Cast Frame for Manhole or Catch basin (NYCDPR)</td>
<td>Each</td>
</tr>
<tr>
<td>655.00110011</td>
<td>Cast Cover for Manhole (NYCDPR)</td>
<td>Each</td>
</tr>
</tbody>
</table>
DESCRIPTION

Under these items, the contractor shall furnish and install Poles at the locations specified on the plans and in accordance with these specifications or as directed by the Engineer.

MATERIALS

The materials and fabrication of the Pole shall meet the requirements of Subsection 724-03 Traffic Signal Poles of the New York State Standard Specifications except as noted.

The poles shall be fabricated in lengths and shall have design load as specified on the plans.

The anchor bolt cover shall be a two piece steel cover which encompasses the entire pole base and all anchor bolts and nuts. The anchor bolt cover shall be braced to prevent deformation from impact. It shall be secured to the pole base plate with a minimum of eight ¼ inch stainless steel bolts. The base plate shall be tapped to accept the ¼ inch bolts.

All couplings for electrical connections and the mounting plates for the controller cabinets shall be shop installed by welding. When specified on the plans, the bolt holes for a span wire through bolt shall be shop drilled. The Contractor is responsible for the proper alignment of the fittings and bolt holes with the anchor bolts installed in the foundation such that when the pole is mounted on the foundation, the couplings, control cabinet, and span through bolt are aligned in accordance with the plans and standard sheets.

The pole shaft, base plate, anchor bolt covers, pole cap, hand holes, hand hole covers, weatherheads, service bracket, conduits, and cabinet mounting brackets shall be Hot-Dip galvanized coated per ASTM A123 after fabrication.

A galvanized ¼ inch diameter cable support hook shall be furnished and installed as shown on the plans.

The mounting brackets for the CCTV camera pan/tilt drive and weatherproof enclosure shall be furnished and installed under other items (Applies to Camera Poles only).

CONSTRUCTION DETAILS

The Construction Details shall meet the requirements of sections 680-3.01, Equipment Lists and Drawings through 680-3.12, Grounding, of the Standard Specifications except as noted.

The poles and fittings shall be protected from damage in shipping to the field locations and during installation. The poles shall be wrapped with two layers of heavy paper.
METHOD OF MEASUREMENT

This work will be measured by the number of Poles furnished and installed.

BASIS OF PAYMENT

The provisions of Section 680-5.01 shall apply. In addition the unit price bid for furnishing and installing Poles shall include the cost of all the items specified in Section 680-3.01 through 680-3.12 of the updated Standard Specifications (US Customary) and the necessary grounding system, anchor bolts, pole assembly, and erection. The cost of cabinets, camera assemblies with mounting equipment, and connecting cables will be paid for under other contract items.
ITEM 680.95010415 - SERVICE CABLE 1 CONDUCTOR, NO. 04 AWG
ITEM 680.95010615 - SERVICE CABLE 1 CONDUCTOR, NO. 06 AWG
ITEM 680.95010815 - SERVICE CABLE 1 CONDUCTOR, NO. 08 AWG
ITEM 680.95011015 - SERVICE CABLE 1 CONDUCTOR, NO. 10 AWG
ITEM 680.95020415 - SERVICE CABLE 2 CONDUCTOR, NO. 04 AWG
ITEM 680.95020615 - SERVICE CABLE 2 CONDUCTOR, NO. 06 AWG
ITEM 680.95020815 - SERVICE CABLE 2 CONDUCTOR, NO. 08 AWG
ITEM 680.95021015 - SERVICE CABLE 2 CONDUCTOR, NO. 10 AWG

**Description.** Under this item the Contractor shall furnish and install in a raceway or conduit service entrance cable which is suitable for wet or dry locations at the location indicated on the plans and as directed by the Engineer. This cable will transmit current from the power source to the signal controller cabinet.

**Material.** The cable shall conform to the requirements for service entrance cable of the National Electrical Code and be Underwriters Laboratory approved. The cable shall be rated for 600 volt service and the conductors shall be stranded copper wire or as specified in the contract documents.

**Construction Details.** Service cable shall be installed in accordance with Details: the contract documents and as directed by the Engineer. A sufficient length of cable, not less than 24 inches, shall be left at the end of the run to allow for the tap to be made by the utility company at the power source entrance. The Contractor shall make all connections at the fused disconnect and the ground bar in the signal controller cabinet.

**Method of Measurement.** Service cable will be measured as the number of linear feet actually installed in accordance with the contract documents or as directed by the engineer.

