

INDEX TO TECHNICAL SPECIFICATIONS

Note: This index has been prepared for the convenience of those using this contract with the sole express purpose of locating quickly the information contained herein; and no claims shall arise due to omissions, additions, deletions, etc., as this index shall not be considered part of the contract.

ITEM

NOTICE TO CONTRACTOR – LIQUIDATED DAMAGES
NOTICE TO CONTRACTOR – CONTRACT DURATION
NOTICE TO CONTRACTOR – BEST MANAGEMENT PRACTICES
NOTICE TO CONTRACTOR – PROCUREMENT OF MATERIALS
NOTICE TO CONTRACTOR – SITE CLEANLINESS
NOTICE TO CONTRACTOR – CONTRACTOR'S MAINTENANCE RESPONSIBILITY DURING CONSTRUCTION
NOTICE TO CONTRACTOR – SEPTIC AND LAWN IRRIGATION SYSTEM ON PRIVATE PROPERTIES
NOTICE TO CONTRACTOR – TOWN OF BROOKFIELD DISCLAIMER
NOTICE TO CONTRACTOR – NOISE POLLUTION
NOTICE TO CONTRACTOR – FIRE DEPT., POLICE AND EMERGENCY MEDICAL SERVICES
NOTICE TO CONTRACTOR - SAFEGUARDING OF RESIDENCES BUSINESS AND PEDESTRIANS
NOTICE TO CONTRACTOR - CONSTRUCTION STAGING AREA
NOTICE TO CONTRACTOR - PROCUREMENT OF MATERIALS
NOTICE TO CONTRACTOR - VEHICLE EMISSIONS
NOTICE TO CONTRACTOR - SECTION 4.06 AND M.04 MIX DESIGNATION EQUIVALENCY
NOTICE TO CONTRACTOR - SUPERPAVE DESIGN LEVEL INFORMATION
NOTICE TO CONTRACTOR - TRAFFIC DRUMS AND TRAFFIC CONES
NOTICE TO CONTRACTOR - NCHRP REPORT 350 REQUIREMENTS FOR WORK ZONE TRAFFIC CONTROL DEVICES
NOTICE TO CONTRACTOR - EXISTING UTILITIES
NOTICE TO CONTRACTOR - PRIVATE LIGHTS AND SIGNS
SECTION 1.05 – CONTROL OF THE WORK
SECTION 1.06 – CONTROL OF MATERIALS
SECTION 1.07 - LEGAL RELATIONS & RESPONSIBILITIES
SECTION 1.08 - PROSECUTION AND PROGRESS
SECTION 4.06 - BITUMINOUS CONCRETE
SECTION 10.00 – GENERAL CLAUSES FOR HIGHWAY ILLUMINATION & TRAFFIC SIGNAL PROJECTS
SECTION 12.00 - GENERAL CLAUSES FOR HIGHWAY SIGNING
SECTION 12.08 – SIGN FACE-SHEET ALUMINUM
SECTION M.04 – BITUMINOUS CONCRETE
SECTION M.13 - ROADSIDE DEVELOPMENT
ITEM #0202001A – EARTH EXCAVATION
ITEM #0219011A – SEDIMENTATION CONTROL SYSTEM AT CATCH BASIN
ITEM #0406275A – FINE MILLING OF BITUMINOUS CONCRETE (0" – 4")
ITEM #0601445A – EMBANKMENT WALL
ITEM #08130X1A – 6" GRANITE STONE CURBING & 6" GRANITE CURVE STONE CURBING
ITEM #0921XXXA – CONCRETE SIDEWALK, RAMP, DRIVEWAY APRON & DETECTABLE WARNING STRIP
ITEM #0921102A – BRICK PAVERS
ITEM #0922999A – INLAID THERMOPLASTIC PAVEMENT MARKIG SYSTEM
ITEM #0944000A – FURNISHING AND PLACING TOPSOIL

ITEM #0945060A – PINE BARK MULCH

ITEM #0949606A – ROOT BARRIER

ITEM #0950005A – TURF ESTABLISHMENT

ITEM #097000XA - TRAFFIC PERSON (MUNICIPAL POLICE OFFICER & UNIFORMED FLAGGER)

ITEM #1003894A – ORNAMENTAL LIGHTING SYSTEM

ITEM #1206023A - REMOVAL RELOCATION OF EXISTING SIGNS

ITEM #1210101A - 4" WHITE EPOXY RESIN PAVEMENT MARKINGS

ITEM #1210102A - 4" YELLOW EPOXY RESIN PAVEMENT MARKINGS

ITEM #1210105A - EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS

ITEM #1220013A - CONSTRUCTION SIGNS – BRIGHT FLUORESCENT SHEETING

July 5, 2018

BROOKFIELD STREETSCAPE PHASE II
Route 202 Federal Road

Town of Brookfield

The State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, Form 817, 2016, as revised by the Supplemental Specifications is hereby made part of this contract, as modified by the Special Provisions contained herein. The State of Connecticut Department of Transportation's "Construction Contract Bidding and Award Manual" ("Manual"), May 14, 2010 edition or latest issue, is hereby made part of this contract. If the provisions of this Manual conflict with provisions of other Department documents (not including statutes or regulations), the provisions of the Manual will govern. The Special Provisions relate in particular to Brookfield Streetscape Phase II, Route 202 Federal Road, Brookfield, Connecticut.

NOTICE TO CONTRACTOR - CONTRACT TIME AND LIQUIDATED DAMAGES

In order to minimize the hazard, cost and inconvenience to the traveling public, pollution of the environment and the detriment to the business area, it is necessary to limit the time of construction work, which interferes with traffic as specified in Article 1.08.04 of the Special Provisions.

For this contract, an assessment per day for liquidated damages, at a rate of One Thousand Dollars (\$1,000) per day shall be applied to each calendar day the work runs in excess of the One Hundred and Twenty (120) allowed calendar days for the contract.

NOTICE TO CONTRACTOR - CONTRACT DURATION

The Contractor is hereby notified that this is not to be considered an ordinary project by any means and that due to the inconvenience to the traveling public that it causes, extra manpower, equipment and work shifts may be required to complete the work in accordance within the specified contract time.

NOTICE TO CONTRACTOR – BEST MANAGEMENT PRACTICES

In constructing or maintaining the construction activities for this project, the Contractor shall employ Best Management Practices to control storm water discharges and erosion and sedimentation and prevent pollution. Such practices to be implemented by the Contractor at this construction site include, but not necessarily limited to the following:

1. Prohibiting dumping of any quantity of oil, chemicals or other deleterious material on the ground.
2. Immediately informing the DEEP's Oil and Chemical Spill Section at (860) 424-3338 and the Engineer of any adverse impact or hazard to the environment, including any discharges, spillage or loss of oil or petroleum or chemical liquids or solids, which occurs or is likely to occur as the direct or indirect result of the construction activities.
3. Separating staging areas at the site from regulated areas by silt fences or haybales at all times.
4. Prohibiting storage of any fuel and refueling of equipment within 25 feet from any wetland or watercourse.
5. Preventing pollution of wetlands and watercourses in accordance with the document "Connecticut Guidelines for Soil Erosion and Sediment Control" as revised. Said controls shall be inspected by the Contractor with the Engineer for deficiencies at least once per week and immediately after each rainfall and at least daily during prolonged rainfall. The Contractor shall correct any such deficiencies to the Engineer within forty-eight (48) hours of said deficiencies being found.
6. Stabilizing disturbed soils in a timely fashion to minimize erosion. If a grading operation at the construction site will be suspended for a period of thirty (30) or more consecutive days, the Contractor shall, within the first seven (7) days of that suspension period, accomplish seeding and mulching or take such other appropriate measures to stabilize the soil involved in such grading operation. Within seven (7) days after establishing final grade in any grading operation at the construction site the Contractor shall seed and mulch the soil involved in such grading operation or take such other appropriate measures to stabilize such soil until the final seeding and mulching can be accomplished.
7. Prohibiting the storage of any materials at the site which are buoyant, hazardous, flammable, explosive, soluble, expansive, and radioactive or which could in the event of a flood be injurious to human, animal or plant life, below the elevation of the five-hundred (500) year flood. Any other material or equipment stored at the site below said elevation by the Contractor must be firmly anchored, restrained or enclosed to prevent flotation. The quantity of fuel stored below such elevation for equipment used at the construction site

shall not exceed the quantity of fuel that is expected to be used by such equipment in one day.

8. Immediately informing the Town and the Engineer of the occurrence of pollution or other environmental damage resulting from construction or maintenance of the authorized activity or any construction associated therewith in violation of the Inland Wetland and Watercourse Permit. The Town shall, no later than 48 hours after the Engineer learns of a violation of the Permit, report the same in writing to the Town of Brookfield Inland Wetland Commission Chairman. Such report shall contain the information that is outlined in the Permit. The Town of Brookfield Inland Wetland Commission Chairman shall inform DEEP's Inland Water Resources Division (IWRD) of the occurrence of pollution or other environmental damage resulting from construction or maintenance of the authorized activity or any construction associated therewith in violation of the Inland Wetland and Watercourse Permit.

There will be no direct payment for the above conditions but the cost shall be included in the general cost of the contract.

NOTICE TO CONTRACTOR - PROCUREMENT OF MATERIALS

Upon award, the Contractor shall proceed with shop drawings, working drawings, procurement of materials, and all other submittals required to complete the work in accordance with the contract documents.

NOTICE TO CONTRACTOR – SITE CLEANLINESS

The Contractor is hereby notified that all areas utilized for construction activities including all onsite and offsite facilities shall be maintained so as to be free of rubbish, trash and deleterious construction debris at all times. The use of covered and secured trash receptacles is required. All receptacles will be regularly emptied and maintained.

There will be no direct payment for maintaining the site cleanliness of the construction areas under the contract.

**NOTICE TO CONTRACTOR – CONTRACTOR’S MAINTENANCE
RESPONSIBILITY DURING CONSTRUCTION DURATION**

The Contractor is hereby notified that the construction area will be maintained by the contractor throughout the duration of the project and will include all maintenance responsibilities with the exception of snow removal. There will be no payment for maintaining the construction area by the Contractor. The cost shall be included in the general cost of the project.

**NOTICE TO CONTRACTOR –SEPTIC AND LAWN IRRIGATION
SYSTEMS ON PRIVATE PROPERTIES**

The contractor shall coordinate with abutting property owners within the project limits to stake out existing septic and lawn irrigation systems. The contractor shall protect the existing septic and lawn irrigation system during the reconstruction of the proposed roadway.

The contractor shall be liable for all damages or claims received or sustained by any property owner in consequence of damages to the existing septic and irrigation systems caused directly or indirectly by the operations of the contractor.

NOTICE TO CONTRACTOR – TOWN OF BROOKFIELD DISCLAIMER

Town of Brookfield Request for Proposals and other information and documents which are obtained through internet websites or other sources other than the Town of Brookfield or the Town of Brookfield's website are not to be construed to be official information for the purposes of proposals or conducting other business with the Town.

It is the responsibility of each Firm and all other interested parties to obtain all proposal related information and documents from the Town of Brookfield's website and/or official sources within the Town.

Persons and/or entities which reproduce and/or make such information available by any means are not authorized by the Town to do so and may be liable for claims resulting from the dissemination of unofficial, incomplete and/or inaccurate information.

NOTICE TO CONTRACTOR – NOISE POLLUTION

The Contractor shall take measures to control the noise intensity caused by his construction operations and equipment, including but not limited to equipment used for drilling, pile driving, blasting, excavation, or hauling.

All methods and devices employed to minimize noise shall be subject to the continuing approval of the Engineer and in accordance with the Town of Brookfield.

NOTICE TO CONTRACTOR – FIRE DEPARTMENT, POLICE AND EMERGENCY MEDICAL SERVICES

The Contractor shall contact the Fire Department, Police, and Emergency Medical Services, prior to work and establish coordination necessary as to disruption of services during construction.

NOTICE TO CONTRACTOR – SAFEGUARDING OF RESIDENCES BUSINESS AND PEDESTRIANS

The Contractor shall maintain and protect traffic operations at all driveways and provide adequate sight lines. The Contractor shall not restrict sight lines with construction equipment when not actively working. The Contractor shall provide and maintain safe pedestrian operations on existing sidewalks or temporary bituminous walks always during and after construction hours. The Contractor shall provide adequate protection between work area and pedestrian sidewalk activities as directed by the Engineer.

NOTICE TO CONTRACTOR – CONSTRUCTION STAGING AREA

The Contractor shall submit for review and approval a plan and description for the proposed construction staging area. The plan and description shall be submitted to the Town of Brookfield Zoning Enforcement Officer and Inland Wetland Enforcement Officer within 7 calendar days after the Firm is awarded the contract.

The following is to be included in the plan and/or description:

- Location and type of erosion control measures (if required)
- Anti-tracking Pad location(s)
- Location and type of security fence (if required)
- Location and type of stockpiles stored on-site
- Location and type of hazardous materials stored on-site
- Location and type of equipment stored on-site
- Location and type of vehicles stored on-site

- Times and days in which construction activities will use the staging area
- Estimated number of trips in and out of the staging area
- Date the staging area will become active
- Date the staging area will be removed and returned to original conditions

NOTICE TO CONTRACTOR - PROCUREMENT OF MATERIALS

Upon award, the Contractor shall proceed with shop drawings, working drawings, procurement of materials, and all other submittals required to complete the work in accordance with the contract documents.

NOTICE TO CONTRACTOR - VEHICLE EMISSIONS

All motor vehicles and/or construction equipment (both on-highway and non-road) shall comply with all pertinent State and Federal regulations relative to exhaust emission controls and safety.

The Contractor shall establish staging zones for vehicles that are waiting to load or unload at the contract area. Such zones shall be located where the emissions from the vehicles will have minimum impact on abutters and the general public.

Idling of delivery and/or dump trucks, or other equipment shall not be permitted during periods of non-active use, and it should be limited to three minutes in accordance with the Regulations of Connecticut State Agencies Section 22a-174-18(b)(3)(c):

No mobile source engine shall be allowed “to operate for more than three (3) consecutive minutes when the mobile source is not in motion, except as follows:

- (i) When a mobile source is forced to remain motionless because of traffic conditions or mechanical difficulties over which the operator has no control,
- (ii) When it is necessary to operate defrosting, heating or cooling equipment to ensure the safety or health of the driver or passengers,
- (iii) When it is necessary to operate auxiliary equipment that is located in or on the mobile source to accomplish the intended use of the mobile source,
- (iv) To bring the mobile source to the manufacturer’s recommended operating temperature,
- (v) When the outdoor temperature is below twenty degrees Fahrenheit (20 degrees F),
- (vi) When the mobile source is undergoing maintenance that requires such mobile

Source be operated for more than three (3) consecutive minutes, or

(vii) When a mobile source is in queue to be inspected by U.S. military personnel prior to gaining access to a U.S. military installation.”

All work shall be conducted to ensure that no harmful effects are caused to adjacent sensitive receptors. Sensitive receptors include but are not limited to hospitals, schools, daycare facilities, elderly housing and convalescent facilities. Engine exhaust shall be located away from fresh air intakes, air conditioners, and windows.

A Vehicle Emissions Mitigation plan will be required for areas where extensive work will be performed in close proximity (less than 50 feet (15 meters)) to sensitive receptors. No work will proceed until a sequence of construction and a Vehicle Emissions Mitigation plan is submitted in writing to the Engineer for review and all comments are addressed prior to the commencement of any extensive construction work in close proximity (less than 50 feet (15 meters)) to sensitive receptors. The mitigation plan must address the control of vehicle emissions from all vehicles and construction equipment.

If any equipment is found to be in non-compliance with this specification, the contractor will be issued a Notice of Non-Compliance and given a 24 hour period in which to bring the equipment into compliance or remove it from the project. If the contractor then does not comply, the Engineer shall withhold all payments for the work performed on any item(s) on which the non-conforming equipment was utilized for the time period in which the equipment was out of compliance.

Any costs associated with this “Vehicle Emissions” notice shall be included in the general cost of the contract. In addition, there shall be no time granted to the contractor for compliance with this notice.

NOTICE TO CONTRACTOR - SECTION 4.06 AND M.04 MIX DESIGNATION EQUIVALENCY

Sections 4.06 and M.04 have been replaced in their entirety with the Special Provisions included as part of this contract. These Special Provisions reflect changes in mix designations for various types of hot-mix asphalt (HMA). The following table is to be used to associate mix designations noted on the plans with that in the contract specifications and related documents. Mix designations on each row are equivalent and refer to a single mix, which shall be subject to the requirements of the Special Provisions replacing Sections 4.06 and M.04.

Mix Designation Equivalency Table

Official Mix Designation	Equivalent Mix Designation (a)	Equivalent Mix Designation (b)
(c)	Superpave 1.5 inch	Superpave 37.5 mm
HMA S1	Superpave 1.0 inch	Superpave 25.0 mm
HMA S0.5	Superpave 0.5 inch	Superpave 12.5 mm
HMA S0.375	Superpave 0.375 inch	Superpave 9.5 mm
HMA S0.25	Superpave 0.25 inch	Superpave 6.25 mm
(d)	Superpave #4	Superpave #4
Bituminous Concrete Class 1	N/A*	N/A*
Bituminous Concrete Class 2	N/A*	N/A*
Bituminous Concrete Class 3	N/A*	N/A*
Bituminous Concrete Class 4	N/A*	N/A*
Bituminous Concrete Class 12	N/A*	N/A*

(a) This mix designation is generally included with projects where the English measurement system is used. The mix designation may contain both the English measurement system designation and the SI (metric) measurement system designation, one of which would be in parentheses.

(b) This mix designation is generally included with projects where the SI (metric) measurement system is used. The mix designation may contain both the English measurement system designation and the SI measurement system designation, one of which would be in parentheses.

(c) This mix is no longer in use except by contract-specific Special Provision; if this mix is called for in the Plans but no such Special Provision is included for this contract a suitable substitute must be approved by the Engineer.

(d) This mix is no longer in use except by contract-specific Special Provision; if this mix is called for in the Plans but no such Special Provision is included for this contract a suitable substitute must be approved by the Engineer.

* N/A = Not applicable; mix designation has not changed.

NOTICE TO CONTRACTOR - SUPERPAVE DESIGN LEVEL INFORMATION

Hot-Mix Asphalt (HMA) constructed according to the Superpave mix-design system is required to attain a Superpave Design Level and is required to use a Performance Graded (PG) binder. The Superpave Design Levels required for this project are listed in Table 1. The required PG binder is indicated for each mix with an “X” in the appropriate box in Table 1.

TABLE 1 – Superpave Design Level and Performance Graded (PG) Binder

Project will require the following Superpave Design Level(s):

Mix Designation	PG Binder	All Roads		
	PG64-22	Design Level	Design Level	Design Level
HMA S0.25	-	-	-	-
HMA S0.375	-	2	-	-
HMA S0.5	X	2	-	-
HMA S1	-	-	-	-

NOTICE TO CONTRACTOR - TRAFFIC DRUMS AND TRAFFIC CONES

Traffic Drums and 42-inch (1 m) Traffic Cones shall have four six-inch (150 mm) wide stripes (two - white and two - orange) of flexible bright fluorescent sheeting.

The material for the stripes shall be one of the following, or an approved equal:

- 3M Scotchlite Diamond Grade Flexible Work Zone Sheeting; Model 3910 for the white stripes and Model 3914 for the orange stripes.
- Avery Dennison WR-7100 Series Reboundable Prismatic Sheeting; Model WR-7100 for the white stripes and Model WR-7114 for the orange stripes.

NOTICE TO CONTRACTOR - EXISTING UTILITIES

It is understood that any references in the contract documents to Northeast Utilities, CL&P and/or Yankee Gas are meant to refer to Eversource.

It is understood that any references in the contract documents to AT&T is meant to refer to Frontier Communications. Existing utilities shall be maintained during construction. The Contractor shall verify the location of underground, structure mounted and overhead utilities. Construction work within the vicinity of utilities shall be performed in accordance with current safety regulations.

The Contractor shall notify "Call Before You Dig", telephone: 811 or 1-800-922-4455 for the location of public utility underground facilities, in accordance with Section 16-345 of the Regulations of the Department of Public Utility Control.

Contractors are cautioned that it is their responsibility to verify locations, conditions, and field dimensions of all existing features, as actual conditions may differ from information shown on the plans or contained elsewhere in the specifications. There is anticipated utility pole relocation work on this project so coordination with specific utility companies will be essential.

The Contractor shall notify the Engineer prior to the start of his work and shall be responsible for all coordination with the Department. The Contractor shall allow the Engineer complete access to the work.

The Contractor is hereby notified that utility work schedules will have to be accommodated prior to proceeding. The Contractor shall coordinate with the Utility Companies to accommodate his schedule with all utility company schedules. Any inconvenience or delay that may result from the utility company work shall be included in the contract proposal for the work.

All of the existing utility infrastructure must remain in service until the new facilities are acceptable to be put in service. The Contractor shall explore with the utilities this aspect of the project. This condition of serviceability applies to the work being done by the contractor for the utilities and to work that is being done under the control of the utility.

NOTICE TO CONTRACTOR – PRIVATE LIGHTS AND SIGNS

Existing private parking lot lights and private signs are located throughout the project on property that has been acquired for inclusion in the right-of-way. The Contractor shall carefully remove these lights and signs from the locations shown on the plans, store them as necessary, and deliver them to the property owner for his use. The Contractor shall coordinate with the property owner the location to place the removed sign or light.

The lights and signs will be examined in the presence of the engineer to document any pre-existing damage and the condition of the unit prior to removal. The unit shall be removed from any footings or foundations and placed on the adjacent property in a location that is acceptable to the owner, and that does not endanger, impede, or cause hazard to pedestrians, traffic or property. All electrical connections shall be removed in such a manner to allow the remaining portions of the lighting or electrical system to be safe and operable.

Care shall be taken to avoid damage to the units and to safeguard all parts from damage or loss. Removal shall include removal of existing concrete foundations in accordance with Section

2.02.03, and the foundations shall not be salvaged. The remaining hole shall be backfilled with clean fill material which shall be compacted, and the ground restored to a grade and condition compatible with the surrounding area. Removal of the lights shall include the luminaire, light housing, pole, arms all hardware, and internal wiring. Sign removal shall include all posts, braces, sign faces, decorative elements, electrical components, and hardware.

For signs that are serviced with power for internal and or external lighting, the work shall include the removal of conduit, wiring, junction boxes, brackets, dampers, grounding wire or other connections required to terminate the lighting operation and allow the remaining portions of the electrical system to be in a safe and operable condition.

All costs (except as noted below) associated with the removal, relocation, and re-installation of the private lights and business signs will be included in the overall contract price bid and will not be paid separately. The Contractor shall replace, at his own expense, all equipment which becomes damaged due to his operations. All private signs and/or lights that the Town decides to replace with a new signage and/or lights will be paid for by the Town and delivered to the property for installation by the Contractor.

SECTION 1.05 - CONTROL OF THE WORK

Article 1.05.02 - Plans, Working Drawings and Shop Drawings is supplemented as follows:

Sub article 1.05.02 - (2) is supplemented by the following:

Traffic Signal Items:

When required by the contract documents or when ordered by the Engineer, The Contractor shall prepare and submit product data sheets and/or shop drawings for all traffic signal items, to the Town or consultant for review before fabrication. The packaged set of product data sheets, and/or shop drawings shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf). The package submitted in paper form shall include one (1) set. Product data sheets shall be printed on ANSI A (8 ½" x 11"; 216 mm x 279mm; letter) sheets. Working drawings and shop drawings shall be printed on ANSI B (11" x 17"; 279 mm x 432 mm; ledger/tabloid) sheets.

Please send the documents via mail to:

Yuyang Lin, PE, PTOE
36 John Street, Hartford, CT, 06106
ylin@freemancos.com
Phone: 860-251-9550

The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file with appropriate bookmarks for each item. The electronic files for product data sheets shall be created on ANSI A (8 ½" x 11"; 216 mm x 279mm; letter) sheets. Working drawings and shop drawings shall be created on ANSI B (11" x 17"; 279 mm x 432 mm; ledger/tabloid) sheets.

Please send the pdf documents via email to:

Town/consultant email
DOT.TrafficElectrical@ct.gov

SECTION 1.06 CONTROL OF MATERIALS

Article 1.06.01 - Source of Supply and Quality:

Add the following:

Traffic Signal Items:

For the following traffic signal items, the contractor shall submit a complete description of the item, shop drawings, product data sheets and other descriptive literature which completely illustrates such items presented for formal review. Such review shall not change the requirements for a certified test report and materials certificate as may be called for. All documents shall be grouped into one separate file for each group of items as indicated by the Roman numerals below (for example, one pdf file for all of the pedestal items). The documents for all of the traffic signal items shall be submitted at one time, unless otherwise allowed by the Engineer.

- I. 10080XX – Rigid Metal Conduit

- II. 1113XXXA - Control Cable

- III. 1117XXXA – Pedestrian Actuated Flashing Beacon Assembly

SECTION 1.07 – LEGAL RELATIONS AND RESPONSIBILITIES

Article 1.07.13 - Contractor's Responsibility for Adjacent Property, Facilities and Services is supplemented as follows:

The following company and representative shall be contacted by the Contractor to coordinate the protection of their utilities on this project 30 days prior to the start of any work on this project involving their utilities:

TOWN OF BROOKFIELD FIRE MARSHALL

Mr. Wayne Gravius
Fire Marshall
Brookfield Town Hall
100 Pocono Rd
Brookfield, CT 06804

COMMUNICATIONS (AT&T CONNECTICUT, SOUTHERN NEW ENGLAND TELEPHONE COMPANY)

Mr. Eric Clark, Manager-OSP Engineering
1441 North Colony Road
Meriden, CT. 06450
Tel. (203) 238-7407
Email: eric.r.clark@ftr.com

EVERSOURCE

Mr. Wayne D. Gagnon, Engineering - System Operations Manager
107 Selden Street
Berlin, CT 06037
Tel. (860) 665-3515
E-Mail: gagnow@eversource.com

AQUARION WATER COMPANY OF CT

Mr. Carlos J. Vizcarrando
Utility Systems Coordinator
Tel. 203-337-5950
Off. Fax. 203-337-5839
Alt. Fax. 203-330-4647
e-mail: cvizcarrondo@aquarionwater.com

SPECTRUM BUSINESS (Charter Cable)

Tel. (800) 314-7195

TOWN OF BROOKFIELD PUBLIC WORKS

Mr. Ralph Tedesco, P.E.
100 Pocono Road
Brookfield, CT 06804
Tel. (203) 775-7318

WATER POLLUTION CONTROL AUTHORITY

Ms. Kristi McPadden
100 Pocono Road
Brookfield, CT 06804
Tel. (203) 775-7848

LIGHT TOWER

Mr. Ray Soma
Tel. (860) 643-4365
Tel. (860) 966-1857

The following Department representative shall be contacted by the Contractor to coordinate an inspection of the service entrance into the controller/flasher cabinet for controllers within the State right-of-way, when ready for inspection, release, and connection of electrical service. The local Building Department shall be contacted for electrical service inspections for controllers located on Town roads located within the respective municipality.

Mr. Michael LeBlanc
Property & Facilities
Department of Transportation
Newington, CT 06111
860-594-2238
e-mail: Michael.LeBlanc@ct.gov

Please provide the electrical service request number provided by the power company. This is a Work Request (WR) Number provided by Eversource (formerly Northeast Utilities [CL&P]) or a Work Order Number provided by United Illuminating (UI). For State-owned traffic signals in CL&P territory, contact the Department's Traffic Electrical Unit to obtain the WR Number. For State-owned traffic signals in UI territory, contact the Department's Traffic Electrical Unit to obtain a Request for Metered Service to provide to UI to obtain the Work Order Number. The street address is required for release to local power companies (Groton Utilities or Wallingford Electric).

SECTION 1.08 - PROSECUTION AND PROGRESS

Article 1.08.03 - Prosecution of Work:

The Contractor shall notify the project engineer on construction projects, or the district permit agent on permit jobs, when all traffic signal related work is completed. The project engineer or district permit agent will notify the Town and the Division of Traffic Engineering to coordinate a field inspection of the work. Refer to Section 10.00 – General Clauses for Highway Illumination and Traffic Signal Projects, Article 10.00.10 and corresponding special provision.

Article 1.08.04 - Limitation of Operations:

Add the following:

In order to provide for traffic operations as outlined in the Special Provision "Maintenance and Protection of Traffic," the Contractor will not be permitted to perform any work which will interfere with the described traffic operations on all project roadways as follows:

Sundays and on the following Legal Holidays:

- New Year's Day
- Martin Luther King Day
- President's Day
- Good Friday
- Memorial Day
- Independence Day
- Labor Day
- Columbus Day
- Veterans Day
- Thanksgiving Day
- Christmas Day

Also, any other day between the hours of 6:00 p.m. and 7:00 a.m.

Weekend Work

The Contractor will be allowed to perform work between the hours of 7:00 a.m. and 12:00 p.m. on Saturday. No Sunday works.

All Roadways

All construction activities, including the loading and unloading of materials and equipment, shall be limited to Monday through Friday, 7:00 a.m. to 4:00 p.m.

Access to local property and businesses must be maintained always unless prior arrangements are made with property owners or business proprietors.

The day before and after a holiday the contractor can't work. The contractor cannot close any lanes (but can work on the sidewalks) until after 8:30 a.m. and after 4:00 p.m. on weekdays.

Additional Lane Closure Restrictions

It is anticipated that work on adjacent roadways will be ongoing simultaneously with this project. The Contractor shall be aware of those projects and anticipate that coordination will be required to maintain proper traffic flow at all times on all project roadways, in a manner consistent with these specifications and acceptable to the Engineer.

The Contractor will not be allowed to perform any work that will interfere with traffic operations on a roadway when traffic operations are being restricted on that same roadway, unless there is at least a one-half mile clear area length where the entire roadway is open to traffic or the closures have been coordinated and are acceptable to the Engineer. The one-half mile clear area length shall be measured from the end of the first work area to the beginning of the signing pattern for the next work area.

Full Depth Reconstruction

During the allowable period, the Contractor shall excavate and fill a reasonable length of existing roadway to the width shown on the Maintenance and Protection of Traffic Plans and install permanent processed aggregate base to the permanent locations and elevations shown on the cross sections. The full width of the roadway shall be constructed during each allowable period.

All temporary connections to abutting driveways and existing roadways must be accomplished in a satisfactory manner prior to the end of the work day. Excavation and installation of subbase must be accomplished full width for the proposed roadway.

On the next to last day of the work week the Contractor shall ensure that all subbase work has been completed from the previous three workdays and ready for the placement of the first course of bituminous concrete pavement.

On the last day of the work week (considered to be Friday), the Contractor shall install a sufficient number of intermediate courses of bituminous concrete pavement for that length of roadway that was prepared during the past four workdays. The final course of pavement shall not be installed at this time. Temporary pavement markings shall be installed on the intermediate course of bituminous concrete pavement mentioned above in accordance with Article 9.71.03 as contained in the Special Provision "Maintenance and Protection of Traffic".

When the installation of all the intermediate courses of bituminous concrete pavement is completed for an entire roadway, the Contractor shall install the final course of bituminous concrete pavement. Final pavement markings shall be installed on the final course of bituminous concrete pavement in accordance with Article 9.71.03 as 'contained in the Special Provision "Maintenance and Protection of Traffic".

Other Limitations

No roadway, with the exception of transition areas, shall be open to traffic unless the appropriate pavement markings have been installed. The transition areas shall have pavement markings applied immediately upon opening to traffic.

Longitudinal dropdowns greater than 2 inches will not be allowed during those periods when the maximum number of lanes of through traffic is required. The Contractor shall temporarily provide a 4:1 traversable slope of suitable material in those areas where a longitudinal dropdown exists. The cost of furnishing, installing and removing this material shall be included in the contract lump sum for "Maintenance and Protection of Traffic."

The Contractor shall schedule operations so that pavement removal and roadway resurfacing shall be completed full width across a roadway section by the end of a workday. All transverse height differentials on a roadway surfaces shall be tapered to negate any "bump" to traffic as specified elsewhere in this contract or as approved by the Engineer. Material for this taper shall be as approved by the Engineer.

All temporary concrete barriers, other protective systems and traffic control devices as called for by the contract or ordered by the Engineer must be on-hand and available in sufficient quantity for immediate installation prior to any stage change.

Article 1.08.07 – Determination of Contract Time:

Add the following:

For this contract, the number of Calendar Days allowed for the completion of the project shall be 120 calendar days.

SECTION 4.06 - BITUMINOUS CONCRETE

Section 4.06 is being deleted in its entirety and replaced with the following:

4.06.01—Description

4.06.02—Materials

4.06.03—Construction Methods

4.06.04—Method of Measurement

4.06.05—Basis of Payment

4.06.01—Description: Work under this section shall include the production, delivery, placement, and compaction of an uniform textured, non-segregated, smooth bituminous concrete pavement to the grade and cross section shown on the plans.

The terms listed below as used in this specification are defined as:

Bituminous Concrete: A composite material consisting of prescribed amounts of asphalt binder, and aggregates. Asphalt binder may also contain additives engineered to modify specific properties and/or behavior of the composite material. References to bituminous concrete apply to all of its forms, such as those identified as hot-mix asphalt (HMA), or polymer-modified asphalt (PMA).

Bituminous Concrete Plant (Plant): A structure where aggregates and asphalt binder are combined in a controlled fashion into a bituminous concrete mixture suitable for forming pavements and other paved surfaces.

Course: A continuous layer (a lift or multiple lifts) of the same bituminous concrete mixture placed as part of the pavement structure.

Density Lot: The total tonnage of all bituminous concrete placed in a single lift and as defined in Article 4.06.03.

Disintegration: Erosion or fragmentation of the pavement surface which can be described as polishing, weathering-oxidizing, scaling, spalling, raveling, or formation of potholes.

Dispute Resolution: A procedure used to resolve conflicts between the Engineer and the Contractor's test results that may affect payment.

Hot Mix Asphalt (HMA): A bituminous concrete mixture typically produced at 325°F.

Job Mix Formula (JMF): A recommended aggregate gradation and asphalt binder content to achieve the required mixture properties.

Lift: An application of a bituminous concrete mixture placed and compacted to a specified thickness in a single paver pass.

Percent Within Limits (PWL): The percentage of the lot falling between the Upper Specification Limit (USL) and the Lower Specification Limit (LSL).

Polymer-Modified Asphalt (PMA): A bituminous concrete mixture containing a polymer modified asphalt binder and using a qualified warm mix technology.

Production Lot: The total tonnage of a bituminous concrete mixture from a single source that may receive an adjustment.

Production Sub Lot: Portion of the production lot typically represented by a single sample.

Quality Assurance (QA): All those planned and systematic actions necessary to provide ConnDOT the confidence that a Contractor will perform the work as specified in the Contract.

Quality Control (QC): The sum total of activities performed by the vendor (Producer, Manufacturer, and Contractor) to ensure that a product meets contract specification requirements.

Superpave: A bituminous concrete mix design used in mixtures designated as “S*” Where “S” indicates Superpave and * indicates the sieve related to the nominal maximum aggregate size of the mix.

Segregation: A non-uniform distribution of a bituminous concrete mixture in terms of gradation, temperature, or volumetric properties.

Warm Mix Asphalt (WMA) Technology: A qualified additive or technology that may be used to produce a bituminous concrete at reduced temperatures and/or increase workability of the mixture.

4.06.02—Materials: All materials shall conform to the requirements of Section M.04.

1. Materials Supply: The bituminous concrete mixture must be from one source of supply and originate from one Plant unless authorized by the Engineer.

2. Recycled Materials: Reclaimed Asphalt Pavement (RAP), Crushed Recycled Container Glass (CRCG), Recycled Asphalt Shingles (RAS), or crumb rubber (CR) from recycled tires may be incorporated in bituminous concrete mixtures in accordance with Project Specifications.

4.06.03—Construction Methods:

1. Material Documentation: All vendors producing bituminous concrete must have Plants with automated vehicle-weighing scales, storage scales, and material feeds capable of producing a delivery ticket containing the information below.

- a. “State of Connecticut” printed on ticket.
- b. Name of producer, identification of Plant, and specific storage silo if used.

- c. Date and time.
- d. Mixture Designation; Mix type and level Curb mixtures for machine-placed curbing must state "curb mix only".
- e. If WMA Technology is used, the additive name and dosage rate or water injection rate must be listed.
- f. Net weight of mixture loaded into the vehicle (When RAP and/or RAS is used the moisture content shall be excluded from mixture net weight).
- g. Gross weight (equal to the net weight plus the tare weight or the loaded scale weight).
- h. Tare weight of vehicle (Daily scale weight of the empty vehicle).
- i. Project number, purchase order number, name of Contractor (if Contractor other than Producer).
- j. Vehicle number - unique means of identification vehicle.
- k. For Batch Plants, individual aggregate, recycled materials, and virgin asphalt max/target/min weights when silos are not used.
- l. For every mixture designation the running daily total delivered and sequential load number.

The net weight of mixture loaded into the vehicle must be equal to the cumulative measured weights of its components.

The Contractor must notify the Engineer immediately if, during production, there is a malfunction of the weight recording system in the automated Plant. Manually written tickets containing all required information will be allowed for no more than one hour.

The State reserves the right to have an inspector present to monitor batching and /or weighing operations.

2. Transportation of Mixture: The mixture shall be transported in vehicles that are clean of all foreign material, excessive coating or cleaning agents, and, that have no gaps through which mixture might spill. Any material spilled during the loading or transportation process shall be quantified by re-weighing the vehicle. The Contractor shall load vehicles uniformly so that segregation is minimized. Loaded vehicles shall be tightly covered with waterproof covers acceptable to the Engineer. Mesh covers are prohibited. The cover must minimize air infiltration. Vehicles found not to be in conformance shall not be loaded.

Vehicles with loads of bituminous concrete being delivered to State projects must not exceed the statutory or permitted load limits referred to as gross vehicle weight (GVW). The Contractor shall furnish a list and allowable weights of all vehicles transporting mixture.

The State reserves the right to check the gross and tare weight of any vehicle. If the gross or tare weight varies from that shown on the delivery ticket by more than 0.4 percent, the Engineer will recalculate the net weight. The Contractor shall correct the discrepancy to the satisfaction of the Engineer.

If a vehicle delivers mixture to the project and the delivery ticket indicates that the vehicle is overweight, the load may not be rejected but a "Measured Weight Adjustment" will be taken in accordance with Article 4.06.04.

Vehicle body coating and cleaning agents must not have a deleterious effect on the mixture. The use of solvents or fuel oil, in any concentration, is prohibited for the coating of vehicle bodies.

For each delivery, the Engineer shall be provided a clear, legible copy of the delivery ticket.

3. Paving Equipment: The Contractor shall have the necessary paving and compaction equipment at the project site to perform the work. All equipment shall be in good working order and any equipment that is worn, defective or inadequate for performance of the work shall be repaired or replaced by the Contractor to the satisfaction of the Engineer. During the paving operation, the use of solvents or fuel oil, in any concentration, is prohibited as a release agent or cleaner on any paving equipment (i.e., rollers, pavers, transfer devices, etc.).

Refueling or cleaning of equipment is prohibited in any location on the project where fuel or solvents might come in contact with paved areas or areas to be paved. Solvents used in cleaning mechanical equipment or hand tools shall be stored off of areas paved or to be paved.

Pavers: Each paver shall have a receiving hopper with sufficient capacity to provide for a uniform spreading operation and a distribution system that places the mix uniformly, without segregation. The paver shall be equipped with and use a vibratory screed system with heaters or burners. The screed system shall be capable of producing a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture. Pavers with extendible screed units as part of the system shall have auger extensions and tunnel extenders as necessary. Automatic screed controls for grade and slope shall be used at all times unless otherwise authorized by the Engineer. The controls shall automatically adjust the screed to compensate for irregularities in the preceding course or existing base. The controls shall maintain the proper transverse slope and be readily adjustable, and shall operate from a fixed or moving reference such as a grade wire or floating beam.

Rollers: All rollers shall be self-propelled and designed for compaction of bituminous concrete. Roller types shall include steel-wheeled, pneumatic or a combination thereof. Rollers that operate in a dynamic mode shall have drums that use a vibratory or oscillatory system or combination of. Vibratory rollers shall be equipped with indicators for amplitude, frequency and speed settings/readouts to measure the impacts per foot during the compaction process. Oscillatory rollers shall be equipped with frequency indicators. Rollers can operate in the dynamic mode using the oscillatory system on concrete structures such as bridges and catch basins if at the lowest frequency setting.

Pneumatic tire rollers shall be equipped with wide-tread compaction tires capable of exerting an average contact pressure from 60 to 90 pounds per square inch uniformly over the surface, The Contractor shall furnish documentation to the Engineer regarding tire size; pressure and loading to confirm that the proper contact pressure is being developed and that the loading and contact pressure is uniform for all wheels.

Lighting: For paving operations, which will be performed during hours of darkness, the paving equipment shall be equipped with lighting fixtures as described below, or with an approved equal. Lighting shall minimize glare to passing traffic. The lighting options and minimum number of fixtures are listed in Tables 4.06-1 and 4.06-2:

TABLE 4.06-1: Minimum Paver Lighting

Option	Fixture Configuration	Fixture Quantity	Requirement
1	Type A	3	Mount over screed area
	Type B (narrow) or Type C (spot)	2	Aim to auger and guideline
	Type B (wide) or Type C (flood)	2	Aim 25 feet behind paving machine
2	Type D Balloon	2	Mount over screed area

TABLE 4.06-2: Minimum Roller Lighting

Option	Fixture Configuration*	Fixture Quantity	Requirement
1	Type B (wide)	2	Aim 50 feet in front of and behind roller
	Type B (narrow)	2	Aim 100 feet in front of and behind roller
2	Type C (flood)	2	Aim 50 feet in front of and behind roller
	Type C (spot)	2	Aim 100 feet in front of and behind roller
3	Type D Balloon	1	Mount above the roller

*All fixtures shall be mounted above the roller.

Type A: Fluorescent fixture shall be heavy-duty industrial type. Each fixture shall have a minimum output of 8,000 lumens. The fixtures shall be mounted horizontally, and be designed for continuous row installation.

Type B: Each floodlight fixture shall have a minimum output of 18,000 lumens.

Type C: Each fixture shall have a minimum output of 19,000 lumens.

Type D: Balloon light: Each balloon light fixture shall have a minimum output of 50,000 lumens, and emit light equally in all directions.

Material Transfer Vehicle (MTV): A MTV shall be used when placing a bituminous concrete surface course as indicated in the contract documents.

The MTV must be a vehicle specifically designed for the purpose of delivering the bituminous concrete mixture from the delivery vehicle to the paver. The MTV must continuously remix the bituminous concrete mixture throughout the placement process.

The use of a MTV will be subject to the requirements stated in Article 1.07.05- Load Restrictions. The Engineer may limit the use of the vehicle if it is determined that the use of the MTV may

damage highway components, utilities, or bridges. The Contractor shall submit to the Engineer at time of pre-construction the following information:

- The make and model of the MTV.
- The individual axle weights and axle spacing for each piece of paving equipment (haul vehicle, MTV and paver).
- A working drawing showing the axle spacing in combination with all pieces of equipment that will comprise the paving echelon.

4. Test Section: The Engineer may require the Contractor to place a test section whenever the requirements of this specification or Section M.04 are not met.

The Contractor shall submit the quantity of mixture to be placed and the location of the test section for review and approval by the Engineer. The same equipment used in the construction of a passing test section shall be used throughout production.

If a test section fails to meet specifications, the Contractor shall stop production, make necessary adjustments to the job mix formula, Plant operations, or procedures for placement and compaction. The Contractor shall construct test sections, as allowed by the Engineer, until all the required specifications are met. All test sections shall also be subject to removal as set forth in Article 1.06.04.

5. Transitions for Roadway Surface: Transitions shall be formed at any point on the roadway where the pavement surface deviates, vertically, from the uniform longitudinal profile as specified on the plans. Whether formed by milling or by bituminous concrete mixture, all transition lengths shall conform to the criteria below unless otherwise specified.

Permanent Transitions: Defined as any gradual change in pavement elevation that remains as a permanent part of the work.

A transition shall be constructed no closer than 75 feet from either side of a bridge expansion joint or parapet. All permanent transitions, leading and trailing, shall meet the following length requirements:

- a) Posted speed limit is greater than 35 MPH: 30 feet per inch of elevation change.
- b) Posted speed limit is 35 MPH or less: 15 feet per inch of elevation change.

In areas where it is impractical to use the above described permanent transition lengths the use of a shorter permanent transition length may be permitted when approved by the Engineer.