**Basis Of Payment.** The unit price bid per linear foot shall include the cost of all materials, labor, connections, incidental fittings, equipment, tools, and all necessary tests to complete the installation.
ITEM 680.96494811 - FIBER OPTIC TERMINATION CABLE 12 FIBER (IN CONDUIT)

DESCRIPTION:

This item involves the furnish and installation of single mode fiber optic termination cable containing 12 fibers in conduit as designated in the plans or as directed by the engineer.

MATERIALS:

(a) Fiber Optic Cable

The fiber optic cable shall be a loose buffer tube design suitable for aerial and conduit installation. The cable shall comply with the Bellcore TR-TSY-000843 standard.

The fiber-optic cable shall consist of single-mode fibers with a step index of 8.3/125 um. The cable shall be capable of operation at both 1310 nm and 1550 nm wavelengths.

The characteristics of the cable shall comply with the following specifications:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Fibers in Cable</td>
<td>12</td>
</tr>
<tr>
<td>Number of Fibers/Tube</td>
<td>12</td>
</tr>
<tr>
<td>Number of Buffer Tubes</td>
<td>1</td>
</tr>
<tr>
<td>Maximum Cable Diameter</td>
<td>0.63 in.</td>
</tr>
<tr>
<td>Minimum Bending Radius</td>
<td>12.6 in. (With Tensile Loading)</td>
</tr>
<tr>
<td></td>
<td>7.6 in. (Without Tensile Loading)</td>
</tr>
<tr>
<td>Maximum Tensile Strength</td>
<td>360 lbf During Installation</td>
</tr>
<tr>
<td></td>
<td>300 lbf In Service</td>
</tr>
<tr>
<td>Max. Crush Resistance</td>
<td>457 lbf/in. (Long Term)</td>
</tr>
<tr>
<td></td>
<td>228 lbf/in. (Short Term)</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-40 to +158 Degrees F</td>
</tr>
<tr>
<td>Color</td>
<td>Black with Orange Stripe(s)</td>
</tr>
<tr>
<td>Markings</td>
<td>NYSDOT ITS TERMINATION</td>
</tr>
<tr>
<td></td>
<td>(718)482-4700</td>
</tr>
<tr>
<td>Attenuation</td>
<td>&lt;0.64 db/mile (1310 nm)</td>
</tr>
<tr>
<td></td>
<td>&lt;0.40 db/mile (1550 nm)</td>
</tr>
</tbody>
</table>

The cable shall be constructed utilizing the following layers from the outside to the inner or a functionally equivalent design. If a different design is utilized, the contractor shall be required to submit evidence detailing how the proposed alternate design will meet or exceed the performance that would be obtained from the specified configuration. The engineer reserves the right to approve or reject any alternate proposal.
ITEM 680.96494811 - FIBER OPTIC TERMINATION CABLE 12 FIBER (IN CONDUIT)

<table>
<thead>
<tr>
<th>Layer 1(Outer)</th>
<th>Layer 2</th>
<th>Layer 3</th>
<th>Layer 4</th>
<th>Layer 5(Inner)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High Density Polyethylene sheath</td>
<td>Treated glass yarns to provide strength and rodent protection</td>
<td>Water Blocking Tape</td>
<td>Gel-filled loose tubes or filler rods</td>
</tr>
</tbody>
</table>

The outer cable jacket shall have sequential length markings in meters. The actual length of the cable shall be within +/- 1% of the length markings. The marking shall be in a contrasting color to the cable jacket. The height of the marking shall be approximately 0.1 in..

A certificate of compliance certifying that the cable complies with these requirements shall be provided as part of the shop drawings. The certificate shall be from a nationally recognized testing body, such as BELLCORE, or from a test performed for a major telecommunication supplier, such as a telephone, electric utility, or CCTV company. All test documentation shall be provided in English. The test results submitted for approval shall not be more than two years old and shall be conducted on similar material being proposed for the project. The engineer reserves the right to order the contractor to perform specific tests on the samples of the cable to be provided, if it is determined that the certified test results provided are invalid or inadequately document that the cable complies with all of the requirements of these specifications.

Before shipment, but while on the shipping reel, all fibers shall be tested for attenuation. Copies of the results shall be attached to the cable reel in a waterproof pouch, and submitted to the Engineer prior to the delivery of the cable to the job site. Attenuation tests shall be performed with an OTDR capable of recording and displaying anomalies of 0.2 dB as a minimum. The single-mode fibers shall be tested at 1310 nm and 1550 nm.