Temporary Transitions: A temporary transition is defined as a transition that does not remain a permanent part of the work. All temporary transitions shall meet the following length requirements:

- a) Posted speed limit is greater than 50 MPH
 - (1) Leading Transitions = 15 feet per inch of vertical change (thickness)
 - (2) Trailing Transitions = 6 feet per inch of vertical change (thickness)
- b) Posted speed limit is 40, 45, or 50 MPH
 - (1) Leading and Trailing = 4 feet per inch of vertical change (thickness)
- c) Posted speed limit is 35 MPH or less
 - (1) Leading and Trailing = 3 feet per inch of vertical change (thickness)

Note: Any temporary transition to be in-place over the winter shutdown period or during extended periods of inactivity (more than 14 calendar days) shall conform to the greater than 50 MPH requirements shown above.

6. Spreading and Finishing of Mixture: Prior to the placement of the mixture, the underlying base course shall be brought to the plan grade and cross section within the allowable tolerance.

Immediately before placing a bituminous concrete lift, a uniform coating of tack coat shall be applied to all existing underlying pavement surfaces and on the exposed surface of a wedge joint. Such surfaces shall be clean and dry. Sweeping or other means acceptable to the Engineer shall be used.

The mixture shall not be placed whenever the surface is wet or frozen.

The Engineer may verify the mixture temperature by means of a probe or infrared type of thermometer. The Engineer may reject the load based on readings from a probe type thermometer and the specify temperature in the quality control plan (QCP) for placement.

Tack Coat Application: The tack coat shall be applied by a pressurized spray system that results in uniform overlapping coverage at an application rate of 0.03 to 0.05 gallons per square yard for a non-milled surface and an application rate of 0.05 to 0.07 gallons per square yard for a milled surface. For areas where both milled and un-milled surfaces occur, the tack coat shall be an application rate of 0.03 to 0.05 gallons per square yard. The Engineer must approve the equipment and the method of measurement prior to use. The material for tack coat shall not be heated in excess of 160°F and shall not be further diluted.

Tack coat shall be allowed sufficient time to break prior to any paving equipment or haul vehicles driving on it.

The Contractor may request to omit the tack coat application between bituminous concrete layers that have not been exposed to traffic and are placed during the same work shift. Requests to omit tack coat application on the exposed surface of a wedge joint will not be considered.

Placement: The mixture shall be placed and compacted to provide a smooth, dense surface with a uniform texture and no segregation at the specified thickness and dimensions indicated in the plans and specifications.

When unforeseen weather conditions prevent further placement of the mixture, the Engineer is not obligated to accept or place the bituminous concrete mixture that is in transit from the Plant.

In advance of paving, traffic control requirements shall be set up, maintained throughout placement, and shall not be removed until all associated work including density testing is completed.

The Contractor shall inspect the newly placed pavement for defects in the mixture or placement before rolling is started. Any deviation from standard crown or section shall be immediately remedied by placing additional mixture or removing surplus mixture. Such defects shall be corrected to the satisfaction of the Engineer.

Where it is impractical due to physical limitations to operate the paving equipment, the Engineer may permit the use of other methods or equipment. Where hand spreading is permitted, the mixture shall be placed by means of suitable shovels and other tools, and in a uniformly loose layer at a thickness that will result in a completed pavement meeting the designed grade and elevation.

Placement Tolerances: Each lift of bituminous concrete placed at a specified thickness shall meet the following requirements for thickness and area. Any pavement exceeding these limits shall be subject to an adjustment or removal. Lift tolerances will not relieve the Contractor from meeting the final designed grade. Lifts of specified non-uniform thickness, i.e. wedge or shim course, shall not be subject to thickness and area adjustments.

- a) Thickness- Where the average thickness of the lift exceeds that shown on the plans beyond the tolerances shown in Table 4.06-3, the Engineer will calculate the thickness adjustment in accordance with Article 4.06.04.

TABLE 4.06-3: Thickness Tolerances

Mixture Designation	Lift Tolerance
S1	+/- 3/8 inch
S0.25, S0.375, S0.5	+/- 1/4 inch

Where the thickness of the lift of mixture is less than that shown on the plans beyond the tolerances shown in Table 4.06-3, the Contractor, with the approval of the Engineer, shall take corrective action in accordance with this specification.

- b) Area- Where the width of the lift exceeds that shown on the plans by more than the specified thickness, the Engineer will calculate the area adjustment in accordance with Article 4.06.04.
- c) Delivered Weight of Mixture - When the delivery ticket shows that the vehicle exceeds the allowable gross weight for the vehicle type, the Engineer will calculate the weight adjustment in accordance with Article 4.06.04.

Transverse Joints: All transverse joints shall be formed by saw-cutting to expose the full thickness of the lift. Tack coat shall be applied to the sawn face immediately prior to additional mixture being placed.

Compaction: The Contractor shall compact the mixture to meet the density requirements as stated in Article 4.06.03 and eliminate all roller marks without displacement, shoving, cracking, or aggregate breakage.

When placing a lift with a specified thickness less than one and one-half (1 ½) inches, or a wedge course, the Contractor shall provide a minimum rolling pattern as determined by the development of a compaction curve. The procedure to be used shall be documented in the Contractor's QCP for placement and demonstrated on the first day of placement.

The use of the vibratory system on concrete structures is prohibited. When approved by the Engineer, the Contractor may operate a roller using an oscillatory system at the lowest frequency setting.

If the Engineer determines that the use of compaction equipment in the dynamic mode may damage highway components, utilities, or adjacent property, the Contractor shall provide alternate compaction equipment. The Engineer may allow the Contractor to operate rollers in the dynamic mode using the oscillatory system at the lowest frequency setting.

Rollers operating in the dynamic mode shall be shut off when changing directions.

These allowances will not relieve the Contractor from meeting pavement compaction requirements.

Surface Requirements:

Each lift of the surface course shall not vary more than ¼ inch from a Contractor-supplied 10 foot straightedge. For all other lifts, the tolerance shall be ⅜ inch. Such tolerance will apply to all paved areas.

Any surface that exhibits these characteristics or exceeds these tolerances shall be corrected by the Contractor at its own expense.

7. Longitudinal Joint Construction Methods: The Contractor shall use Method I- Notched Wedge Joint (see Figure 4.06-1) when constructing longitudinal joints where lift thicknesses are between 1½ and 3 inches. S1.0 mixtures shall be excluded from using Method I. Method II Butt Joint (see Figure 4.06-2) shall be used for lifts less than 1½ inches or greater than or equal to 3 inches. During placement of multiple lifts, the longitudinal joint shall be constructed in such a manner that it is located at least 6 inches from the joint in the lift immediately below. The joint in the final lift shall be at the centerline or at lane lines. Each longitudinal joint shall maintain a consistent offset from the centerline of the roadway along its entire length. The difference in

elevation between the two faces of any completed longitudinal joint shall not exceed $\frac{1}{4}$ inch in any location.

Method I - Notched Wedge Joint:

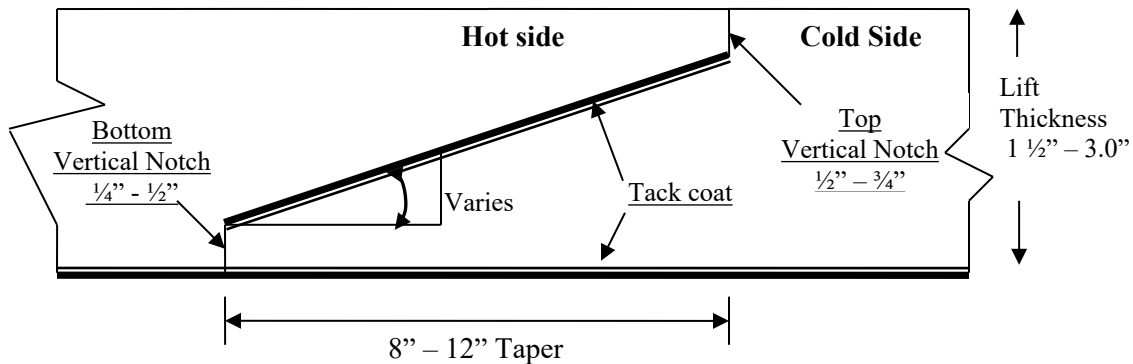


FIGURE 4.06-1: Notched Wedge Joint

A notched wedge joint shall be constructed as shown in Figure 4.06-1 using a device that is attached to the paver screed and is capable of independently adjusting the top and bottom vertical notches. The device shall have an integrated vibratory system.

The taper portion of the wedge joint must be placed over the longitudinal joint in the lift immediately below. The top vertical notch must be located at the centerline or lane line in the final lift. The requirement for paving full width "curb to curb" as described in Method II may be waived if addressed in the QC plan and approved by the Engineer.

The taper portion of the wedge joint shall be evenly compacted using equipment other than the paver or notch wedge joint device.

The taper portion of the wedge joint shall not be exposed to traffic for more than 5 calendar days.

Any exposed wedge joint must be located to allow for the free draining of water from the road surface.

The Engineer reserves the right to define the paving limits when using a wedge joint that will be exposed to traffic.

If Method I, Notched Wedge Joint cannot be used on lifts between 1.5 and 3 inches, Method III Butt Joint may be substituted according to the requirements below for "Method III – Butt Joint with Hot Pour Rubberized Asphalt Treatment."

Method II - Butt Joint:

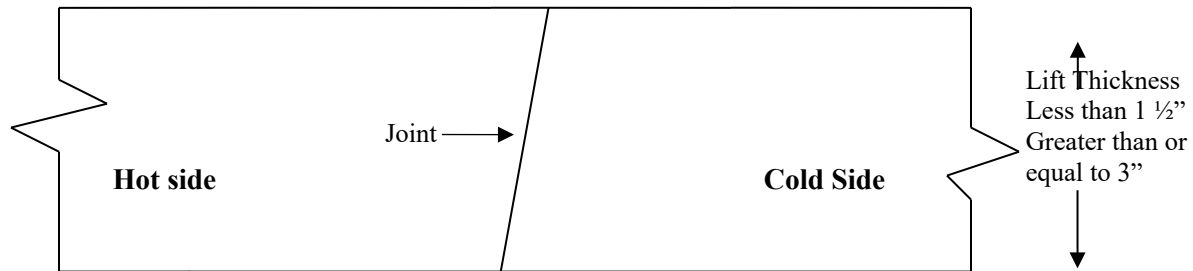


FIGURE 4.06-2: Butt Joint

When adjoining passes are placed, the Contractor shall utilize equipment that creates a near vertical edge (refer to Figure 4.06-2). The completing pass (hot side) shall have sufficient mixture so that the compacted thickness is not less than the previous pass (cold side). The end gate on the paver should be set so there is an overlap onto the cold side of the joint.

The Contractor shall not allow any butt joint to be incomplete at the end of a work shift unless otherwise allowed by the Engineer. When using this method, the Contractor is not allowed to leave a vertical edge exposed at the end of a work shift and must complete paving of the roadway full width “curb to curb.”

Method III- Butt Joint with Hot Poured Rubberized Asphalt Treatment: If Method I Wedge Joint cannot be used due to physical constraints in certain limited locations; the contractor may submit a request in writing for approval by the Engineer, to utilize Method III Butt Joint as a substitution in those locations. There shall be no additional measurement or payment made when the Method III Butt Joint is substituted for the Method I Notched Wedge Joint. When required by the contract or approved by the Engineer, Method III (see Figure 4.06-3) shall be used.

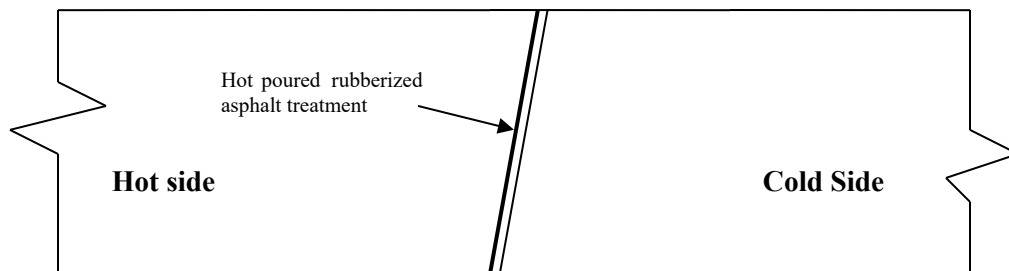


FIGURE 4.06-3: Butt Joint with Hot Poured Rubberized Asphalt Treatment

All of the requirements of Method II must be met with Method III. In addition, the longitudinal vertical edge must be treated with a rubberized joint seal material meeting the requirements of ASTM D 6690, Type 2. The joint sealant shall be placed on the face of the “cold side” of the butt joint as shown above prior to placing the “hot side” of the butt joint. The joint seal material shall be applied in accordance with the manufacturer’s recommendation so as to provide a uniform coverage and avoid excess bleeding onto the newly placed pavement.

8. Contractor Quality Control (QC) Requirements: The Contractor shall be responsible for maintaining adequate quality control procedures throughout the production and placement operations. Therefore, the Contractor must ensure that the materials, mixture and work provided by Subcontractors, Suppliers and Producers also meet contract specification requirements.

This effort must be documented in Quality Control Plans and address the actions, inspection, or sampling and testing necessary to keep the production and placement operations in control, to determine when an operation has gone out of control and to respond to correct the situation in a timely fashion.

The Standard QCP for production shall consist of the quality control program specific to the production facility.

There are three components to the QCP for placement: a Standard QCP, a Project Summary Sheet that details project specific information, and if applicable a separate Extended Season Paving Plan as required in Section 9 “Temperature and Seasonal Requirements”.

The Standard QCP for both production and placement shall be submitted to the Department for approval each calendar year and at a minimum of 30 days prior to production or placement.

Production or placement shall not occur until all QCP components have been approved by the Engineer.

Each QCP shall include the name and qualifications of a Quality Control Manager (QCM). The QCM shall be responsible for the administration of the QCP, and any modifications that may become necessary. The QCM shall have the ability to direct all Contractor personnel on the project during paving operations. All Contractor sampling, inspection and test reports shall be reviewed and signed by the QCM prior to submittal to the Engineer. The QCPs shall also include the name and qualifications of any outside testing laboratory performing any QC functions on behalf of the Contractor.

Approval of the QCP does not relieve the Contractor of its responsibility to comply with the project specifications. The Contractor may modify the QCPs as work progresses and must document the changes in writing prior to resuming operations. These changes include but are not limited to changes in quality control procedures or personnel. The Department reserves the right to deny significant changes to the QCPs.

QCP for Production: Refer to Section M.04.03-1.

QCP for Placement: The Standard QCP, Project Summary Sheet, and Extended Season Paving Plan shall conform to the format provided by the Engineer. The format is available at http://www.ct.gov/dot/lib/dot/documents/dconstruction/pat/qcp_outline_hma_placement.pdf.

The Contractor shall perform all quality control sampling and testing, provide inspection, and exercise management control to ensure that placement conforms to the requirements as outlined in its QCP during all phases of the work. The Contractor shall document these activities for each day of placement.

The Contractor shall submit complete field density testing and inspection records to the Engineer within 48 hours in a manner acceptable to the Engineer.

The Contractor may obtain one (1) mat core and one (1) joint core per day for process control, provided this process is detailed in the QCP. The results of these process control cores shall not be used to dispute the Department determinations from the acceptance cores. The Contractor shall submit the location of each process control core to the Engineer for approval prior to taking the core. The core holes shall be filled to the same requirements described in sub-article 4.06.03-10.

9. Temperature and Seasonal Requirements: Paving, including placement of temporary pavements, shall be divided into two seasons, “In-Season” and “Extended-Season”. In-Season paving occurs from May 1 – October 14, and Extended Season paving occurs from October 15-April 30. The following requirements shall apply unless otherwise authorized or directed by the Engineer:

- Mixtures shall not be placed when the air or sub base temperature is less than 40°F regardless of the season.
- Should paving operations be scheduled during the Extended Season, the Contractor must submit an Extended Season Paving Plan for the project that addresses minimum delivered mix temperature considering WMA, PMA or other additives, maximum paver speed, enhanced rolling patterns and the method to balance mixture delivery and placement operations. Paving during Extended Season shall not commence until the Engineer has approved the plan.

10. Obtaining Bituminous Concrete Cores: This Section describes the methodology and sampling frequency the Contractor shall use to obtain pavement cores.

Coring shall be performed on each lift specified to a thickness of one and one-half (1 ½) inches or more within 5 days of placement. The Contractor shall extract cores (4 or 6 inch diameter for S0.25, S0.375 and S0.5 mixtures 6 inch diameter for S1.0 mixtures) from locations determined by the Engineer. The Engineer must witness the extraction, labeling of cores and filling of the core holes.

A density lot will be complete when the full designed paving width and length of the lot has been placed and shall include all longitudinal joints between the curb lines. HMA S1 mixes are excluded from the longitudinal joint density requirements.

A standard density lot is the quantity of material placed within the defined area exclusive of any structures. A combo density lot is the quantity of material placed within the defined area inclusive of structures less than or equal to 500 feet long. A bridge density lot is the quantity of material placed on a structure larger than 500 feet in length.

Prior to paving, the type and number of lot (s) shall be determined by the Engineer. The number of cores per lot shall be determined in accordance to Tables 4.06-4, 4.06-5A and 4.06-5B. Noncontiguous areas such as highway ramps may be combined to create one lot. Combined areas should be set up to target a 2000 ton lot size. The longitudinal locations of mat cores within a lot containing multiple paving passes will be determined using the total distance covered by the paver. The locations of the joint cores will be determined using the total length of longitudinal joints within the lot.

Sampling is in accordance with the following tables:

TABLE 4.06-4: Bridge Density Lot(s)

Length of Each Structure (Feet)	No. of Mat Cores	No. of Joint Cores
≤ 500'	See Table 4.06-5(A or B)	See Table 4.06-5(A or B)
501' – 1500'	3	3
1501' – 2500'	4	4
2501' and greater	5	5

All material placed on structures less than or equal to 500 feet in length shall be included as part of a standard lot as follows:

TABLE 4.06-5A: Standard and Combo Density Lot(s) ≥ 500 Tons

Lot Type	No. of Mat Cores		No. of Joint Cores		Target Lot Size (Tons)
Standard Lot / Without Bridge (s)	4		4		2000
Combo Lot / Lot With Bridge(s) ⁽¹⁾	4 plus	1 per structure (≤ 300')	4 plus	1 per structure (≤ 300')	2000
		2 per structure (301' – 500')		2 per structure (301' – 500')	

TABLE 4.06-5B: Standard and Combo Density Lot < 500 Tons

Lot Type	No. of Mat Cores		No. of Joint Cores	
Standard Lot / Without Bridge (s)	3		3	
Combo Lot / Lot With Bridge(s) ⁽¹⁾	2 plus	1 per structure	2 plus	1 per structure

Note:

(1) If a combo lot mat or joint core location randomly falls on a structure, the core is to be obtained on the structure in addition to the core(s) required on the structure.

After the lift has been compacted and cooled, the Contractor shall cut cores to a depth equal to or greater than the lift thickness and remove them without damaging the lift(s) to be tested. Any core that is damaged or obviously defective while being obtained will be replaced with a new core from a location within 2 feet measured in a longitudinal direction.

A mat core shall not be located any closer than one foot from the edge of a paver pass. If a random number locates a core less than one foot from any edge, the location will be adjusted by the Engineer so that the outer edge of the core is one foot from the edge of the paver pass.

Method I, Notched Wedge Joint cores shall be taken so that the center of the core is 5 inches from the visible joint on the hot mat side (Figure 4.06-5).

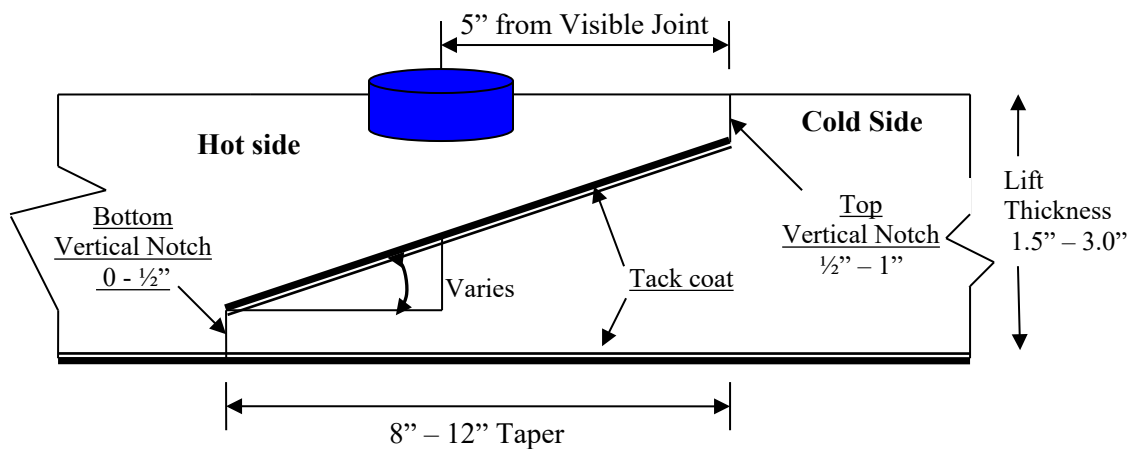


FIGURE 4.06-5: Notched Wedge Joint Cores

When Method II or Method III Butt Joint is utilized, cores shall be taken from the hot side so the edge of the core is within 1 inch of the longitudinal joint.

The cores shall be labeled by the Contractor with the project number, date placed, lot number and sub-lot number. The core's label shall, include "M" for a mat core and "J" for a joint core. A mat core from the second lot and first sub-lot shall be labeled "M2 - 1" (Figure 4.06-4). The Engineer shall fill out a MAT-109 to accompany the cores. The Contractor shall deliver the cores and MAT-109 to the Department's Central Lab. The Contractor shall use a container approved by the Engineer. The container shall have a lid capable of being locked shut and tamper proof. The Contractor shall use foam, bubble wrap, or another suitable material to prevent the cores from being damaged during handling and transportation. Once the cores and MAT-109 are in the container the Engineer will secure the lid using a security seal. The security seal's identification number must be documented on the MAT-109. Central Lab personnel will break the security seal and take possession of the cores.

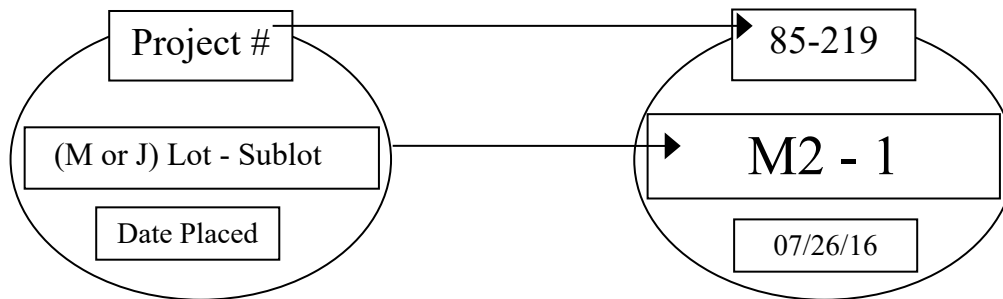


FIGURE 4.06-4: Labeling of Cores

Each core hole shall be filled within four hours upon core extraction. Prior to being filled, the hole shall be prepared by removing any free water and applying tack coat using a brush or other means to uniformly cover the cut surface. The core hole shall be filled using a bituminous concrete mixture at a minimum temperature of 240°F containing the same or smaller nominal maximum aggregate size and compacted with a hand compactor or other mechanical means to the maximum compaction possible. The bituminous concrete shall be compacted to 1/8 inch above the finished pavement.