The internal fibers and buffer tubes shall be color coded according to standard Bellcore requirements as outlined below:

<table>
<thead>
<tr>
<th>Tube/Fiber #1</th>
<th>Tube/Fiber #2</th>
<th>Tube/Fiber #3</th>
<th>Tube/Fiber #4</th>
<th>Tube/Fiber #5</th>
<th>Tube/Fiber #6</th>
<th>Tube/Fiber #7</th>
<th>Tube/Fiber #8</th>
<th>Tube/Fiber #9</th>
<th>Tube/Fiber #10</th>
<th>Tube/Fiber #11</th>
<th>Tube/Fiber #12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue</td>
<td>Orange</td>
<td>Green</td>
<td>Brown</td>
<td>Slate</td>
<td>White</td>
<td>Red</td>
<td>Black</td>
<td>Yellow</td>
<td>Violet</td>
<td>Rose</td>
<td>Aqua</td>
</tr>
</tbody>
</table>
CONSTRUCTION DETAILS:

The Contractor shall prepare a shop drawing submittal which will include copies of descriptive literature for every component to be included in the fiber optic cable plant to be installed under this item. Included in the submittal, shall be a certificate of compliance certifying that the cable complies with the material requirements as detailed in the material section of this specification. If the engineer determines that the certificate of compliance is not acceptable, the contractor shall be required to perform factory testing on exact samples of cables being proposed for the project.

The termination cable shall be installed between a field cabinet containing fiber optic electronics and a trunk line fiber optic cable. As indicated on the plans, this termination cable may be required in adjacent aerial and conduit runs. One continuous run of cable shall be installed between the two termination points. No intermediate splicing of the termination cable shall be allowed. The end of the termination cable to be installed in the cabinet shall be factory terminated into a break-out assembly. This break-out assembly shall be paid for under another bid item included in this contract. 16 ft. of slack cable shall be provided for each run of termination cable.

The shop drawing submittal must be approved by the engineer prior to installation of any of the material covered under this bid item on the project site.

Upon arrival of the cable at the job site and prior to installation, a physical inspection of the cable and reel shall be performed. All of the fibers shall be tested with a field OTDR for attenuation to confirm that the cable meets requirements. Test results shall be recorded, dated, compared and filed with the copy accompanying the shipping reel in a weatherproof envelope. Attenuation deviations from the shipping records greater than 5 percent shall be brought to the attention of the Engineer. The cable shall not be installed until completion of these test sequences and written approval from the Engineer is obtained. Copies of traces and test results shall be submitted to the Engineer. If the OTDR test results are unsatisfactory, the reel of fiber optic cable shall be considered unacceptable and all records corresponding to that reel of cable shall be marked accordingly.

Prior to the installation of the actual cable, all preparatory work involving the installation of supports, conduits, pull boxes, trenching, and manholes shall have been completed.

The cable shall be installed using methods that do not exceed the rated pulling-strength of the cable and shall be consistent with the manufacturer’s published procedures. The fiber optic cable shall be installed in minimum of 2 NPS conduit as detailed in the plans or directed by the engineer.

After each segment between splices of the cable is installed, the OTDR test shall be repeated with the cable installed in place. The test shall indicate that attenuation is still within tolerance of the specifications for all fibers. If any fibers fail the test, the cable shall be removed from the job site and replaced with an entirely new cable, at the contractor’s expense.
ITEM 680.96494811 - FIBER OPTIC TERMINATION CABLE 12 FIBER (IN CONDUIT)

METHOD OF MEASUREMENT:

Fiber optic cable will be measured by the number of linear feet of cable actually installed, as verified by the sequential length markings on the cable, in accordance with the Contract Documents and as directed by the Engineer.

BASIS OF PAYMENT:

The unit price bid shall include the cost of all equipment, material, supports, testing, and labor detailed in the contract documents. Lengths of cable shall be eligible for payment after the installed cable OTDR testing has been completed for a segment. Conduit shall exist or be paid for under a separate bid item as detailed in the plans. Breakout termination and splicing shall be paid for under a separate bid item.
ITEM 800.01000015 – DESIGN BUILD – DESIGN SERVICES

DESCRIPTION.  This work shall consist of providing design services in accordance with the contract documents.

MATERIALS.  None Specified.

CONSTRUCTION DETAILS.  The Design Builder shall provide Design Services by the appropriately qualified and licensed personnel in accordance with the requirements in the contract documents.

METHOD OF MEASUREMENT.  Design Build - Design Services will be measured for payment on a lump sum basis.

BASIS OF PAYMENT.  The lump sum price bid for Design Build - Design Services shall include the cost of furnishing all labor, equipment and incidentals to satisfactorily complete the work.  Progress payments will be made in accordance with the contract documents.
ITEM 800.02000015 – DESIGN BUILD – CONSTRUCTION INSPECTION SERVICES

DESCRIPTION. This work shall consist of providing Construction Inspection Services in accordance with the contract documents.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall provide Construction Inspection Services by the appropriately qualified and licensed personnel in accordance with the requirements in the contract documents.

METHOD OF MEASUREMENT. Design Build - Construction Inspection Services will be measured for payment on a lump sum basis.

BASIS OF PAYMENT. The lump sum price bid for Design Build - Construction Inspection Services shall include the cost of furnishing all labor, equipment and incidentals to satisfactorily complete the work. Progress payments will be made in accordance with the contract documents.
ITEM 800.03000015 – DESIGN BUILD – QUALITY CONTROL SERVICES

DESCRIPTION. This work shall consist of providing Quality Control Services in accordance with the contract documents.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall provide Quality Control Services by the appropriately qualified and licensed personnel in accordance with the requirements in the contract documents.

METHOD OF MEASUREMENT. Design Build - Quality Control Services will be measured for payment on a lump sum basis.

BASIS OF PAYMENT. The lump sum price bid for Design Build - Quality Control Services shall include the cost of furnishing all labor, equipment and incidentals to satisfactorily complete the work. Progress payments will be made in accordance with the contract documents.
ITEM 800.04000015 – DESIGN BUILD – FORCE ACCOUNT WORK

DESCRIPTION. This work shall consist of performing construction work in accordance with the contract documents and as directed by the Engineer.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall perform construction work in accordance with the contract documents as directed by the Engineer. The Design Builder will maintain and provide agreed price or force account records to document the costs in accordance with DB section 109-9.

METHOD OF MEASUREMENT. Design Build – Force Account Work will be measured for payment on a Dollar Cents basis.

BASIS OF PAYMENT. The price shown for Design Build - Force Account Work shall include the cost of furnishing all labor, materials, equipment and incidentals to satisfactorily complete the work. The total cost shown in the itemized proposal will be considered the price bid even though payment will be made only for actual work performed. The unit price amount is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figure will be disregarded, and the original price will be used to determine the total amount bid for the contract.

Progress payments will be made in accordance with the contract documents.
DESCRIPTION. This work and the associated provisions shall be as contained in the Contract Documents, Form SCD.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. Refer to the Contract Documents, Form SCD.

METHOD OF MEASUREMENT. Design Build – Rail Road No-Show Force Account Work will be measured for payment on a Dollar Cents basis.

BASIS OF PAYMENT. The price shown for Design Build – Rail Road No-Show Force Account Work has been established consistent with the Requirements in the Contract, Form SCD. The total cost shown in the itemized proposal will be considered the fixed price bid even though payment will be made only for actual work performed. The unit price amount is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figure will be disregarded, and the original price will be used to determine the total amount bid for the contract.

Progress payments will be made in accordance with the contract documents.
ITEM 800.05000015 – DESIGN BUILD – SITE MOBILIZATION

DESCRIPTION. This work shall consist of providing necessary bonds, insurance, prefinancing and set up of necessary general plant, including shops, storage areas, office and such sanitary and other facilities as are required by local or state law or regulation.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall provide the above facilities and service for mobilization in a safe and workmanlike manner in conformance with any pertinent local or State Law, regulation or code to the extent and at the time the Contractor deems them necessary for its operations. Good housekeeping shall be maintained.

METHOD OF MEASUREMENT. Design Build – Site Mobilization will be measured for payment on a lump sum basis.

BASIS OF PAYMENT. The lump sum price bid for Design Build – Site Mobilization shall not exceed four percent (4%) of the total contract bid price for all Construction Work items. Should the bidder exceed the foregoing four percent (4%), the Department will make the necessary adjustment to determine the total amount bid based on the arithmetically correct proposal.

Progress payments in the amount of 4% of the construction work items will be made to the Contractor with the first contract payment made for other contract work at the individual itemized work site.
ITEM 800.0600NN15 – DESIGN BUILD – CONSTRUCTION WORK

DESCRIPTION. This work shall consist of construction work in accordance with the contract documents.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall perform all construction work in accordance with the requirements in the contract documents.