11. Acceptance Sampling and Testing: Sampling and testing shall be performed at a frequency not less than the minimum frequency specified in Section M.04 and sub-article 4.06.03-10.

Sampling shall be performed in accordance with ASTM D 3665, or a statistically based procedure of stratified random sampling approved by the Engineer.

Plant Material Acceptance: The Contractor shall provide the required sampling and testing during all phases of the work in accordance with Section M.04. The Department will verify the Contractor's acceptance test results. Should any test results exceed the specified tolerances in the Department's current QA Program for Materials, the Contractor test results for a subject lot or sub lot may be replaced with the Department's results for the purpose of calculating adjustments. The verification procedure is included in the Department's current QA Program for Materials.

Density Acceptance: The Engineer will perform all acceptance testing in accordance with AASHTO T 331. The density of each core will be determined using the daily production's average maximum theoretical specific gravity (Gmm) established during the testing of the parent material at the Plant. When there was no testing of the parent material or any Gmm exceeds the specified tolerances in the Department's current QA Program for Materials, the Engineer will determine the maximum theoretical density value to be used for density calculations.

12. Density Dispute Resolution Process: The Contractor and Engineer will work in partnership to avoid potential conflicts and to resolve any differences that may arise during quality control or

acceptance testing for density. Both parties will review their sampling and testing procedures and results and share their findings. If the Contractor disputes the Engineer's test results, the Contractor must submit in writing a request to initiate the Dispute Resolution Process within 7 calendar days of the notification of the test results. No request for dispute resolution will be allowed unless the Contractor provides quality control results within the timeframe described in sub-article 4.06.03-9 supporting its position. No request for Dispute Resolution will be allowed for a Density Lot in which any core was not taken within the required 5 calendar days of placement. Should the dispute not be resolved through evaluation of existing testing data or procedures, the Engineer may authorize the Contractor to obtain a new set of core samples per disputed lot. The core samples must be extracted no later than 14 calendar days from the date of Engineer's authorization.

The number and location (mat, joint, or structure) of the cores taken for dispute resolution must reflect the number and location of the original cores. The location of each core shall be randomly located within the respective original sub lot. All such cores shall be extracted and the core hole filled using the procedure outlined in Article 4.06.03. The dispute resolution results shall be added to the original results and averaged for determining the final in-place density value.

13. Corrective Work Procedure:

If pavement placed by the Contractor does not meet the specifications, and the Engineer requires its replacement or correction, the Contractor shall:

- a) Propose a corrective procedure to the Engineer for review and approval prior to any corrective work commencing. The proposal shall include:
 - Limits of pavement to be replaced or corrected, indicating stationing or other landmarks that are readily distinguishable.
 - Proposed work schedule.
 - Construction method and sequence of operations.
 - Methods of maintenance and protection of traffic.
 - Material sources.
 - Names and telephone numbers of supervising personnel.
- b) Any corrective courses placed as the final wearing surface shall match the specified lift thickness after compaction.

14. Protection of the Work: The Contractor shall protect all sections of the newly finished pavement from damage that may occur as a result of the Contractor's operations for the duration of the Project.

15. Cut Bituminous Concrete Pavement: Work under this item shall consist of making a straight-line cut in the pavement to the lines delineated on the plans or as directed by the Engineer. The cut shall provide a straight, clean, vertical face with no cracking, tearing or breakage along the cut edge.

4.06.04—Method of Measurement:

1. HMA S* or PMA S*: The quantity of bituminous concrete measured for payment will be determined by the documented net weight in tons accepted by the Engineer in accordance with this specification and Section M.04.

2. Adjustments: Adjustments may be applied to bituminous concrete quantities and will be measured for payment using the following formulas:

Yield Factor for Adjustment Calculation = 0.0575 Tons/SY/inch

Actual Area = [(Measured Length (ft)) x (Avg. of width measurements (ft))]

Actual Thickness (t) = Total tons delivered / [Actual Area (SY) x 0.0575 Tons/SY/inch]

- a) Area: If the average width exceeds the allowable tolerance, an adjustment will be made using the following formula. The tolerance for width is equal to the specified thickness (in.) of the lift being placed.

Tons Adjusted for Area (T_A) = [(L x W_{adj})/9] x (t) x 0.0575 Tons/SY/inch = (-) Tons

Where: L = Length (ft)

(t) = Actual thickness (inches)

W_{adj} = (Designed width (ft) + tolerance /12) - Measured Width)

- b) Thickness: If the actual average thickness is less than the allowable tolerance, the Contractor shall submit a repair procedure to the Engineer for approval. If the actual thickness exceeds the allowable tolerance, an adjustment will be made using the following formula:

Tons Adjusted for Thickness (T_T) = A x t_{adj} x 0.0575 = (-) Tons

Where: A = Area = {[L x (Designed width + tolerance (lift thickness)/12)] / 9}

t_{adj} = Adjusted thickness = [(Dt + tolerance) - Actual thickness]

Dt = Designed thickness (inches)

- c) Weight: If the quantity of bituminous concrete representing the mixture delivered to the project is in excess of the allowable gross vehicle weight (GVW) for each vehicle, an adjustment will be made using the following formula:

Tons Adjusted for Weight (T_w) = GVW – DGW = (-) Tons

Where: DGW = Delivered gross weight as shown on the delivery ticket or measured on a certified scale.

d) Mixture Adjustment: The quantity of bituminous concrete representing the production lot at the Plant will be adjusted as follow:

i. Non-PWL Production Lot (less than 3500 tons):

The adjustment values in Table 4.06-6 and 4.06-7 shall be calculated for each sub lot based on the Air Void (AV) and Asphalt Binder Content (PB) test results for that sub lot. The total adjustment for each day's production (lot) will be computed using tables and the following formulas:

$$\text{Tons Adjusted for Superpave Design (T}_{SD}) = [(\text{AdjAV}_t + \text{AdjPB}_t) / 100] \times \text{Tons}$$

$$\text{Percent Adjustment for Air Voids} = \text{AdjAV}_t = [\text{AdjAV}_1 + \text{AdjAV}_2 + \text{AdjAV}_i + \dots + \text{AdjAV}_n] / n$$

Where: AdjAV_t = Total percent air void adjustment value for the lot

AdjAV_i = Adjustment value from Table 4.06-7 resulting from each sub lot or the average of the adjustment values resulting from multiple tests within a sub lot, as approved by the Engineer.

n = number of sub lots based on Table M.04.03-2

TABLE 4.06-6: Adjustment Values for Air Voids

Adjustment Value (AdjAV _i) (%)	S0.25, S0.375, S0.5, S1 Air Voids (AV)
+2.5	3.8 - 4.2
+3.125*(AV-3)	3.0 - 3.7
-3.125*(AV-5)	4.3 - 5.0
20*(AV-3)	2.3 - 2.9
-20*(AV-5)	5.1 - 5.7
-20.0	≤ 2.2 or ≥ 5.8

$$\text{Percent Adjustment for Asphalt Binder} = \text{AdjPB}_t = [(\text{AdjPB}_1 + \text{AdjPB}_2 + \text{AdjPB}_i + \dots + \text{AdjPB}_n)] / n$$

Where: AdjPB_t = Total percent asphalt binder adjustment value for the lot

AdjPB_i = Adjustment value from Table 4.06-7 resulting from each sub lot

n = number of binder tests in a production lot

TABLE 4.06-7: Adjustment Values for Binder Content

Adjustment Value (AdjAV _i) (%)	S0.25, S0.375, S0.5, S1 Pb
0.0	JMF Pb ± 0.3
- 10.0	≤ JMF Pb - 0.4 or ≥ JMF Pb + 0.4

ii. PWL Production Lot (3500 tons or more):

For each lot, the adjustment values shall be calculated based on PWL for AV, VMA and PB test results. The lot will be considered as being normally distributed and all applicable equations in AASHTO R9 and AASHTO R42 Appendix X4 will apply.

Only one test result will be considered for each sub lot. The specification limits are listed in Section M.04.

For AV, PB and voids in mineral aggregate (VMA), the individual material quality characteristic adjustment (Adj) will be calculated as follow:

For PWL between 50 and 90%: $Adj(AV_t \text{ or } PB_t \text{ or } VMA_t) = (55 + 0.5 \text{ PWL}) - 100$

For PWL at and above 90%: $Adj(AV_t \text{ or } PB_t \text{ or } VMA_t) = (77.5 + 0.25 \text{ PWL}) - 100$

Where:

AdjAV_t = Total percent AV adjustment value for the lot

AdjPB_t = Total percent PB adjustment value for the lot

AdjVMA_t = Total percent VMA adjustment value for the lot

Lots with PWL less than 50% in any of the three individual material quality characteristics will be evaluated under 1.06.04.

The total adjustment for each production lot will be computed using the following formula:

Tons Adjusted for Superpave Design (T_{SD}) = $[(0.5AdjAV_t + 0.25AdjPB_t + 0.25AdjVMA_t) / 100] \times \text{Tons}$

iii. Partial Lots:

Lots with less than 4 sublots will be combined with the prior lot. If there is no prior lot with equivalent material or if the last test result of the prior lot is over 30 calendar days old, the adjustment will be calculated as indicated in 4.06.04-2.d.i.

Lots with 4 or more sublots will be calculated as indicated in 4.06.04-2.d.ii.

- e) Density Adjustment: The quantity of bituminous concrete measured for payment in a lift of pavement specified to be 1½ inches or greater may be adjusted for density. Separate density adjustments will be made for each lot and will not be combined to establish one density adjustment. The final lot quantity shall be the difference between the total payable tons for the project and the sum of the previous lots. If either the Mat or Joint adjustment value is “remove and replace”, the density lot shall be removed and replaced (curb to curb).

No positive adjustment will be applied to a Density Lot in which any core was not taken within the required 5 calendar days of placement.

Tons Adjusted for Density (T_D) = $[\{(PA_M \times .50) + (PA_J \times .50)\} / 100] \times$ Density Lot Tons

Where: T_D = Total tons adjusted for density for each lot

PA_M = Mat density percent adjustment from Table 4.06-9

PA_J = Joint density percent adjustment from Table 4.06-10

TABLE 4.06-9: Adjustment Values for Pavement Mat density

Average Core Result Percent Mat Density	Percent Adjustment (Bridge and Non-Bridge) ⁽¹⁾⁽²⁾
97.1 - 100	-1.667*(ACRPD-98.5)
94.5 – 97.0	+2.5
93.5 – 94.4	+2.5*(ACRPD-93.5)
92.0 – 93.4	0
90.0 – 91.9	-5*(92-ACRPD)
88.0 – 89.9	-10*(91-ACRPD)
87.0 – 87.9	-30
86.9 or less	Remove and Replace (curb to curb)

TABLE 4.06-10: Adjustment Values for Pavement Joint Density

Average Core Result Percent Joint Density	Percent Adjustment (Bridge and Non-Bridge) ⁽¹⁾⁽²⁾
97.1 – 100	-1.667*(ACRPD-98.5)
93.5 – 97.0	+2.5
92.0 – 93.4	+1.667*(ACRPD-92)
91.0 – 91.9	0
89.0 – 90.9	-7.5*(91-ACRPD)
88.0 – 88.9	-15*(90-ACRPD)

87.0 – 87.9	-30
86.9 or less	Remove and Replace (curb to curb)

(1) ACRPD = Average Core Result Percent Density

(2) All Percent Adjustments to be rounded to the second decimal place. For example, 1.667 is to be rounded to 1.67.

3. Transitions for Roadway Surface: The installation of permanent transitions shall be measured under the appropriate item used in the formation of the transition.

The quantity of material used for the installation of temporary transitions shall be measured for payment under the appropriate item used in the formation of the transition. The installation and removal of a bond breaker, and the removal and disposal of any temporary transition formed by milling or with bituminous concrete pavement is not measured for payment.

4. Cut Bituminous Concrete Pavement: The quantity of bituminous concrete pavement cut will be measured in accordance with Article 2.02.04.

5. Material for Tack Coat: The quantity of tack coat will be measured for payment by the number of gallons furnished and applied on the Project and approved by the Engineer. No tack coat material shall be included that is placed in excess of the tolerance described in Article 4.06.03.

a. Container Method- Material furnished in a container will be measured to the nearest ½ gallon. The volume will be determined by either measuring the volume in the original container by a method approved by the Engineer or using a separate graduated container capable of measuring the volume to the nearest ½ gallon. The container in which the material is furnished must include the description of material, including lot number or batch number and manufacturer or product source.

b. Vehicle Method-

i. Measured by Weight: The number of gallons furnished will be determined by weighing the material on calibrated scales furnished by the Contractor. To convert weight to gallons, one of the following formulas will be used:

$$\text{Tack Coat (gallons at } 60^{\circ}\text{F)} = \frac{\text{Measured Weight (pounds)}}{\text{Weight per gallon at } 60^{\circ}\text{F}}$$

$$\text{Tack Coat (gallons at } 60^{\circ}\text{F)} = \frac{0.996 \times \text{Measured Weight (pounds)}}{\text{Weight per gallon at } 77^{\circ}\text{F (from test report)}}$$

ii. Measured by automated metering system on the delivery vehicle:

Tack Coat (gallons at 60°F) = Factor (from Table 4.06-11) multiplied by the measured gallons.

TABLE 4.06-11: Factor to Convert Volume of Tack Coat to 60°F

Tack Coat Application Temperature (°F)	Factor	Tack Coat Application Temperature (°F)	Factor
75	0.996	120	0.985
80	0.995	125	0.984
85	0.994	130	0.983
90	0.993	135	0.982
95	0.991	140	0.980
100	0.990	145	0.979
105	0.989	150	0.978
110	0.988	155	0.977
115	0.986	160	0.976

6. Material Transfer Vehicle (MTV): The furnishing and use of a MTV will be measured separately for payment based on the actual number of surface course tons delivered to a paver using the MTV.

4.06.05—Basis of Payment:

1. HMA S* or PMA S*: The furnishing and placing of bituminous concrete will be paid for at the Contract unit price per ton for “HMA S*” or “PMA S*”.

- All costs associated with providing illumination of the work area are included in the general cost of the work.
- All costs associated with cleaning the surface to be paved, including mechanical sweeping, are included in the general cost of the work. All costs associated with constructing longitudinal joints are included in the general cost of the work.
- All costs associated with obtaining cores for acceptance testing and dispute resolution are included in the general cost of the work.

2. Bituminous Concrete Adjustment Costs: The adjustment will be calculated using the formulas shown below if all of the measured adjustments in Article 4.06.04 are not equal to zero. A positive or negative adjustment will be applied to monies due the Contractor.

Production Lot: $[T_T + T_A + T_W + T_{SD}] \times \text{Unit Price} = \text{Est. (P)}$

Density Lot: $T_D \times \text{Unit Price} = \text{Est. (D)}$

Where: Unit Price = Contract unit price per ton per type of mixture

T_* = Total tons of each adjustment calculated in Article 4.06.04

Est. () = Pay Unit represented in dollars representing incentive or disincentive.

The Bituminous Concrete Adjustment Cost item if included in the bid proposal or estimate is not to be altered by the Contractor.

3. Transitions for Roadway Surface: The installation of permanent transitions shall be paid under the appropriate item used in the formation of the transition. The quantity of material used for the installation of temporary transitions shall be paid under the appropriate pay item used in the formation of the transition. The installation and removal of a bond breaker, and the removal and disposal of any temporary transition formed by milling or with bituminous concrete pavement is included in the general cost of the work.

4. The cutting of bituminous concrete pavement will be paid in accordance with Article 2.02.05.

5. Material for tack coat will be paid for at the Contract unit price per gallon at 60°F for "Material for Tack Coat".

6. The Material Transfer Vehicle (MTV) will be paid at the Contract unit price per ton for a "Material Transfer Vehicle".

<u>Pay Item*</u>	<u>Pay Unit*</u>
HMA S*	ton
PMA S*	ton
Bituminous Concrete Adjustment Cost	est.
Material for Tack Coat	gal.
Material Transfer Vehicle	ton

*For contracts administered by the State of Connecticut, Department of Administrative Services, the pay items and pay units are as shown in contract award price schedule.

**SECTION 10.00 - GENERAL CLAUSES FOR HIGHWAY
ILLUMINATION AND TRAFFIC SIGNAL PROJECTS**

ARTICLE 10.00.12 - Negotiations with utility company: Add the following:

The contractor shall give notice to utility companies a minimum of 30 days prior to required work or services to the utility company. Refer to Section 1.07 – Legal Relations and Responsibilities for the list of utility companies and representatives the contractor shall use.

The Contractor shall perform all work in conformance with Rules and Regulations of Public Utility Regulatory Authority (PURA), NESC, and OSHA regulations. The Contractor is cautioned that there may be energized wires in the vicinity of the specified installations.

SECTION 12.00 – GENERAL CLAUSES FOR HIGHWAY SIGNING

Description:

Work under this item shall conform to the requirements of Section 12.00 supplemented as follows:

12.00.06 – Data Labels:

For the purpose of developing and maintaining a highway sign inventory and for the purpose of sampling and testing reflective sheeting, the Contractor shall affix a Data Label(s) to the back of each sign face-extruded aluminum sign and each sign face-sheet aluminum sign in the vicinity of the lower left-hand corner or quadrant. Data Labels shall be 2 (two) separate 5 (five) inch by 3 (three) inch (125mm by 75mm), non-reflective weatherproof films with black copy on a yellow background having a pressure sensitive adhesive backing.

A “Fabrication” Data Label is to include information about the sign fabricator, date of fabrication and the sheeting manufacturer - type. An “Installation” Data Label is to include The State Project Number or Maintenance Permit Number that installed the sign and date of installation.

The cost of the data labels coded and in place on the sign shall be included in the unit cost of the respective sign material. Payment for the respective quantities of each sign face-extruded aluminum sign and each sign face-sheet aluminum sign may be withheld until all Data Label(s) have been installed to the satisfaction of the Engineer.

The Data Label designs, with additional notes relative to design requirements are attached herewith

DATA LABELS
NON-REFLECTIVE, WEATHERPROOF FILM
BLACK COPY, YELLOW BACKGROUND

CONN DOT											
SIGN FACE DATA LABEL											
Fabricator: (Insert NAME or State)											
Sheeting Manufacturer - Type (Insert NAME - TYPE)											
Date Fabricated - Month / Year											
J	F	M	A	M	J	J	A	S	O	N	D
12	13	14	15	16	17	18	19	20	21	22	23

CONN DOT SIGN FACE DATA LABEL											
Installed By:											
Project No.: (Insert 000-0000 or State)											
Permit No.: (Insert D_-000000)											
Date Installed - Month / Year											
J	F	M	A	M	J	J	A	S	O	N	D
12	13	14	15	16	17	18	19	20	21	22	23

Data Labels to Be 5 Inch By 3 Inch Each (125mm x 75mm) With Face Designs As Shown Above.

All Copy Ink Must Be Durable And Not Fade, Discolor Or Smudge.

All Variable Legends To Be Included At Label Fabrication.

Only One "Installed By" Permit Or Project Number Should Be Provided.

Sign Fabrication And / Or Installation By State Forces, Insert "State."

The Month And Year Of Fabrication And Installation May Be Punched Or Marked Out.

The Back Of The Data Label Must Contain A Pre-coated Pressure- Sensitive Adhesive Covered By A Removable Liner.

At Application, The Liner Must Be Removable Without Soaking In Water Or Other Solvents.

The Adhesive Must Form A Durable Bond to Surfaces That Are Smooth, Clean, Corrosion-Free And Weather Resistant.

Completed Data Labels Must Not Discolor, Crack, Craze, Blister, Delaminate, Peel, Chalk Or Lose Adhesion When Subjected To Temperatures From -30 Degrees to 200 Degrees Fahrenheit.

SECTION 12.08 - SIGN FACE-SHEET ALUMINUM

Work under this item shall conform to the requirements of Section 12.08 amended as follows:

General: Delete all references to parapet mounted sign supports.

Article M.18.15 – Sign Mounting Bolts: *Replace with the following:*

Bolts used for sign mounting shall be stainless steel and conform to ASTM F593, Group 1 or 2 (Alloy Types 304 or 316). Locking nuts shall be stainless steel and shall conform to ASTM F594 (Alloy Types 304 or 316). Washers shall also be stainless steel and shall conform to ASTM A240 (Alloy Types 304 or 316).

SECTION M.04 BITUMINOUS CONCRETE MATERIALS

Section M.04 is being deleted in its entirety and replaced with the following:

M.04.01—Bituminous Concrete Materials and Facilities

M.04.02—Mix Design and Job Mix Formula (JMF)

M.04.03—Production Requirements

M.04.01—Bituminous Concrete Materials and Facilities: Each source of component material, Plant and laboratory used to produce and test bituminous concrete must be qualified on an annual basis by the Engineer. AASHTO or ASTM Standards noted with an (M) have been modified and are detailed in Table M.04.03-6.

Aggregates from multiple sources of supply must not be blended or stored in the same stockpile.

1. Coarse Aggregate:

All coarse aggregate shall meet the requirements listed in Section M.01.

2. Fine Aggregate:

All fine aggregate shall meet the requirements listed in Section M.01

3. Mineral Filler:

Mineral filler shall conform to the requirements of AASHTO M 17.

4. Performance Graded (PG) Asphalt Binder:

a. General:

i. PG asphalt binder shall be uniformly mixed and blended and be free of contaminants such as fuel oils and other solvents. Binder shall be properly heated and stored to prevent damage or separation.

ii. The binder shall meet the requirements of AASHTO M 332 and shall be graded or verified in accordance with AASHTO R 29. The Contractor shall submit a Certified Test Report and bill of lading representing each delivery in accordance with AASHTO R 26(M). The Certified Test Report must also indicate the binder specific gravity at 77°F; rotational viscosity at 275°F and 329°F and the mixing and compaction viscosity-temperature chart for each shipment.

iii. The Contractor shall submit the name(s) of personnel responsible for receipt, inspection, and record keeping of PG binder. Contractor plant personnel shall document specific storage tank(s) where binder will be transferred and stored until used, and provide binder samples to the Engineer upon request. The person(s) shall assure that each shipment is accompanied by a statement certifying that the transport vehicle was inspected before loading and was found acceptable for the material shipped, and, that the binder is free

of contamination from any residual material, along with two (2) copies of the bill of lading.

iv. The blending or combining of PG binders in one storage tank at the Plant from different suppliers, grades, or additive percentages is prohibited.

b. Basis of Approval:

The request for approval of the source of supply shall list the location where the material will be manufactured, and the handling and storage methods, along with necessary certification in accordance with AASHTO R 26(M). Only suppliers/refineries that have an approved “Quality Control Plan for Performance Graded Binders” formatted in accordance with AASHTO R 26(M) may supply PG binders to Department projects.

c. Standard Performance Grade (PG) Binder:

i. Standard PG binder shall be defined as “Neat”. Neat PG binders shall be free from modification with: fillers, extenders, reinforcing agents, adhesion promoters, thermoplastic polymers, acid modification and other additives such as re-refined motor oil, and shall indicate such information on each bill of lading and certified test report.

ii. The standard asphalt binder grade shall be PG 64S-22.

d. Modified Performance Grade (PG) Binder:

The modified asphalt binder shall be Performance Grade PG 64E-22 asphalt modified solely with a Styrene-Butadiene-Styrene (SBS) polymer. The polymer modifier shall be added at either the refinery or terminal and delivered to the bituminous concrete production facility as homogenous blend. The stability of the modified binder shall be verified in accordance with ASTM D7173 using the Dynamic Shear Rheometer (DSR). The DSR $G^*/\sin(\delta)$ results from the top and bottom sections of the ASTM D7173 test shall not differ by more than 10%. The results of ASTM D7173 shall be included on the Certified Test Report. The binder shall meet the requirements of AASHTO M 332 (including Appendix X1) and AASHTO R 29.

e. Warm Mix Additive or Technology:

i. The warm mix additive or technology must be listed on the North East Asphalt User Producer Group (NEAUPG) Qualified Warm Mix Asphalt (WMA) Technologies List at the time of bid, which may be accessed online at <http://www.neaupg.uconn.edu>.

ii. The warm mix additive shall be blended with the asphalt binder in accordance with the manufacturer’s recommendations.

iii. The blended binder shall meet the requirements of AASHTO M 332 and shall be graded or verified in accordance with AASHTO R 29 for the specified binder grade. The Contractor shall submit a Certified Test Report showing the results of the testing demonstrating the binder grade. In addition, it must include the grade of the virgin binder, the brand name of the warm mix additive, the manufacturer’s suggested rate for

the WMA additive, the water injection rate (when applicable) and the WMA Technology manufacturer's recommended mixing and compaction temperature ranges.

5. Emulsified Asphalts:

a. General:

- i. The emulsified asphalt shall meet the requirements of AASHTO M 140 or AASHTO M 208 as applicable.
- ii. The emulsified asphalts shall be free of contaminants such as fuel oils and other solvents.
- iii. The blending at mixing plants of emulsified asphalts from different suppliers is prohibited.

b. Basis of Approval

- i. The request for approval of the source of supply shall list the location where the material is manufactured, the handling and storage methods, and certifications in accordance with AASHTO PP 71. Only suppliers that have an approved "Quality Control Plan for Emulsified Asphalt" formatted in accordance with AASHTO PP 71 and submit monthly split samples per grade to the Engineer may supply emulsified asphalt to Department projects.
- ii. Each shipment of emulsified asphalt delivered to the project site shall be accompanied with the corresponding Certified Test Report listing Saybolt viscosity, residue by evaporation, penetration of residue, and weight per gallon at 77°F and Material Certificate.
- iii. Anionic emulsified asphalts shall conform to the requirements of AASHTO M-140. Materials used for tack coat shall not be diluted and meet grade RS-1 or RS-1H. When ambient temperatures are 80°F and rising, grade SS-1 or SS-1H may be substituted if permitted by the Engineer.
- iv. Cationic emulsified asphalt shall conform to the requirements of AASHTO M-208. Materials used for tack coat shall not be diluted and meet grade CRS-1. The settlement and demulsibility test will not be performed unless deemed necessary by the Engineer. When ambient temperatures are 80°F and rising, grade CSS-1 or CSS-1H may be substituted if permitted by the Engineer.

6. Reclaimed Asphalt Pavement (RAP):

- a. General: RAP is a material obtained from the cold milling or removal and processing of bituminous concrete pavement. RAP material shall be crushed to 100% passing the ½ inch sieve and free from contaminants such as joint compound, wood, plastic, and metals.
- b. Basis of Approval: The RAP material will be accepted on the basis of one of the following criteria:
 - i. When the source of all RAP material is from pavements previously constructed on Department projects, the Contractor shall provide a Materials Certificate listing the detailed locations and lengths of those pavements and that the RAP is only from those locations listed.
 - ii. When the RAP material source or quality is not known, the Contractor shall request for approval to the Engineer at least 30 calendar days prior to the start of the paving operation. The request shall include a Material Certificate and applicable test results stating that the RAP consists of aggregates that meet the specification requirements of sub articles M.04.01-1 through 3, and, that the binder in the RAP is substantially free of solvents, tars and other contaminants. The Contractor is prohibited from using unapproved material on Department projects and shall take necessary action to prevent contamination of approved RAP stockpiles. Stockpiles of unapproved material shall remain separate from all other RAP materials at all times. The request for approval shall include the following:
 - 1. A 50-pound sample of the RAP to be incorporated into the recycled mixture.
 - 2. A 25-pound sample of the extracted aggregate from the RAP.

7. Crushed Recycled Container Glass (CRCG):

- a. Requirements: The Contractor may propose to use clean and environmentally-acceptable CRCG in an amount not greater than 5% by weight of total aggregate.
- b. Basis of Approval: The Contractor shall submit to the Engineer a request to use CRCG. The request shall state that the CRCG contains no more than 1% by weight of contaminants such as paper, plastic and metal and conform to the following gradation:

CRCG Grading Requirements	
<u>Sieve Size</u>	<u>Percent Passing</u>
3/8-inch	100
No. 4	35-100
No. 200	0.0-10.0

The Contractor shall submit a Materials Certificate to the Engineer stating that the CRCG complies with all the applicable requirements in this specification.

8. Joint Seal Material:

- a. Requirements: Joint seal material must meet the requirements of ASTM D 6690 – Type 2. The Contractor shall submit a Material Certificate in accordance with Article 1.06.07 certifying that the joint seal material meets the requirements of this specification.

9. Recycled Asphalt Shingles (RAS)

- a. Requirements: RAS shall consist of processed asphalt roofing shingles from post-consumer asphalt shingles or from manufactured shingle waste. The RAS material under consideration for use in bituminous concrete mixtures must be certified as being asbestos free and shall be entirely free of whole, intact nails. The RAS material shall meet the requirements of AASHTO MP 23.

The producer shall test the RAS material to determine the asphalt content and the gradation of the RAS material. The producer shall take necessary action to prevent contamination of RAS stockpiles.

The Contractor shall submit a Materials Certificate to the Engineer stating that the RAS complies with all the applicable requirements in this specification.

10. Plant Requirements:

- a. General: The Plant producing bituminous concrete shall comply with AASHTO M 156.
- b. Storage Silos: The Contractor may use silos for short-term storage with the approval of the Engineer. A silo must have heated cones and an unheated silo cylinder if it does not contain a separate internal heating system. When multiple silos are filled, the Contractor shall discharge one silo at a time. Simultaneous discharge of multiple silos for the same Project is not permitted.

<u>Type of silo cylinder</u>	<u>Maximum storage time for all classes (hr)</u>	
	HMA	WMA/PMA
Open Surge	4	Mfg Recommendations*
Unheated – Non-insulated	8	Mfg Recommendations*
Unheated – Insulated	18	Mfg Recommendations*
Heated – No inert gas	TBD by the Engineer	

*Not to exceed HMA limits

- c. Documentation System: The mixing plant documentation system shall include equipment for accurately proportioning the components of the mixture by weight and in the proper order, controlling the cycle sequence and timing the mixing operations. Recording equipment shall monitor the batching sequence of each component of the mixture and produce a printed record of these operations on each Plant ticket, as specified herein.

If recycled materials are used, the Plant tickets shall include their dry weight, percentage and daily moisture content.

If a WMA Technology is added at the Plant, the Plant tickets shall include the actual dosage rate.

For drum Plants, the Plant ticket shall be produced at 5 minute intervals and maintained by the vendor for a period of three years after the completion of the project.

For batch Plants, the Plant ticket shall be produced for each batch and maintained by the vendor for a period of three years after the completion of the project. In addition, an asterisk (*) shall be automatically printed next to any individual batch weight(s) exceeding the following tolerances:

Each Aggregate Component	±1.5% of individual or cumulative target weight for each bin
Mineral Filler	±0.5% of the total batch
Bituminous Material	±0.1% of the total batch
Zero Return (Aggregate)	±0.5% of the total batch
Zero Return (Bituminous Material)	±0.1% of the total batch

The entire batching and mixing interlock cut-off circuits shall interrupt and stop the automatic batching operations when an error exceeding the acceptable tolerance occurs in proportioning.

The scales shall not be manually adjusted during the printing process. In addition, the system shall be interlocked to allow printing only when the scale has come to a complete rest. A unique printed character (m) shall automatically be printed on the ticket when the automatic batching sequence is interrupted or switched to auto-manual or full manual during proportioning.

- d. Aggregates: Aggregate stockpiles shall be managed to prevent segregation and cross contamination. For drum plants only, the percent moisture content at a minimum prior to production and half way through production shall be determined.
- e. Mixture: The dry and wet mix times shall be sufficient to provide a uniform mixture and a minimum particle coating of 95% as determined by AASHTO T 195(M) .

Bituminous concrete mixtures shall contain no more than 0.5% moisture when tested in accordance with AASHTO T 329.

- f. RAP: RAP moisture content shall be determined a minimum of twice daily (prior to production and halfway through production).

- g. Asphalt Binder: A binder log shall be submitted to the Department's Central Lab on a monthly basis.
- h. Warm mix additive: For mechanically foamed WMA, the water injection rate shall be monitored during production and not exceed 2.0% by total weight of binder. For additive added at the Plant, the dosage rate shall be monitored during production.
- i. Plant Laboratory: The Contractor shall maintain a laboratory at the production facility to test bituminous concrete mixtures during production. The laboratory shall have a minimum of 300 square feet, have a potable water source and drainage in accordance with the CT Department of Public Health Drinking Water Division, and be equipped with all necessary testing equipment as well as with a PC, printer, and telephone with a dedicated hard-wired phone line. In addition, the PC shall have internet connection and a functioning web browser with unrestricted access to <https://ctmail.ct.gov>. This equipment shall be maintained in working order at all times and be made available for use by the Engineer.

The laboratory shall be equipped with a heating system capable of maintaining a minimum temperature of 65°F. It shall be clean and free of all materials and equipment not associated with the laboratory. Sufficient light and ventilation must be provided. During summer months, adequate cooling or ventilation must be provided so the indoor air temperature shall not exceed the ambient outdoor temperature.

The laboratory testing apparatus, supplies, and safety equipment shall be capable of performing all tests in their entirety that are referenced in AASHTO R 35 and AASHTO M 323. The Contractor shall ensure that the Laboratory is adequately supplied at all times during the course of the project with all necessary testing supplies and equipment.

The Contractor shall maintain a list of laboratory equipment used in the acceptance testing processes including but not limited to, balances, scales, manometer/vacuum gauge, thermometers, gyratory compactor, clearly showing calibration and/or inspection dates, in accordance with AASHTO R 18. The Contractor shall notify the Engineer if any modifications are made to the equipment within the laboratory. The Contractor shall take immediate action to replace, repair, and/or recalibrate any piece of equipment that is out of calibration, malfunctioning, or not in operation.

M.04.02—Mix Design and Job Mix Formula (JMF)

1. Curb Mix:

- a. Requirements: The Contractor shall use bituminous concrete that meets the requirements of Table M.04.02-1. RAP may be used in 5% increments by weight up to 30%.
- b. Basis of Approval: Annually, an approved JMF based on a mix design for curb mix must be on file with the Engineer prior to use. .

Any change in component source of supply or consensus properties must be approved by the Engineer. A revised JMF shall be submitted prior to use.

**TABLE M.04.02 – 1:
Control Points for Curb Mix Mixtures**

Notes: (a) Compaction Parameter 50gyration N_{des} . (b) The percent passing the #200 sieve shall not exceed the percentage of bituminous asphalt binder.		
Mix	Curb Mix	Production Tolerances from JMF target
Grade of PG Binder content %	PG 64S-22 6.5 - 9.0	0.4
Sieve Size		
# 200	3.0 – 8.0 (b)	2.0
# 50	10 - 30	4
# 30	20 - 40	5
# 8	40 - 70	6
# 4	65 - 87	7
1/4"		
3/8 "	95 - 100	8
1/2 "	100	8
3/4"		8
1"		
2"		
Additionally, the fraction of material retained between any two consecutive sieves shall not be less than 4%		
Mixture Temperature		
Binder	325°F maximum	
Aggregate	280-350° F	
Mixtures	265-325° F	
Mixture Properties		
Air Voids (VA) %	0 – 4.0 (a)	

2. Superpave Design Method – S0.25, S0.375, S0.5, and S1

- a. Requirements: All designated mixes shall be designed using the Superpave mix design method in accordance with AASHTO R 35. A JMF based on the mix design shall meet the requirements of Tables M.04.02-2 through Table M.04.02-5. Each JMF must be submitted no less than seven (7) days prior to production and must be approved by the Engineer prior to use. All approved JMFs expire at the end of the calendar year.

All aggregate component consensus properties and tensile strength ratio (TSR) specimens shall be tested at an AASHTO Materials Reference Laboratory (AMRL) by NETTCP certified technicians.

All bituminous concrete mixes shall be tested for stripping susceptibility by performing the tensile strength ratio (TSR) test procedure in accordance with AASHTO T 283(M) at a minimum every 36 months. The compacted specimens may be fabricated at the Plant and then tested at an AMRL accredited facility. TSR specimens, and corresponding JMF shall be submitted with each test report.

i. Superpave Mixtures with RAP: RAP may be used with the following conditions:

- RAP amounts up to 15% may be used with no binder grade modification.
- RAP amounts up to 20% may be used provided a new JMF is approved by the Engineer. The JMF submittal shall include the grade of virgin binder added. The JMF shall be accompanied by a blending chart and supporting test results in accordance with AASHTO M 323 Appendix X1, or by testing that shows the combined binder (recovered binder from the RAP, virgin binder at the mix design proportions, warm mix asphalt additive and any other modifier if used) meets the requirements of the specified binder grade.
- Two representative samples of RAP shall be obtained. Each sample shall be split and one split sample shall be tested for binder content in accordance with AASHTO T 164 and the other in accordance AASHTO T 308.
- RAP material shall not be used with any other recycling option.

ii. Superpave Mixtures with RAS: RAS may be used solely in HMA S1 mixtures with the following conditions:

- RAS amounts up to 3% may be used.
- RAS total binder replacement up to 15% may be used with no binder grade modification.
- RAS total binder replacement up to 20% may be used provided a new JMF is approved by the Engineer. The JMF submittal shall include the grade of virgin binder added. The JMF shall be accompanied by a blending chart and supporting test results in accordance to AASHTO M 323 appendix X1 or by testing that shows the combined binder (recovered binder from the RAP, virgin binder at the mix design proportions, warm mix asphalt additive and any other modifier if used) meets the requirements of the specified binder grade.
- Superpave Mixtures with RAS shall meet AASHTO PP 78 design considerations. The RAS asphalt binder availability factor (F) used in AASHTO PP 78 shall be 0.85.

iii. Superpave Mixtures with CRCG: CRCG may be used solely in HMA S1 mixtures. One percent of hydrated lime, or other accepted non-stripping agent, shall be added to all mixtures containing CRCG. CRCG material shall not be used with any other recycling option.

- b. Basis of Approval: The following information must be included with the JMF submittal:
- Gradation, consensus properties and specific gravities of the aggregate, RAP or RAS.
 - Average asphalt content of the RAP or RAS by AASHTO T 164.
 - Source of RAP or RAS, and percentage to be used.
 - Warm mix Technology, manufacturer's recommended additive rate and tolerances and manufacturer recommended mixing and compaction temperatures.
 - TSR test report and anti-strip manufacturer and recommended dosage rate if applicable.
 - Mixing and compaction temperature ranges for the mix with and without the warm-mix technology incorporated.
 - JMF ignition oven correction factor by AASHTO T 308.

With each JMF submittal, the following samples shall be submitted to the Division of Materials Testing:

- 4 - one quart cans of PG binder, with corresponding Safety Data Sheet (SDS)
- 1 - 50 lbs bag of RAP
- 2 - 50 lbs bag of plant blended virgin aggregate

A JMF may not be approved if any of the properties of the aggregate components or mix do not meet the verification tolerances as described in the Department's current QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures.

Any material based on a JMF, once approved, shall only be acceptable for use when it is produced by the designated plant, it utilizes the same components, and the production of material continues to meet all criteria as specified herein, and component aggregates are maintained within the tolerances shown in Table M.04.02-2. A new JMF must be submitted to the Engineer for approval whenever a new component source is proposed.

Only one mix with one JMF will be approved for production at any one time. Switching between approved JMF mixes with different component percentages or sources of supply is prohibited.

- c. Mix Status: Each facility will have each type of mixture rated based on the results of the previous year's production. Mix Status will be provided to each bituminous concrete producer annually prior to the beginning of the paving season.

The rating criteria are based on compliance with Air Voids and Voids in Mineral Aggregate (VMA) as indicated in Table M.04.03-4 and are calculated as follows:

Criteria A: Percentage of acceptance test results with compliant air voids.

Criteria B: The average of the percentage of acceptance test results with compliant VMA, and percentage of acceptance test results with compliant air voids.

The final rating assigned will be the lower of the rating obtained with Criteria A or B.

Mix status is defined as:

“A” – Approved:

Assigned to each mixture type from a production facility with a current rating of 70% or greater, or to each mixture type completing a successful PPT.

“PPT” – Pre-Production Trial:

Temporarily assigned to each mixture type from a production facility when:

1. there are no compliant acceptance production test results submitted to the Department from the previous year;
2. there is a source change in one or more aggregate components
3. there is a component percentage change of more than 5% by weight;
4. there is a change in RAP percentage;
5. the mixture has a rating of less than 70% from the previous season;
6. a new JMF not previously submitted.

Bituminous concrete mixtures with a “PPT” status cannot be used on Department projects. Testing shall be performed by the Producer with NETTCP certified personnel on material under this status. Test results must confirm that specifications requirements in Table M.04.02-2 and Table M.04.02-5 are met before material can be used. One of the following methods must be used to verify the test results:

Option A: Schedule a day when a Department Inspector can be at the facility to witness testing or,

Option B: When the Contractor or their representative performs testing without being witnessed by an Inspector, the Contractor shall submit the test results and a split sample including 2 gyratory molds, 5,000 grams of boxed bituminous concrete, and 5,000 grams of cooled loose bituminous concrete for verification testing and approval.

Option C: When the Contractor or their representative performs testing without being witnessed by a Department Inspector, the Engineer may verify the mix in the Contractor’s laboratory.

Witnessing or verifying by the Department of compliant test results will change the mix’s status to an “A”.

The differences between the Department’s test results and the Contractor’s must be within the “C” tolerances included in the Department’s QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures in order to be verified.

“U” – Not Approved:

Status assigned to a type of mixture that does not have an approved JMF. . Bituminous concrete mixtures with a “U” status cannot be used on Department projects.

TABLE M.04.02– 2: Superpave Mixture Design Criteria

Notes: ⁽¹⁾ For all mixtures using a WMA technology, the mix temperature shall meet PG binder and WMA manufacturer's recommendations.								
Sieve	S0.25		S0.375		S0.5		S1	
	CONTROL POINTS		CONTROL POINTS		CONTROL POINTS		CONTROL POINTS	
inches	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)	Min (%)	Max (%)
2.0	-	-	-	-	-	-	-	-
1.5	-	-	-	-	-	-	100	-
1.0	-	-	-	-	-	-	90	100
3/4	-	-	-	-	100	-	-	90
1/2	100	-	100	-	90	100	-	-
3/8	97	100	90	100	-	90	-	-
#4	75	90	-	75	-	-	-	-
#8	32	67	32	67	28	58	19	45
#16	-	-	-	-	-	-	-	-
#30	-	-	-	-	-	-	-	-
#50	-	-	-	-	-	-	-	-
#100	-	-	-	-	-	-	-	-
#200	2.0	10.0	2.0	10.0	2.0	10.0	1.0	7.0
VMA (%)	16.5 ± 1		16.0 ± 1		15.0 ± 1		13.0 ± 1	
VA (%)	4.0 ± 1		4.0 ± 1		4.0 ± 1		4.0 ± 1	
Gse	JMF value		JMF value		JMF value		JMF value	
Gmm	JMF ± 0.030		JMF ± 0.030		JMF ± 0.030		JMF ± 0.030	
Dust / binder	0.6 – 1.2		0.6 – 1.2		0.6 – 1.2		0.6 – 1.2	
Mix Temp ⁽¹⁾	265 – 325°F		265 – 325°F		265 – 325°F		265 – 325°F	
TSR	≥ 80%		≥ 80%		≥ 80%		≥ 80%	
T-283 Stripping	Minimal, as determined by the Engineer							

TABLE M.04.02–3: Superpave Consensus Properties Requirements for Combined Aggregate

Notes: (1) 95/90 denotes that a minimum of 95% of the coarse aggregate, by mass, shall have one fractured face and that a minimum of 90% shall have two fractured faces.. (2) Criteria presented as maximum Percent by mass of flat and elongated particles of materials retained on the #4 sieve, determined at 5:1 ratio.					
Traffic Level	Design ESALs (80 kN), Millions	Coarse Aggregate Angularity ⁽¹⁾ ASTM D 5821, Minimum %	Fine Aggregate Angularity AASHTO T 304, Method A Minimum %	Flat and Elongated Particles ⁽²⁾ ASTM D 4791, Maximum %	Sand Equivalent AASHTO T 176, Minimum %
1	< 0.3	55/- -	40	10	40
2	0.3 to < 3.0	75/- -	40	10	40
3	≥ 3.0	95/90	45	10	45

TABLE M.04.02– 4: Superpave Traffic Levels and Design Volumetric Properties

Traffic Level	Design ESALs (million)	Number of Gyration by Superpave Gyrotory Compactor			Percent Density of Gmm from HMA/WMA specimen			Voids Filled with Asphalt (VFA) Based on Nominal mix size – inch			
		Nini	Ndes	Nmax	Nini	Ndes	Nmax	0.25	0.375	0.5	1
1	< 0.3	6	50	75	≤ 91.5	96.0	≤ 98.0	70 - 80	70 - 80	70 - 80	67 - 80
2	0.3 to < 3.0	7	75	115	≤ 90.5	96.0	≤ 98.0	65 - 78	65 - 78	65 - 78	65 - 78
3	≥ 3.0	8	100	160	≤ 90.0	96.0	≤ 98.0	65 – 77	73 - 76	65 - 75	65 - 75

**TABLE M.04.02– 5:
Superpave Minimum Binder Content by Mix Type and Level**

Mix Type	Level	Binder Content Minimum
S0.25	1	5.70
S0.25	2	5.60
S0.25	3	5.50
S0.375	1	5.70
S0.375	2	5.60
S0.375	3	5.50
S0.5	1	5.10
S0.5	2	5.00
S0.5	3	4.90
S1	1	4.60
S1	2	4.50
S1	3	4.40

M.04.03— Production Requirements:

1. Standard Quality Control Plan (QCP) for Production:

The QCP for production shall describe the organization and procedures which the Contractor shall use to administer quality control. The QCP shall include the procedures used to control the production process, to determine when immediate changes to the processes are needed, and to implement the required changes. The QCP must detail the inspection, sampling and testing protocols to be used, and the frequency for each.