METHOD OF MEASUREMENT. Design Build – Construction Work will be measured for payment on a lump sum basis for each location. The individual locations are identified in the contract documents.

BASIS OF PAYMENT. The lump sum price bid for Design Build – Construction Work shall include the cost of furnishing all labor, materials, equipment, management and supervision to satisfactorily complete the work. Progress payments will be made for each construction work location in accordance with the contract documents.

Note: NN in pay item number denotes serialization by location.
ITEM 800.06XXNN15 – DESIGN BUILD – CONSTRUCTION WORK – STRUCTURAL REPAIRS

DESCRIPTION. This work shall consist of structural repair work in accordance with the contract documents and as directed by the Engineer.

MATERIALS. None Specified.

CONSTRUCTION DETAILS. The Design Builder shall perform all structural repair work in accordance with the requirements in the contract documents.

For the “unanticipated repairs” items of work, the Design Builder will maintain and provide agreed price or force account records to document the costs in accordance with DB section 109-9.

METHOD OF MEASUREMENT. Design Build – Construction Work – Structural Repairs will be measured for payment on either a lump sum or Dollars-Cents basis.

BASIS OF PAYMENT.

Steel Superstructure Repair Work – directive repairs - The lump sum price bid shall include the cost of furnishing all labor, materials, equipment, management and supervision to satisfactorily complete the work. Progress payments will be made for each construction work location in accordance with the contract documents.

Steel Superstructure Repair Work – unanticipated repairs - The price shown shall include the cost of furnishing all labor, materials, equipment and incidentals to satisfactorily complete the work, and additional necessary subcontractor work in accordance with DB 109-9.2.2, including but not limited to engineering and quality control. The total cost shown in the itemized proposal will be considered the price bid even though payment will be made only for actual work performed.

Concrete Substructure Repair Work – directive repairs - The lump sum price bid shall include the cost of furnishing all labor, materials, equipment, management and supervision to satisfactorily complete the work. Progress payments will be made for each construction work location in accordance with the contract documents.

Concrete Substructure Repair Work – unanticipated repairs - The price shown shall include the cost of furnishing all labor, materials, equipment and incidentals to satisfactorily complete the work, and additional necessary subcontractor work in accordance with DB 109-9.2.2, including but not limited to engineering and quality control. The total cost shown in the itemized proposal will be considered the price bid even though payment will be made only for actual work performed.

Progress payments will be made for each construction work location in accordance with the contract documents.
Payment will be made under:

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>800.0601NN15</td>
<td>Steel Superstructure Repair Work – directive repairs</td>
<td>Lump Sum</td>
</tr>
<tr>
<td>800.06020015</td>
<td>Steel Superstructure Repair Work – unanticipated repairs</td>
<td>Dollars-Cents</td>
</tr>
<tr>
<td>800.0606NN15</td>
<td>Concrete Substructure Repair Work – directive repairs</td>
<td>Lump Sum</td>
</tr>
<tr>
<td>800.06070015</td>
<td>Concrete Substructure Repair Work– unanticipated repairs</td>
<td>Dollars-Cents</td>
</tr>
</tbody>
</table>

Note: NN in pay item number denotes serialization by location.
ITEM 800.1000NN15 – DESIGN BUILD – UTILITY RELATED WORK

DESCRIPTION. This work shall consist of utility related work in accordance with the contract documents or owner requirements. The “owner” of each utility is identified in the contract documents.

MATERIALS. Materials shall be as specified in the contract documents or owner requirements. If none specified, then the proposed material shall be approved by the Engineer of Record before any purchase is made.

CONSTRUCTION DETAILS. The Design Builder shall perform all utility related work in accordance with the requirements in the contract documents or owner requirements. In case of a conflict with owner requirements, the owner requirements shall take precedence.

METHOD OF MEASUREMENT. Design Build – Utility Related Work as defined in the contract documents will be measured for payment on a fixed price lump sum basis for each utility. The individual utilities will be identified in the contract documents.

BASIS OF PAYMENT. The fixed price lump sum for Design Build – Utility Related Work shall include the cost of furnishing all labor, materials, equipment, design, construction inspection, testing, and supervision to satisfactorily complete the work. Progress payments will be made for each utility work in accordance with the contract documents.

FIXED PRICE ITEM
The fixed price shown in the proposal for this pay item is not to be altered in any manner by the Proposer. Should the amount be altered, the new figure will be disregarded and the original price will be used to determine the total amount bid for the Contract.

Note: NN in pay item number denotes serialization by each utility.