Control Chart(s) shall be developed and maintained for critical aspect(s) of the production process as determined by the Contractor. The control chart(s) shall identify the material property, applicable upper and lower control limits, and be updated with current test data. As a minimum, the following quality characteristics shall be included in the control charts: percent passing #4 sieve, percent passing #200 sieve, binder content, air voids, Gmm and VMA. The control chart(s) shall be used as part of the quality control system to document variability of the bituminous concrete production process. The control chart(s) shall be submitted to the Engineer the first day of each month.

The QCP shall also include the name and qualifications of a Quality Control Manager. The Quality Control Manager shall be responsible for the administration of the QCP, including compliance with the plan and any plan modifications.

The Contractor shall submit complete production testing records to the Engineer within 24 hours in a manner acceptable to the Engineer.

The QCP shall also include the name and qualifications of any outside testing laboratory performing any QC functions on behalf of the Contractor. The QCP must also include a list of sampling & testing methods and frequencies used during production, and the names of all Quality Control personnel and their duties.

Approval of the QCP does not imply any warranty by the Engineer that adherence to the plan will result in production of bituminous concrete that complies with these specifications. The Contractor shall submit any changes to the QCP as work progresses.

2. Acceptance Requirements:

i. General:

Acceptance samples shall be obtained from the hauling vehicles and tested by the Contractor at the Plant.

The Contractor shall submit all acceptance tests results to the Engineer within 24 hours or prior to the next day's production. All acceptance test specimens and supporting documentation must be retained by the Contractor and may be disposed of with the approval of the Engineer. All quality control specimens shall be clearly labeled and separated from the acceptance specimens.

Contractor personnel performing acceptance sampling and testing must be present at the facility prior to, during, and until completion of production, and be certified as a NETTCP HMA Plant Technician or Interim HMA Plant Technician and be in good standing. Production of material for use on State projects must be suspended by the Contractor if such personnel are not present. Technicians found by the Engineer to be non-compliant with NETTCP policies and procedures or Department policies may be removed by the Engineer from participating in the acceptance testing process for Department projects until their actions can be reviewed.

Anytime during production that testing equipment becomes defective or inoperable, production can continue for a maximum of 1 hour. The Contractor shall obtain box sample(s) in accordance with Table M.04.03-2 to satisfy the daily acceptance testing requirement for the quantity shipped to the project. The box sample(s) shall be tested once the equipment issue has been resolved to the satisfaction of the Engineer. Production beyond 1 hour may be considered by the Engineer. Production will not be permitted beyond that day until the subject equipment issue has been resolved.

Verification testing will be performed by the Engineer in accordance with the Department's QA Program for Materials.

Should the Department be unable to verify the Contractor's acceptance test result(s) due to a failure of the Contractor to retain acceptance test specimens or supporting documentation, the Contractor shall review its quality control plan, determine the cause of the nonconformance and

respond in writing within 24 hours to the Engineer describing the corrective action taken. In addition, the Contractor must provide supporting documentation or test results to validate the subject acceptance test result(s). The Engineer may invalidate any adjustments for material corresponding to the subject acceptance test(s). Failure of the Contractor to adequately address quality control issues at a facility may result in suspension of production for Department projects at that facility.

ii. Curb Mix Acceptance Sampling and Testing Procedures:

Curb Mix shall be tested in accordance to Table M.04.03-1 by the Contractor at a frequency of one test per every 250 tons of cumulative production, regardless of the day of production.

TABLE M.04.03 – 1: Curb Mix Acceptance Test Procedures

Protocol	Reference	Description
1	AASHTO T 30(M)	Mechanical Analysis of Extracted Aggregate
2	AASHTO T 168	Sampling of Bituminous Concrete
3	AASHTO T 308	Binder content by Ignition Oven method (adjusted for aggregate correction factor)
4	AASHTO T 209(M)⁽²⁾	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
5	AASHTO T 312⁽²⁾	⁽¹⁾ Superpave Gyrotory molds compacted to N _{des}
6	AASHTO T 329	Moisture Content of Hot-Mix Asphalt (HMA) by Oven Method

Notes: ⁽¹⁾ One set equals two six-inch molds. Molds to be compacted to 50 gyrations

⁽²⁾ Once per year or when requested by the Engineer

a. Determination of Off-Test Status:

- i. Curb Mix is considered “off test” when the test results indicate that any single value for bitumen content or gradation are not within the tolerances shown in Table M.04.02-1. If the mix is “off test”, the Contractor must take immediate actions to correct the deficiency and a new acceptance sample shall be tested on the same day or the following day of production.
- ii. When multiple silos are located at one site, mixture supplied to one project is considered as coming from one source for the purpose of applying the “off test” status.
- iii. The Engineer may cease supply from the plant when test results from three consecutive samples are not within the JMF tolerances or the test results from two consecutive samples not within the control points indicated in Table M.04.02-1 regardless of production date.

b. JMF revisions

- i. If a test indicates that the bitumen content or gradation are outside the tolerances, the Contractor may make a single JMF revision as allowed by the Engineer prior to any additional testing. Consecutive test results outside the requirements of Table M.04.02-1 JMF tolerances may result in rejection of the mixture.
- ii. Any modification to the JMF shall not exceed 50% of the JMF tolerances indicated in Table M.04.02-1 for any given component of the mixture without approval of the Engineer. When such an adjustment is made to the bitumen, the corresponding production percentage of bitumen shall be revised accordingly.

iii. Superpave Mix Acceptance:

a. Sampling and Testing Procedures

Production Lot: The Lot will be defined as one of the following types:

- Non-PWL Production Lot for total estimated project quantities per mixture less than 3500 tons: All mixture placed during a single continuous paving operation.
- PWL Production Lot for total estimated project quantities per mixture of 3500 tons or more: Each 3500 tons of mixture produced within 30 calendar days.

Production Sub Lot:

- For Non-PWL: As defined in Table M.04.03 – 2
- For PWL: 500 tons (the last Sub Lot may be less than 500 tons)

Partial Production Lots (For PWL only): A Lot with less than 3500 tons due to:

- completion of the Course
- a Job Mix Formula revision due to changes in:
 - o cold feed percentages over 5%
 - o target combined gradation over 5%
 - o target binder over 0.15%
 - o any component specific gravity
- a Lot spanning 30 calendar days

The acceptance sample(s) location(s) shall be selected using stratified – random sampling in accordance with ASTM D 3665 based on:

- the total daily estimated tons of production for non-PWL lots, or
- the total lot size for PWL lots.

One acceptance sample shall be obtained and tested per Sub Lot. The Engineer may direct that additional acceptance samples be obtained. For non-PWL lots, one acceptance test shall always be performed in the last sub-lot based on actual tons of material produced.

For Non-PWL lots, quantities of the same mixture per plant may be combined daily for multiple State projects to determine the number of sub lots.

The payment adjustment will be calculated as described in 4.06.

**TABLE M.04.03 – 2:
Superpave Acceptance Testing Frequency per Type/Level/Plant for Non-PWL lots**

Daily quantity produced in tons (lot)	Number of Sub Lots/Tests
0 to 150	0, Unless requested by the Engineer
151 to 500	1
501 to 1,000	2
1,001 to 2,000	3
2,001 or greater	1 per 500 tons or portions thereof

The following test procedures shall be used for acceptance:

TABLE M.04.03– 3: Superpave Acceptance Testing Procedures

Protocol	Procedure	Description
1	AASHTO T 168	Sampling of bituminous concrete
2	AASHTO R 47	Reducing samples to testing size
3	AASHTO T 308	Binder content by ignition oven method (adjusted for aggregate correction factor)
4	AASHTO T 30(M)	Gradation of extracted aggregate for bituminous concrete mixture
5	AASHTO T 312	⁽¹⁾ Superpave gyratory molds compacted to N_{des}
6	AASHTO T 166	⁽²⁾ Bulk specific gravity of bituminous concrete
7	AASHTO R 35	⁽²⁾ Air voids, VMA
8	AASHTO T 209(M)	Maximum specific gravity of bituminous concrete (average of two tests)
9	AASHTO T 329	Moisture content of bituminous concrete

Notes: ⁽¹⁾ One set equals two six-inch molds. Molds to be compacted to N_{max} for PPTs and to N_{des} for production testing. The first subplot of the year will be compacted to N_{max}

⁽²⁾ Average value of one set of six-inch molds.

If the average ignition oven corrected binder content differs by 0.3% or more from the average of the Plant ticket binder content in five (5) consecutive tests regardless of the production date (moving average), the Contractor shall immediately investigate, determine an assignable cause and correct the issue. When two consecutive moving average differences are 0.3% or more and no assignable cause has been established, the Engineer may require a new ignition oven aggregate correction factor to be performed or to adjust the current factor by the average of the differences between the corrected binder content and production Plant ticket for the last five (5) acceptance results.

The test specimen must be placed in an ignition oven for testing in accordance with AASHTO T 308 within thirty minutes of being obtained from the hauling vehicle and the test shall start immediately after.

The Contractor shall perform TSR testing within 30 days after the start of production for all design levels of HMA- and PMA- S0.5 plant-produced mixtures, in accordance with AASHTO T 283(M). The TSR test shall be performed at an AMRL certified laboratory by NETTCP certified technicians. The compacted specimens may be fabricated at the Plant and then tested at an AMRL accredited facility. The test results and specimens shall be submitted to the Engineer for review. Superpave mixtures that require anti-strip additives (either liquid or mineral) shall continue to meet all requirements specified herein for binder and bituminous concrete. The Contractor shall submit the name, manufacturer, percent used, technical datasheet and SDS for the anti-strip additive (if applicable) to the Engineer.

b. Determination of Off-Test Status:

- i. Superpave mixes shall be considered "*off test*" when any Control Point Sieve, binder content, VA, VMA, or Gmm value is outside of the limits specified in Table M.04.03-4 or the target binder content at the Plant is below the minimum binder content stated in Table M.04.02-5. Note that further testing of samples or portions of samples not initially tested for this purpose cannot be used to change the status.
- ii. Any time the bituminous concrete mixture is considered Off-test:
 1. The Contractor shall notify the Engineer when the Plant is "*off test*" for any mix design that is delivered to the project in any production day. When multiple silos are located at one site, mixture supplied to one project is considered as coming from one source for the purpose of applying the "*off test*" determination.
 2. The Contractor must take immediate actions to correct the deficiency, minimize "*off test*" production to the project, and obtain an additional Process Control (PC) test after any corrective action to verify production is in conformance to the specifications. A PC test will not be used for acceptance and is solely for the use of the Contractor in its quality control process.

c. Cessation of Supply for Superpave Mixtures in non-PWL lots:

A mixture shall not be used on Department's projects when it is "off test" for:

- i. four (4) consecutive tests in any combination of VA, VMA or Gmm, regardless of date of production, or,
- ii. two (2) consecutive tests in the Control Point sieves in one production shift.

As a result of cessation of supply, the mix status will be changed to PPT.

d. JMF revisions:

JMF revisions are only permitted prior to or after a production shift. A JMF revision is effective from the time it was submitted and is not retroactive to the previous test(s).

JMF revisions shall be justified by a documented trend of test results.

Revisions to aggregate and RAP specific gravities are only permitted when testing is performed at an AMRL certified laboratory by NETTCP certified technicians.

A JMF revision is required when the Plant target RAP and/or bin percentage deviates by more than 5% and/or the Plant target binder content deviates by more than 0.15% from the active JMF.

TABLE M.04.03– 4: Superpave Mixture Production Requirements

Notes: (1) 300°F minimum after October 15. (2) JMF tolerances shall be defined as the limits for production compliance. (3) For all mixtures with WMA technology, changes to the minimum aggregate temperature will require Engineer's approval. (4) For PMA and mixtures with WMA technology, the mix temperature shall meet manufacturer's recommendations. In addition, for all mixtures with WMA technology, the maximum mix temperature shall not exceed 325°F.(5) 0.4 for PWL lots (6) 1.3 for PWL lots (7) 1.2 for PWL lots									
	S0.25		S0.375		S0.5		S1		Tolerances
Sieve	CONTROL POINTS		CONTROL POINTS		CONTROL POINTS		CONTROL POINTS		From JMF Targets ⁽²⁾
inches	Min(%)	Max(%)	Min(%)	Max(%)	Min(%)	Max(%)	Min(%)	Max(%)	±Tol
1.5	-	-	-	-	-	-	100	-	
1.0	-	-	-	-	-	-	90	100	
3/4	-	-	-	-	100	-	-	90	
1/2	100	-	100	-	90	100	-	-	
3/8	97	100	90	100	-	90	-	-	
#4	75	90	-	75	-	-	-	-	
#8	32	67	32	67	28	58	19	45	
#16	-	-	-	-	-	-	-	-	
#200	2.0	10.0	2.0	10.0	2.0	10.0	1.0	7.0	
Pb	JMF value		JMF value		JMF value		JMF value		0.3 ⁽⁵⁾
VMA (%)	16.5		16.0		15.0		13.0		1.0 ⁽⁶⁾
VA (%)	4.0		4.0		4.0		4.0		1.0 ⁽⁷⁾
Gmm	JMF value		JMF value		JMF value		JMF value		0.030
Agg. Temp ⁽³⁾	280 – 350F		280 – 350F		280 – 350F		280 – 350F		
Mix Temp ⁽⁴⁾	265 – 325 F ⁽¹⁾		265 – 325 F ⁽¹⁾		265 – 325 F ⁽¹⁾		265 – 325 F ⁽¹⁾		
Prod. TSR	N/A		N/A		≥80%		N/A		
T-283 Stripping	N/A		N/A		Minimal as determined by the Engineer		N/A		

**TABLE M.04.03– 5:
Superpave Traffic Levels and Design Volumetric Properties**

Traffic Level	Design ESALs	Number of Gyations by Superpave Gyrotory Compactor	
	(million)	Nini	Ndes
1	< 0.3	6	50
2	0.3 to < 3.0	7	75
3	≥3.0	8	100

**TABLE M.04.03-6:
Modifications to Standard AASHTO and ASTM Test Specifications and Procedures**

AASHTO Standard Method of Test	
Reference	Modification
T 30	Section 7.2 thru 7.4 Samples are not routinely washed for production testing
T 168	<p>Samples are taken at one point in the pile. Samples from a hauling vehicle are taken from only one point instead of three as specified.</p> <p>Selection of Samples: Sampling is equally important as the testing, and the sampler shall use every precaution to obtain samples that are truly representative of the bituminous mixture.</p> <p>Box Samples: In order to enhance the rate of processing samples taken in the field by construction or maintenance personnel the samples will be tested in the order received and data processed to be determine conformance to material specifications and to prioritize inspections by laboratory personnel.</p>
T 195	Section 4.3 only one truck load of mixture is sampled. Samples are taken from opposite sides of the load.
T 209	<p>Section 7.2 The average of two bowls is used proportionally in order to satisfy minimum mass requirements.</p> <p>8.3 Omit Pycnometer method.</p>
T 283	When foaming technology is used, the material used for the fabrication of the specimens shall be cooled to room temperature, and then reheated to the manufactures recommended compaction temperature prior to fabrication of the specimens.

AASHTO Standard Recommended Practices	
Reference	Modification
R 26	<p>All laboratory technician(s) responsible for testing PG-binders be certified or Interim Qualified by the New England Transportation Technician Certification Program (NETTCP) as a PG Asphalt Binder Lab Technician.</p> <p>All laboratories testing binders for the Department are required to be accredited by the AASHTO Materials Reference Laboratory (AMRL).</p> <p>Sources interested in being approved to supply PG-binders to the Department by use of an “in-line blending system,” must record properties of blended material, and additives used.</p> <p>Each source of supply of PG-binder must indicate that the binders contain no additives used to modify or enhance their performance properties. Binders that are manufactured using additives, modifiers, extenders etc., shall disclose the type of additive, percentage and any handling specifications/limitations required.</p> <p>All AASHTO M 320 references shall be replaced with AASHTO M 332.</p> <p>Once a month, one split sample and test results for each asphalt binder grade and each lot shall be submitted by the PG binder supplier to the Department’s Central Lab. Material remaining in a certified lot shall be re-certified no later than 30 days after initial certification. Each April and September, the PG binder supplier shall submit test results for two (2) BBR tests at two (2) different temperatures in accordance with AASHTO R 29.</p>

SECTION M.13 – ROADSIDE DEVELOPMENT

Article M.13.04 – Seed Mixtures:

Replace (a) with the following:

(a) Turf Seed Mix:

In order to preserve and enhance the diversity, the source for seed mixtures shall be locally obtained within the Northeast USA including New England, New York, Pennsylvania, New Jersey, Delaware, or Maryland. One approved seed mixture is detailed below. Other proposed mixtures must be approved by the ConnDOT Landscape Design office.

Species		
<u>Common name</u>	<u>Scientific name</u>	<u>Proportion (Percent)</u>
Abbey Kentucky Bluegrass	Poa pratensis	25
Ambrose Chewing Fescue	Festuca rubra	15
Envicta Kentucky Bluegrass	Poa pratensis	15
Manhattan Ryegrass	Lolium perenne	20
Pennlawn Red Fescue	Festuca rubra	25

ITEM #0202001A – EARTH EXCAVATION

Work under this item shall conform to the requirements of Section 2.02, amended as follows:

Article 2.02.01 – Description:

Add the following:

The work shall include the removal of sidewalk as show on the plans or as ordered by the Engineer and shall include Concrete Sidewalk, Bituminous Concrete Sidewalk and sidewalk ramps. Cutting concrete sidewalk at the limits shown if needed shall also be included in the work for Earth Excavation.

Article 2.01.05 – Basis of Payment:

Add the following:

All cost per cubic yard shall include the excavation and disposal of concrete and bituminous concrete sidewalk and ramps which price shall include all materials, equipment, tools, and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Earth Excavation	CY

ITEM #0219011A – SEDIMENTATION CONTROL AT CATCH BASIN

Description: This work shall consist of furnishing, installing, cleaning, maintaining, replacing, and removing sedimentation control at catch basins at the locations and as shown on plans and as directed by the engineer.

Materials

Sack shall be manufactured from a specially designed woven polypropylene geotextile sewn by a double needle machine, using a high strength nylon thread. Sack shall be manufactured by one of the following or an approved equal:

Siltsack®

SI Geosolutions:

www.sigeosolutions.com

(800)621-0444

Dandy Sack™

Dandy Products Inc.

P.O. Box 1980

Westerville, Ohio 43086

Phone: 800-591-2284

Fax: 740-881-2791

Email: dlc@dandyproducts.com

Website: www.dandyproducts.com

FLeXstorm Inlet Filters

Inlet & Pipe Protection

24137 W. 111th St - Unit A

Naperville, IL 60564

Telephone: (866) 287-8655

Fax: (630) 355-3477

The sack will be manufactured to fit the opening of the catch basin or drop inlet. Sack will have the following features: two dump straps attached at the bottom to facilitate the emptying of sack and lifting loops as an integral part of the system to be used to lift sack from the basin. The sack shall have a restraint cord approximately halfway up the sack to keep the sides away from the catch basin walls, this cord is also a visual means of indicating when the sack should be emptied. Once the strap is covered with sediment, the sack should be emptied, cleaned and placed back into the basin.

Construction Methods:

Installation, removal, and maintenance shall be per manufacturer instructions and recommendations.

Method of Measurement: Sedimentation Control at Catch Basin will be measured as each installed, maintained, accepted, and removed. There will be no separate measurement for maintenance or replacement associated with this item.

Basis of Payment:

Sedimentation Control at Catch Basin will be paid for at the contract unit price each complete in place and accepted, which price shall include all maintenance throughout construction, disposal of debris, materials, equipment, tools, and labor incidental thereto.

ITEM #0406275A - FINE MILLING OF BITUMINOUS CONCRETE (0 TO 4 INCHES)

Description: This work shall consist of the milling, removal, and disposal of existing bituminous concrete pavement.

Construction Methods: The Contractor shall remove the bituminous concrete material using means acceptable to the Engineer. The pavement surface shall be removed to the line, grade, and existing or typical cross-section shown on the plans or as directed by the Engineer.

The bituminous concrete material shall be disposed of offsite by the Contractor at an approved disposal facility unless otherwise stated in the Contract.

Any milled surface, or portion thereof, that is exposed to traffic shall be paved within five (5) calendar days unless otherwise stated in the plans or Contract.

The equipment for milling the pavement surface shall be designed and built for milling bituminous concrete pavements. It shall be self propelled with sufficient power, traction, and stability to maintain depth and slope and shall be capable of removing the existing bituminous concrete pavement.

The milling machine shall be equipped with a built-in automatic grade averaging control system that can control the longitudinal profile and the transverse cross-slope to produce the specified results. The longitudinal controls shall be capable of operating from any longitudinal grade reference, including string line, contact ski (30 feet minimum), non-contact ski (20 feet minimum), or mobile string line (30 feet minimum). The transverse controls shall have an automatic system for controlling cross-slope at a given rate. The Engineer may waive the requirement for automatic grade or slope controls where the situation warrants such action.

The machine shall be able to provide a 0 to 4 inch deep cut in one pass. The rotary drum of the machine shall use carbide or diamond tipped tools spaced not more than $\frac{5}{16}$ inch apart. The forward speed of the milling machine shall be limited to no more than 45 feet/minute. The tools on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture.

The machine shall be equipped with an integral pickup and conveying device to immediately remove material being milled from the surface of the roadway and discharge the millings into a truck, all in one operation. The machine shall also be equipped with a means of effectively limiting the amount of dust escaping from the milling and removal operation.

When milling smaller areas or areas where it is impractical to use the above described equipment, the use of a lesser equipped milling machine may be permitted when approved by the Engineer.

Protection shall be provided around existing catch basin inlets, manholes, utility valve boxes, and any similar structures. Any damage to such structures as a result of the milling operation is the Contractor's responsibility and shall be repaired at the Contractor's expense.

To prevent the infiltration of milled material into the storm drainage system, the Contractor shall take special care to prevent the milled material from falling into the inlet openings or inlet grates. Any milled material that has fallen into inlet openings or inlet grates shall be removed at the Contractor's expense.

Surface Tolerance: The milled surface shall provide a satisfactory riding surface with a uniform textured appearance. The milled surface shall be free from gouges, longitudinal grooves and ridges, oil film, and other imperfections that are a result of defective equipment, improper use of equipment, or poor workmanship. The Contractor, under the direction of the Inspector, shall perform random spot-checks with a Contractor supplied ten-foot straightedge to verify surface tolerances at a minimum of five (5) locations per day. The variation of the top of two ridges from the testing edge of the straightedge, between any two ridge contact points, shall not exceed ¼ inch. The variation of the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed ¼ inch. Any unsatisfactory surfaces produced are the responsibility of the Contractor and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

The depth of removal will be verified by taking measurements every 250 feet per each pass of the milling machine, or as directed by the Engineer. These depth measurements shall be used to monitor the average depth of removal.

Where a surface delamination between bituminous concrete layers or a surface delamination of bituminous concrete on Portland cement concrete causes a non-uniform texture to occur, the depth of milling shall be adjusted in small increments to a maximum of +/- ½ inch to eliminate the condition.

When removing bituminous concrete pavement entirely from an underlying Portland cement concrete pavement, all of the bituminous concrete pavement shall be removed leaving a uniform surface of Portland cement concrete, unless otherwise directed by the Engineer.

Any unsatisfactory surfaces produced by the milling operation are the Contractor's responsibility and shall be corrected at the Contractor's expense and to the satisfaction of the Engineer.

No vertical faces, transverse or longitudinal, shall be left exposed to traffic unless the requirements below are met. This shall include roadway structures (catch basins, manholes, utility valve boxes, etc.). If any vertical face is formed in an area exposed to traffic, a temporary paved transition shall be established according to the requirements shown on the plans. If the milling machine is used to form a temporary transition, the length of the temporary transition shall conform to Special Provision Section 4.06 –Bituminous Concrete, "Transitions for Roadway Surface," the requirements shown on the plans, or as directed by the Engineer. At all

permanent limits of removal, a clean vertical face shall be established by saw cutting prior to paving.

Roadway structures shall not have a vertical face of greater than one (1) inch exposed to traffic as a result of milling. All structures within the roadway that are exposed to traffic and greater than one (1) inch above the milled surface shall receive a transition meeting the following requirements:

For roadways with a posted speed limit of 35 mph or less*:

1. Round structures with a vertical face of greater than 1 inch to 2.5 inches shall be transitioned with a hard rubber tapered protection ring of the appropriate inside diameter designed specifically to protect roadway structures.
2. Round structures with a vertical face greater than 2.5 inches shall receive a transition of bituminous concrete formed at a minimum 24 to 1 (24:1) taper in all directions.
3. All rectangular structures with a vertical face greater than 1 inch shall receive a transition of bituminous concrete formed at a minimum 24 to 1 (24:1) taper in all directions.

*Bituminous concrete tapers at a minimum 24 to 1 (24:1) taper in all directions may be substituted for the protection rings if approved by the Engineer.

For roadways with a posted speed limit of 40, 45 or 50 mph:

1. All structures shall receive a transition of bituminous concrete formed at a minimum 36 to 1 (36:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be 24 to 1 (24:1) in all other directions.

For roadways with a posted speed limit of greater than 50 mph:

1. All structures shall receive a transition of bituminous concrete formed at a minimum 60 to 1 (60:1) taper in the direction of travel. Direction of travel includes both the leading and trailing side of a structure. The minimum taper shall be 24 to 1 (24:1) in all other directions.

All roadway structure edges and bituminous concrete tapers shall be clearly marked with fluorescent paint. The paint shall be maintained throughout the exposure to traffic.

The milling operation shall proceed in accordance with the requirements of the "Maintenance and Protection of Traffic" and "Prosecution and Progress" specifications, or other Contract requirements. The more stringent specification shall apply.

Prior to opening an area which has been milled to traffic, the pavement shall be thoroughly swept with a sweeper truck. The sweeper truck shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. The sweeper truck shall operate at a forward speed that allows for the maximum pickup of millings from the roadway surface. Other

sweeping equipment may be provided in lieu of the sweeper truck where acceptable by the Engineer.

Any milled area that will not be exposed to live traffic for a minimum of 48 hours prior to paving shall require a vacuum sweeper truck in addition to, or in lieu of, mechanical sweeping. The vacuum sweeper truck shall have sufficient power and capacity to completely remove all millings from the roadway surface including any fine particles within the texture of the milled surface. Vacuum sweeper truck hose attachments shall be used to clean around pavement structures or areas that cannot be reached effectively by the main vacuum. Compressed air may be used in lieu of vacuum attachments if approved by the Engineer.

Method of Measurement: This work will be measured for payment by the number of square yards of area from which the milling of asphalt has been completed and the work accepted. No area deductions will be made for minor unmilled areas such as catch basin inlets, manholes, utility boxes and any similar structures.

Basis of Payment: This work will be paid for at the Contract unit price per square yard for “Fine Milling of Bituminous Concrete (0 to 4 Inches).” This price shall include all equipment, tools, labor, and materials incidental thereto.

No additional payments will be made for multiple passes with the milling machine to remove the bituminous surface.

No separate payments will be made for cleaning the pavement prior to paving; providing protection and doing handwork removal of bituminous concrete around catch basin inlets, manholes, utility valve boxes and any similar structures; repairing surface defects as a result of the Contractors negligence; providing protection to underground utilities from the vibration of the milling operation; removal of any temporary milled or paved transition; removal and disposal of millings; furnishing a sweeper truck and sweeping after milling. The costs for these items shall be included in the Contract unit price.

Pay Item
Fine Milling of Bituminous Concrete (0 to 4 Inches)

Pay Unit
S.Y.

ITEM #0601445A - EMBANKMENT WALL (SITE NO. 1)

Description: This item will consist of designing, furnishing and constructing an embankment retaining wall in the location, grades, and to the dimensions and details shown on the contract drawings, and in accordance with these specifications.

Retaining Wall Selection: The Contractor shall select the proprietary embankment retaining wall from the Department's current approved list shown below. The Engineer will reject any proposed retaining wall that is not listed below.

The following is a list of the proprietary embankment retaining walls for this project:

1. VERSA-LOK Retaining Wall
VERSA-LOK of New England
P.O. Box 6002
Nashua, NH 03063
(603) 883-3042

3. KeySystem I Retaining Wall
Keystone Retaining Wall Systems
13453 County Road 1
Fairhope, AL 36532
(251) 990-5761

2. MESA Retaining Wall System
TENSAR Earth Technology, Inc.
227 Ritter Road
Sewickley, PA 15143
(412) 749-9190

4. Pyramid Modular Blockwall
The Reinforced Earth Company
133 Park Street
North Reading, MA 01864
(978) 664-2830

5. Redi-Rock Retaining Wall-
Cobblestone Face Mold
Redi-Rock Walls-CT Division
68A South Canal Street
Plainville, CT 06062
(860) 793-6805

No other proprietary retaining walls will be allowed for this project.

This listing does not warrant that the individual walls can be designed to meet either the dimensional, structural, or geotechnical constraints at each site.

Design:

1 - Design Computations: It is the Contractor's responsibility to design and provide, detailing and additional construction specifications required to construct the wall. The actual designer of the retaining wall shall be a qualified Professional Engineer licensed in the State of Connecticut.

2 - Designer's Liability Insurance: The Designer shall secure and maintain at no direct cost to the State, a Professional Liability Insurance Policy for errors and omissions in the minimum amount of Five Hundred Thousand Dollars (\$500,000). The designer may, at his election, obtain a policy containing a maximum One Hundred Twenty Five Thousand Dollars (\$125,000) deductible clause, but if he should obtain a policy containing such a clause, the designer shall be liable to the extent of the deductible amount. The Designer shall obtain the appropriate and proper endorsement to its Professional Liability Policy to cover the indemnification clause in this contract as the same relates to negligent acts, errors or omissions in the work performed by the Designer. The Designer shall continue this liability insurance coverage for a period of three years from the date of the acceptance of the work by the agency head as evidenced by a certificate of acceptance issued to the contractor or for three years after the termination of the contract, whichever is earlier, subject to the continued commercial availability of such insurance.

The designer shall supply the certificate of this insurance to the Engineer prior to the start of construction of the wall. The designer's insurance company shall be licensed in the State of Connecticut.

3 - Preliminary Submissions: Prior to the start of fabrication or construction, the Contractor shall submit to the Engineer a design package, which shall include, but not be limited to the following:

a. Detailed Plans:

- Plan sheets shall be approximately 24" x 36"
- Stamped by a licensed Professional Engineer (Connecticut).
- Full plan view of the wall drawn to scale. The plan view must reflect the horizontal alignment and offset from the horizontal control line to the face of the wall. Beginning and ending stations, all utilities, signs, lights, etc. that affect the construction along with all property lines and easement lines adjacent to the wall shall be shown.
- Full elevation view of the wall drawn to scale. Elevation views should indicate the elevation at the top and bottom of walls, horizontal and vertical break points, and the location of finished grade.
- Typical cross sections drawn to scale including all appurtenances. Detailed cross section should be provided at significant reinforcement transitions such as wall ends.

- Details of all wall components and their connections such as the length, size and type of soil reinforcement and where any changes occur; facing details; connections; etc.
 - Certified test reports indicating the connection strength versus normal load relationship for the block-soil reinforcement connection to be used.
 - Drainage details for embankment backfill including attachment to outlets shown on contract drawings.
 - Details of any roadway drainage pipe projecting through the wall, or any attachments to the wall. Details of the treatment of drainage swales or ditches shown on the contract drawings.
 - Design parameters used along with AASHTO references.
 - Material designations for all materials to be used.
 - Detailed construction methods including a quality control plan. Construction quality control plans should include monitoring and testing frequencies (e.g. for setting batter and maintaining horizontal and vertical control). Construction restraints should also be listed in the details. Specific requirements for construction around obstructions should be included.
 - Details of installation of protective fencing where required.
 - Details of Architectural Treatment where required.
 - Details of Temporary Earth Retaining System(s) where required.
 - Details of wall treatment where the wall abuts other structures.
 - Treatment at underground utilities where required.
- b. Design Computations:
- Stamped by a licensed Professional Engineer (Connecticut).
 - Computations shall clearly refer to the applicable AASHTO provisions as stated in the Notes on the Contract Drawings.
 - Documentation of computer programs including all design parameters.

c. Construction Specifications:

- Construction methods specific to the proprietary retaining wall chosen. These specifications should include construction limitations including vertical clearance, right-of-way limits, etc. Submittal requirements for materials such as certification, quality, and acceptance/rejection criteria should be included. Details on connection of modular units and connection of reinforcements such that assurance of uniform stress transfer should be included.
- Any requirements not stated herein.

The submissions for proprietary retaining walls shall be treated as working drawings according to Section 1.05 amended as follows:

a. Six sets of each submission shall be supplied to the State.

b. The Contractor shall allow 21 days for the review of each submission. If subsequent submissions are required as a result of the review process, 21 days shall be allowed for review of these submissions. No extensions in contract time will be allowed for the review of these submissions.

4 - Final Submissions: Once a proprietary retaining wall design has been reviewed and accepted by the Department, the Contractor shall submit the final plans. The final submission shall include one set of full size (approximately 24" x 36") mylar sheets and five sets of full size blue line copies.

The final submission shall be made within 14 days of acceptance by the State. No work shall be performed on the retaining wall until the final submission has been received by the Department.

Acceptance of the final design shall not relieve the Contractor of his responsibility under the contract for the successful completion of the work.

The actual designer of the proprietary retaining wall is responsible for the review of any shop drawings prepared for the fabrication of the wall. One set of full size blue line copies of all approved shop drawings shall be submitted to the Department's permanent records.

5 - General Design Requirements:

a. All designs for proprietary walls and temporary earth retaining systems shall conform to the latest edition of the American Association of State Highway and Transportation Officials (AASHTO) LRFD Bridge Design Specifications, 8th Edition as supplemented by the CTDOT Bridge Design Manual, 2003 Edition, up to and including the latest revisions.

b. The wall design shall follow the general dimensions of the wall envelope shown in the contract plans.

c. The top of the concrete leveling pad shall be located at or below the theoretical leveling pad elevation. The minimum wall embedment shall be two feet as measured to the top of the leveling pad or as shown on the plans.

d. If footing steps are required, they shall be kept below the minimum embedment depth. Footing steps in addition to those shown on the plans will be permitted at no additional cost to the State.

e. The wall shall be designed to be within all property lines and easement lines shown on the contract drawings. If additional work areas are necessary for the construction of the proprietary retaining wall, the Contractor shall be responsible for obtaining the rights from the affected property owners. Copies of these rights shall be forwarded to the Department.

f. The top of the wall shall be at or above the top of the wall elevations shown on the plans. The top of the wall may be level or sloped to meet the top of the wall line noted.

g. Cast-in-place concrete will not be an acceptable replacement for areas noted by the wall envelope, except for minor grouting of pipe penetrations.

h. The mechanical wall height for the purposes of design calculations shall be from the top of the leveling pad to the top of the potential failure surface where the failure surface intercepts the ground surface.

i. The minimum length of internal soil reinforcement shall be as specified in AASHTO 5.8.1, except for the minimum eight (8.0') foot length requirement.

j. If there are specific surcharges acting on the wall, they shall also be accounted for. The minimum equivalent fluid pressure used to design the wall shall be 33 lbs./ft² per linear foot of wall.

k. The maximum allowable bearing capacity of the soil shall be assumed to be 4 ksf unless otherwise shown on the plans. If additional soils information is required by the Contractor's designer, it must be obtained by the Contractor. The cost of obtaining additional geotechnical information shall be included in the cost of this item.

l. For limit state allowable stress computations of extensible reinforcements, the combined factor of safety for construction damage and environmental/aging effects shall not be less than 1.75.

Materials: Materials shall conform to the following requirements and those not listed below shall be as prescribed within the Standard Specifications for Roads, Bridges and Incidental Construction, including supplemental specifications and applicable special provisions.

1 – Facing Block: The facing block can be precast or dry cast concrete and shall be the color specified on the plans. The block shall meet the following requirements:

a. Drycast Concrete:

- i. The minimum compressive strength of the block shall be 4000 psi measured at 28 days.
- ii. The maximum water absorption shall be less than five percent.

The Contractor shall submit to the Engineer a certified test report confirming the compressive strength and water absorption conforming to the requirements of ASTM C-140.

b. Precast Concrete: Shall conform to the requirements of Section M.03 and as follows:

- i. The minimum compressive strength of the block shall be 4000 psi measured at 28 days.
- ii. All precast concrete components shall be air-entrained composed of portland cement, fine and coarse aggregates, admixtures and water. The air-entraining feature may be obtained by the use of either air-entraining portland cement or an approved air-entraining admixture. The entrained-air content shall be not less than four percent or more than seven percent.

2 - Geosynthetic Soil Reinforcement: The minimum strength of the geosynthetic soil reinforcement shall be based on experimental data. The Contractor shall submit to the Engineer a certified test report confirming the strength of the material when tested according to the methods specified in ASTM D5262 and extrapolated according to ASTM D2837 as outlined in AASHTO Article 5.8.7.2.

3 – Metallic Soil Reinforcement: All soil reinforcement and structural connectors shall be hot dipped galvanized according to the requirements of ASTM A123 (AASHTO M-111). The minimum thickness of the galvanizing shall be based on the service life requirements in the AASHTO Specifications.

Steel strip reinforcement shall be hot rolled to the required shape and dimensions. The steel shall conform to AASHTO M223 (ASTM A572) Grade 65, unless otherwise specified.

Welded wire fabric reinforcement shall be shop fabricated from cold-drawn wire of the sizes and spacing shown on the plans. The wire shall conform to the requirements of ASTM A82, fabricated fabric shall conform to the requirements of ASTM A185.

4 - Metal Connectors: All metal hardware shall be hot dipped galvanized according to the requirements of ASTM A123 (AASHTO M-111). The minimum thickness of the galvanizing shall be based on the service life requirements in the AASHTO Specifications.

5 - Backfill Material: The material for backfill shall be Pervious Structure Backfill conforming to the requirements of Articles M.02.05 and M.02.06.

6 - Facing Sealer: The face of all exposed dry cast block shall be coated with clear Penetrating Sealer Protective Compound conforming to the requirements of Article M.03.01-11.

Construction Methods: All construction methods for items not listed below shall be in accordance with the detailed requirements prescribed for the construction of the several contract items entering into the completed structure as specified in the Standard Specifications for Roads, Bridges, and Incidental Construction.

1 - Installation: The foundation for the structure shall be graded level for a width equal to or exceeding the length of the soil reinforcements, or as shown on the plans. If rock is encountered in the excavation, it shall be removed to provide a level area equal to or exceeding the length of the soil reinforcement but not greater than the pay limits shown on the plans.

Prior to wall construction, the foundation, if not in rock, shall be compacted as directed by the Engineer. Any foundation soils found to be unsuitable shall be removed and replaced.

At each foundation level, an unreinforced concrete leveling pad shall be provided as shown on the plans. The leveling pad shall have nominal dimensions of 6-inch thickness and 24-inch width, and shall be cast using a minimum 2,000 psi 28-day compressive strength concrete. The leveling pad shall be cast to the design elevations as shown on the plans. Allowable elevation tolerances are +0.01 foot (1/8 inches) and -0.02 feet (1/4 inches) from the design elevation.

The materials for the wall shall be handled carefully and installed in accordance with manufacturer's recommendations and specifications. Special care shall be taken in setting the bottom course of blocks to true line and grade.

All blocks above the first course shall interlock with the lower courses by means of connecting pins. Vertical joints shall be staggered with each successive course as shown on the working drawings. Vertical tolerances and horizontal alignment tolerances measured from the face line shown on the plans shall not exceed ½ inches when measured along an 8-foot straight edge. The overall tolerance of the wall from top to bottom shall not exceed ½ inches per eight feet of wall height or one inch total, whichever is the lesser, measured from the face line shown

on the plans. A bond breaker shall be placed between the blocks and any adjacent cast-in-place concrete.

2 - Backfilling: Backfill placement shall closely follow erection of each course of panels. Backfill shall be placed in such a manner as to avoid any damage or disturbance to the wall materials or misalignment of the facing panels. Any wall materials that become damaged or disturbed during backfill placement shall be either removed and replaced at the Contractor's expense or corrected, as directed by the Engineer. Any backfill material placed within the reinforced soil mass that does not meet the requirements of this specification shall be corrected or removed and replaced at the Contractor's expense.

Backfill shall be compacted to 95 percent of the maximum density as determined by AASHTO T-99, Method C or D (with oversize correction, as outlined in Note 7).

The moisture content of the backfill material prior to and during compaction shall be uniform throughout each layer. Backfill material shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniform and acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T-99, Method C or D (with oversize correction, as outlined in Note 7).

If 30 percent or more of the backfill material is greater than $\frac{3}{4}$ inches size, AASHTO T-99 is not applicable. For such a material, the acceptance criterion for control of compaction shall be either a minimum of 70 percent of the relative density of the material as determined by a method specification provided by the wall supplier, based on a test compaction section, which defines the type of equipment, lift thickness, number of passes of the specified equipment, and placement moisture content.

The maximum lift thickness after compaction shall not exceed 10 inches, regardless of the vertical spacing between layers of soil reinforcements. The Contractor shall decrease this lift thickness, if necessary, to obtain the specified density. Prior to placement of the soil reinforcements, the backfill elevation at the face shall be level with the connection after compaction. From a point approximately three feet behind the back face of the panels to the free end of the soil reinforcements the backfill shall be two inches above the attachment device elevation unless otherwise shown on the plans.

Compaction within three feet of the back face of the panels shall be achieved by at least three passes of a lightweight mechanical tamper, roller or vibratory system. The specified lift thickness shall be adjusted as warranted by the type of compaction equipment actually used. Care shall be exercised in the compaction process to avoid misalignment of the panels or damage to the attachment devices. Heavy compaction equipment shall not be used to compact backfill within three feet of the wall face.

At the end of each day's operation, the Contractor shall slope the last level of backfill away from the wall facing to direct runoff of rainwater away from the wall face. The Contractor shall control and divert runoff at the ends of the wall such that erosion or washout of the wall section does not occur. In addition, the Contractor shall not allow surface runoff from adjacent areas to enter the wall construction site.

3 - Face Sealer: After the wall has been erected, the entire exposed face of the wall shall be coated with Penetrating Sealer Protective Compound. The application of the sealer shall conform to the requirements Article 8.18.03.

Several samples of the dry cast block shall be sealed prior to sealing the actual wall to ensure that the sealer will not discolor the block. If the sealer does discolor the block, the Contractor shall change to another approved supplier of sealer.

Method of Measurement: This work will be paid for on a lump sum basis and will not be measured for payment.

Basis of Payment: This work will be paid for at the contract lump sum price for "Embankment Wall (Site No. 1)", complete in place, which price shall include all work shown within the pay limits shown on the plans for the embankment wall including but not limited to the following:

1. Design, detailing, and specifications for the wall.
2. Excavation for the wall.
3. Design and construction of temporary earth retaining systems for the support of the slope during construction.
4. Construction of the Embankment Wall, including the unreinforced concrete leveling pad.
5. The furnishing, placing and compacting of pervious structure backfill within the maximum payment lines.
6. The furnishing and placing of backfill drainage systems for the wall.
7. Any other work and materials shown on the plans for the construction of the wall.

The price shall also include all materials, equipment, tools and labor incidental thereto.

If bedrock or large boulders (greater than one cubic yard) are encountered in the excavation, the payment for its removal shall be paid for under the item "Structure Excavation – Rock (Excluding Cofferdam and Dewatering)".

ITEM #0813021A – 6” GRANITE STONE CURBING

ITEM #0813031A – 6” GRANITE CURVE STONE CURBING

Work under this item shall conform to the requirements of Section 8.13 of the Standard Specifications, Form 817, amended as follows:

8.13.03 - Construction Methods: *Add the following:*

The finish product shall include ¼” Bevel & Thermalize Top similar to what was constructed in phase 1 - Town District Sidewalk and Access Management Plan.

All work shall proceed as directed by and to the satisfaction of the Engineer.

ITEM #0921001A CONCRETE SIDEWALK

ITEM #0921005A CONCRETE SIDEWALK RAMP

ITEM #0921013A – CONCRETE DRIVEWAY APRON

ITEM #0921039A – DETECTABLE WARNING STRIP

Delete Section 9.21 in its entirety and replace it with the following:

9.21.01—Description: This item shall consist of concrete sidewalks and ramps constructed on a gravel or reclaimed miscellaneous aggregate base course in the locations and to the dimensions and details shown on the plans or as ordered and in accordance with these specifications. Cutting of existing concrete sidewalk for the installation of new concrete sidewalk or concrete ramps shall be included in the respective items.

9.21.02—Materials: Materials for this work shall conform to the requirements of Article M.03.01 for Class “F” Concrete.

Gravel or reclaimed miscellaneous aggregate for base shall conform to Article M.02.01 for granular fill.

Detectable warning strips shall be a prefabricated detectable warning tile chosen from the Department’s Qualified Products List for retrofit and/or cast in place applications.

Metal Edging shall be placed in areas where the brick border is adjacent to the grass buffer strip. The edging shall be ¼” with a black finish, anchored with 18” landscape spikes.

9.21.03—Construction Methods:

1. Excavation: Excavation, including removal of any existing sidewalk (bituminous or concrete) and curbing, shall be made to the required depths below the finished grade, as shown on the plans or as directed. All soft and yielding material shall be removed and replaced with suitable material.

When connecting new concrete sidewalk to a section of existing concrete sidewalk, the connection point shall be at the nearest joint in the existing sidewalk.

The Contractor shall establish the limits required to achieve grades for each ramp prior to removal of existing sidewalk and ramps. The Contractor shall document and notify the Engineer of any control points that may conflict with the design grades or configuration of ramps shown on the plans. Control points can be but are not limited to ROW, utility poles, drainage structures, buildings, fences, walls or other features found near the proposed ramp. When control points are

encountered within the limits of the ramp, the Engineer will determine if an alternative ramp type is required or the ramp is to be constructed as shown on the plans.

2. Gravel or Reclaimed Miscellaneous Aggregate Base: The gravel or reclaimed miscellaneous aggregate base shall be placed in layers not over 6 inches in depth and to such a depth that after compaction it shall be at the specified depth below the finished grade of the walk. The base shall be wetted and rolled or tamped after the spreading of each layer.

3. Forms: Forms shall be of metal or wood, straight, free from warp and of sufficient strength to resist springing from the pressure of the concrete. If made of wood, they shall be of 2-inch surfaced plank except that at sharp curves thinner material may be used. If made of metal, they shall be of an approved section and have a flat surface on the top. Forms shall be of a depth equal to the depth of the sidewalk. Forms shall be securely staked, braced and held firmly to the required line and grade and shall be sufficiently tight to prevent leakage of mortar. All forms shall be cleaned and oiled or wetted before concrete is placed against them. Sheet metal templates 1/8 inch in thickness, of the full depth and width of the walk, shall be spaced at intervals of 12 feet or as directed. If the concrete is placed in alternate sections, these templates shall remain in place until concrete has been placed on both sides of the template. As soon as the concrete has obtained its initial set, the templates shall be removed.

4. Concrete: The concrete shall be proportioned, mixed, placed, etc., in accordance with the provisions of Section 6.01 for Class "F" Concrete. Concrete shall be cured in accordance with the provisions of Article 4.01.03 for Concrete Pavement.

5. Finishing: The surface of the concrete shall be finished with a wood float or by other approved means. The outside edges of the slab and all joints shall be edged with a 1/4-inch radius edging tool. Each slab shall be divided into two or more sections by forming dummy joints with a jointing tool as directed.

6. Backfilling and Removal of Surplus Material: The sides of the sidewalk shall be backfilled with suitable material thoroughly compacted and finished flush with the top of the sidewalk. All surplus material shall be removed and the site left in a neat and presentable condition to the satisfaction of the Engineer.

7. Detectable Warning Strip: The detectable warning strip for new construction shall be set directly in poured concrete and each tile shall be weighted down to prevent the tile from floating after placement in wet concrete in accordance with curing procedures. Install detectable warning strip, according to the plans and the Manufacturer's specifications, or as directed by the Engineer.

The detectable warning strip for retrofit construction shall be installed according to the plans in the direction of pedestrian route and contained wholly within painted crosswalk when present. Its installation shall conform to all Manufactures requirements.

9.21.04—Method of Measurement: This work will be measured for payment as follows:

1. Concrete Sidewalk or Sidewalk Ramp: This work will be measured by the actual number of square feet of completed and accepted concrete sidewalk or ramp.

2. Excavation: Excavation below the finished grade of the sidewalk or ramp, backfilling, and disposal of surplus material will not be measured for payment, but the cost shall be included in the

price bid for the sidewalk or ramp. Excavation above the finished grade of the sidewalk or ramp will be measured and paid for in accordance with Section 2.02

3. Gravel or Reclaimed Miscellaneous Aggregate Base: This work will not be measured for payment, but the cost shall be considered as included in the price bid for the sidewalk or ramp.

4. Detectable Warning Strip: For new construction (cast in place), the detectable warning strip will be measured for payment by the actual number of each ramp where a detectable warning strip has been installed and accepted regardless of the number of tiles installed.

5. Retrofit Detectable Warning Strip: For retrofit construction (surface applied), the detectable warning strip will be measured for payment by the actual number of each ramp where a detectable warning strip has been installed and accepted regardless of the number of tiles installed.

6. Construction Staking: The establishment of control points and limits of grading will be measured in accordance with the item Construction Staking.

7. Cut Concrete Sidewalk: This work shall not be measured but shall be included in the measurement for concrete sidewalk or concrete ramp.

9.21.05—Basis of Payment: Construction of a concrete sidewalk or ramp will be paid for at the contract unit price per square foot for "Concrete Sidewalk," or "Concrete Sidewalk Ramp" complete in place, which price shall include all excavation as specified above, backfill, disposal of surplus material, curb removal and any monolithic or separately cast sidewalk curb when required for the sidewalk ramp as shown on the plans, gravel or reclaimed miscellaneous aggregate base, equipment, tools, materials and labor incidental thereto.

Cut Concrete Sidewalk shall not be paid separately but shall be paid in the item - concrete sidewalk or concrete ramp.

A new detectable warning strip will be paid for at the contract unit price for each ramp where the detectable warning strip has been installed complete in place. This price shall include all tiles, materials, equipment, tools and labor incidental thereto.

Retrofitting the existing concrete sidewalk with a detectable warning strip will be paid for at the contract unit price for each ramp where the retrofit detectable warning strip has been installed complete in place. This price will include all tiles, saw cutting concrete, adhesive, drilling holes for fasteners, materials, equipment, tools and labor incidental there to.

The establishment of control points and limits of grading will be paid for in accordance with the item Construction Staking.

base preparation and installation to the lines and grades shown on the plans including any incidentals thereto.

Measurement for this item will be based on the number of square feet of Concrete Driveway Apron that is completed and accepted.

<u>Pay Item</u>	<u>Pay Unit</u>
Concrete Sidewalk	SF
Concrete Sidewalk Ramp	SF
Concrete Driveway Apron	SF
Detectable Warning Strip	EA

ITEM NO. 0921102A – BRICK PAVERS

Description:

This item shall consist of furnishing and installing brick pavers on a processed aggregate base to the dimensions and details as shown on the plans and in accordance with these specifications.

Materials:

Acceptable Manufacture(s):

Processed Aggregate Base: Materials for this surface shall conform to the requirements of Subarticles M.05.01-1, M.05.01-2, and M.05.01-3.

Brick Pavers: Acceptable brick paver shall be manufactured by the following:

1. Pine Hall 2 ¼” x4” x8” English Edge F/R Pavers or
2701 Shorefair Drive, P.O. Box 11044 Winston-Salem, NC 27116
2. The Belden Brick Company - Regimental Full Range Paver 4x8x2-1/4 or
P.O. Box 20910, Canton, Ohio, 44701-0910
3. Whitacre Greer - Shade #36 4x8x2-1/4
1400 S Mahoning Ave, Alliance, OH 44601

Joint Filer Sand: Acceptable brick paver shall be manufactured by the following or approved equal

1. Silpro SilproPaver Sand Polymeric Joint Sand
2 New England Way Ayer, MA, 01432-1514

Construction Methods:

The Contractor shall receive approval on the brick paver prior to the installation. The pavers will be free from excessive chips, cracks, voids, discoloration or other defects that might be visible or cause staining in finished work. The brick pavers will be mixed from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures. The brick pavers will be cut with motor-driven masonry saw equipment to provide clean, sharp, un-chipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable

1 – Excavation: Excavation shall be made to required depths below finish grade, as shown necessary to achieve the desire surface drainage for the finish surface. The Contractor shall be careful of the adjacent concrete sidewalks, building and bituminous concrete driveway and curbing. Any damage caused to the surrounding features will be replaced at the Contractor's expense.

2 – Base Course: The Processed Aggregate Base for the base course shall be uniformly spread upon the compacted subgrade to the require depth and thoroughly compacted.

3 – Brick Pavers: The brick pavers shall be set to the line and grade to achieve the desired finished surface drainage using the running bond pattern. The brick pavers shall be installed hand tight with a maximum joint not to exceed 1/8". After the brick pavers have been completely laid, sweep joint sand into the joints until full. Lightly fog with water and continue to fill with sand until no further settlement occurs. Paver edge restraints shall be installed around the entire perimeter that is not restrained by the concrete sidewalk. Place the edge restraint on

the base material and spike through pre-drilled holes into the compacted base material using 10" x 3/8" diameter steel spikes as per the manufacturer's recommendations. Upon completion, the surface shall be swept clean.

Method of Measurement

1 – Brick Pavers: This work will be measured by the actual numbers of square yards of brick pavers completed and accepted.

2 – Excavation: All excavation required for the installation of the brick pavers to the lines and grades directed by the plans or as directed by the Engineer, will not be measured for payment.

The disposal of surplus material will not be measured for payment, but the cost shall be included in the price bid for the brick pavers.

3 – Processed Aggregate Base: This work will not be measured for payment but the cost thereof shall be included in the price bid for the brick pavers.

Basis of Payment:

This work will be paid for at the contract unit price per square yard for “Brick Pavers” complete in place, which price shall include all excavation as specified above, backfill, disposal of surplus material, processed aggregate base, edge restraints, and all equipment, tools, labor and materials incidental thereto.

Pay Item

Brick Pavers

Pay Unit

SY

ITEM # 0922999A - INLAID THERMOPLASTIC PAVEMENT MARKING SYSTEM

Description:

This work shall consist of the installation of a durable imprinted aggregate reinforced preformed thermoplastic pavement marking system, "Traffic Patterns XD®" by Ennis-Flint of Thomasville, NC, telephone 336.475.6600, www.ennisflint.com, or approved equal, herein referred to as "the System", that provides a colorized, textured, highly attractive and durable topical treatment to the surface of asphalt pavement. Typically, the system replicates, in relief, the grout lines common to brick or other types of unit pavers, but may also be used to create other patterns. It is intended for use on asphalt pavements to create traffic calming solutions and decorative crosswalks, medians, intersections and through areas in parking lots.

Materials:

The aggregate reinforced preformed thermoplastic is typically supplied in panels measuring 2 ft. x 2 ft. [$\pm\frac{1}{8}$ in.]

The System shall be provided in a colonial brick color and 6" square tile pattern to match town standard.

The System shall utilize a resilient, aggregate reinforced preformed thermoplastic product which contains a minimum of thirty percent (30%) intermixed anti-skid/anti-slip elements and where the top surface contains anti-skid/anti-slip elements. These anti-skid/anti-slip elements must have a minimum hardness of 6 (Mohs scale).

The System must be resistant to the detrimental effects of motor fuels, antifreeze, lubricants, hydraulic fluids, etc.

The System manufacturer must be ISO 9001:2008 certified for design, development and manufacturing of preformed thermoplastic, and provide proof of current certification.

Must be composed of an ester modified rosin impervious to degradation by motor fuels, lubricants, etc. in conjunction with aggregates, pigments, binders, and anti-skid/anti-slip elements. Pigments and anti-skid/anti-slip elements must be uniformly distributed throughout the material. The material conforms to AASHTO designation M249, with the exception of the relevant differences due to the material being supplied in a preformed state, being non-reflective, and potentially being of a color different from white or yellow.

Pigments:

White: The material shall be manufactured with sufficient titanium dioxide pigment to meet FHWA Docket No.

FHWA-99-6190 Table 5 and Table 6 as revised and corrected.

Other Colors: The pigment system must not contain heavy metals nor any carcinogen, as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.

Skid Resistance: The surface of the material shall contain factory applied anti-skid/anti-slip elements with a minimum hardness of 6 (Mohs scale). Upon application the material shall provide a minimum skid resistance value of 60 BPN when tested according to ASTM E 303.

Slip Resistance: The surface of the material shall contain factory applied anti-skid/anti-slip elements with a minimum hardness of 6 (Mohs scale). Upon application the material shall provide a minimum static friction of coefficient of 0.6 when tested according to ASTM C 1028 (wet and dry), and a minimum static coefficient of friction of 0.6 when tested according to ASTM D 2047.

Thickness: The material must be supplied at a minimum thickness of 150 mil.

Environmental Resistance: The material must be resistant to deterioration due to exposure to sunlight, water, salt or adverse weather conditions and impervious to oil and gasoline.

Storage Life: The material may be stored for 12 months, if stored indoors and protected from the elements.

Transverse Lines to Supplement System Application: Supplied as white, retroreflective preformed thermoplastic line stripe material in 90 mil (2.3 mm) or 125 mil (3.2 mm) thicknesses, material is available in 6 in. (.15m), 8 in. (.20m) or 12 in. (.30m) widths. This preformed thermoplastic material may be supplied and applied by the certified applicator in conjunction with the System and is available from the System manufacturer. (Consult the manufacturer's published application instructions for the preformed thermoplastic line stripe material selected, for proper application methods.)

Construction Methods:

The System must be able to be applied to asphalt surfaces without preheating the application surface to a specific temperature.

The System must be able to be applied in temperatures down to 45°F (7°C) without any special storage, preheating or treatment of the material before application.

The System is applied to asphalt pavement using proprietary reciprocating infrared heating equipment. A two-part epoxy sealer specified by the manufacturer must be applied to the substrate prior to preformed thermoplastic application to ensure proper adhesion, and to provide reinforcement for larger volumes of material. Immediately following sealer application, panels of aggregate reinforced preformed thermoplastic are positioned properly on the asphalt substrate. The preformed thermoplastic is then heated to the required melting temperature. Additional aggregate may be applied to the preformed thermoplastic surface as needed following the melting process, to achieve added friction properties and a uniform surface appearance. As the material is cooling,

it is imprinted with a vibratory plate compactor and a template made from 3/8 in. (9.5 mm) flexible wire rope in the required design to create crisp, clean lines which define the pattern.

Stamping Templates: A wire rope template is required in the execution of the System. The template is used for imprinting the defined pattern once the preformed thermoplastic has been applied. The wire rope diameter for the imprinting template used for the specified pattern is 3/8 in. (9.5mm). The stamping templates are distributed by the System manufacturer.

Heating Equipment: The System manufacturer shall distribute reciprocating infrared heating equipment designed specifically to elevate the temperature of the preformed thermoplastic material and asphalt pavement without adversely affecting it. The primary heating unit must employ a bank of propane-fired infrared heaters, mounted on a track device that allows the heater bank to reciprocate back and forth over a designated area, thereby allowing the operator to monitor the temperature of the preformed thermoplastic at all times during the pavement heating process.

A smaller, mobile infrared heater distributed by the System manufacturer is designed specifically to heat areas such as borders and narrow areas that are inaccessible to the primary heaters. This secondary heater also allows the operator to monitor the temperature of the preformed thermoplastic at all times during the heating process.

An approved hand-held propane heat torch distributed by the System manufacturer shall be used to heat isolated areas of the preformed thermoplastic.

Sealer: A two-part epoxy sealer specified and distributed by the System manufacturer must be applied to the substrate prior to material application to ensure proper adhesion, and to provide reinforcement for larger volumes of material.

Specialized Sealer Dispensing Gun: Used to dispense the required two-part epoxy sealer onto the substrate. The sealer dispensing guns are distributed by the System manufacturer.

Hand Held Finishing Tool: Enables the applicator to complete the imprinting of the thermoplastic in areas around permanent structures, such as curbs and manholes covers, which may be inaccessible to the stamping template. The hand-held finishing tools are distributed by the System manufacturer.

Aggregate: Supplemental anti-skid/anti-slip elements to be applied to the surface of the molten thermoplastic as needed, if the factory applied anti-skid/anti-slip elements embed too deeply into the surface of the molten thermoplastic material during the heating process. (Embedded aggregate is exposed upon wear for extended skid resistance.) The aggregate is distributed by the System manufacturer.

Air Powered Spray Hopper: Used to spray supplemental anti-skid/anti-slip elements (aggregate) on the surface of the molten preformed thermoplastic in a uniform manner. The air powered spray hoppers are distributed by the System manufacturer.

Vibratory Plate Compactor (700-900 lb.): Shall be used for pressing the 3/8" (9.5mm) wire rope stamping templates into the thermoplastic to create the specified pattern in both the thermoplastic and asphalt substrate. The System manufacturer does not supply vibratory plate compactors.

Manufacturer Certified Applicator Requirement: The System shall be supplied and applied only by an applicator certified by the System manufacturer. The applicator shall provide proof of current certification before commencing work. The Certified Applicator shall follow the System manufacturer's current published application procedures.

Substrate Condition: The System must only be applied to a stable, high quality asphalt pavement substrate over a stable base that is free of defects, as per the manufacturer published Substrate Guide. The asphalt pavement surface shall be dry and free from all foreign matter, including but not limited to dirt, dust, de-icing materials, and chemical residue.

Procedure: The System is applied to asphalt pavement using proprietary reciprocating infrared heating equipment. The material must be able to be applied at ambient and road temperatures down to 45°F (7°C) without any preheating of the pavement to a specific temperature. A two-part epoxy sealer specified by the manufacturer must be applied to the substrate prior to preformed thermoplastic application. Immediately following sealer application, the panels of aggregate reinforced preformed thermoplastic are positioned properly on the asphalt substrate with the aggregate side facing up. The preformed thermoplastic is then heated to the required melting temperature. Additional aggregate may be applied to the preformed thermoplastic surface as needed following the melting process. As the material is cooling it is imprinted with a stamping template made from 3/8 in. (9.5 mm) flexible wire rope in the required design using a vibratory plate compactor. The preformed thermoplastic material is then allowed to cool thoroughly before being opened to vehicle or pedestrian traffic. (Consult the manufacturer's published application procedures for complete information.)

Method of Measurement:

The work of providing and installing the INLAID THERMOPLASTIC PAVEMENT MARKING SYSTEM will be measured for payment by the square foot of material installed and accepted. Bituminous pavement shall not be included in this item but rather paid for under other items in the contract.

Basis of Payment:

This work shall be paid for at the Contract unit price per square foot, which shall include all equipment, supplies, materials, labor and incidentals thereto for the complete installation of an INLAID THERMOPLASTIC PAVEMENT MARKING SYSTEM.

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>
0922999A	INLAID THERMOPLASTIC PAVEMENT MARKING SYSTEM	S.F.

ITEM #0944000A – FURNISHING AND PLACING TOPSOIL

Work under this item shall conform to the requirements of Section 9.44, amended as follows:

Article 9.44.02 - Materials

Add the following at the end of the sentence:

“except that the topsoil shall contain no rocks or stones over 1/2 inch in diameter.”

<u>Pay Item</u>	<u>Pay Unit</u>
Furnishing and Placing Topsoil	SY

ITEM #0945060A – PINE BARK MULCH

9.49.01 Description:

The work under this item shall consist of furnishing, planting, staking, and mulching trees – Syringa reticulata 'Ivory Silk' Ivory Silk Japanese Tree Lilac, Liquidambar styraciflua, Sweetgum, and Gleditsia triacanthos inermis 'Shade Master' Shade Master Thornless Honeylocust, perennials – Pennisetum alopecuroides 'Hameln' Hameln Dwarf Fountain Grass and Perovskia atriplicifolia 'Little Spire' Little Spire Russian Sage indicated on the plans. It shall also include all incidental operations, such as the care of the plant material and the replacement of dead or unsatisfactory materials before final acceptance of the contract.

9.49.02 Materials:

Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.

Topsoil: A mineral soil taken from the A Horizon of a well-drained site and having a USDA soil texture classification of a Clay Loam or Loam. ASTM D 5268, pH range of 5.5 to 7, a minimum of 2 percent organic material content; free of stones 1 inch (25 mm) or larger in any dimension and other extraneous materials harmful to plant growth.

Planting Soil: Native, imported or manufactured soil modified to become topsoil; mixed with soil amendments.

Soil shall be loose and friable, free from refuse, stumps, roots, brush, weeds, rocks and stones 1" in overall dimensions.

Soil Test Analysis: Submit certified soil physical and chemical test analysis for planting soil by approved, independent testing agencies stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of planting soil. Make submittals at least three (3) weeks prior to delivery of material to site.

The acceptable textural classes for planting soil shall be:

- * Loamy Sand, with not more than 80% sand
- * Sandy Loam
- * Loam
- * Silt Loam, with not more than 60% silt
- * Clay Loam, with not more than 30% clay
- * Sandy Clay Loam, with not more than 30% clay

Fertilizer shall be commercial grade as recommended by soil test report.

Organic Mulch material shall be shall be a native shredded pine bark, 100 percent organic, having a moisture content not exceeding 40 percent, free of any disease or insects. The particles shall pass a 1 inch square mesh and be retained on a 1/8 inch square mesh.

All plants shall be nursery-grown, first-class representatives of their normal species or varieties. They shall have well-furnished branch systems together with vigorous fibrous root systems. Plant List: Investigate sources of supply prior to submitting bid. Confirm that size, variety and quantity of plant material specified on Plant List can be supplied. Failure to take this precaution will not relieve the successful bidder from his responsibility for furnishing and installing all plant material in strict accordance with the Contract requirements and without additional expense to the Owner.

Substitutions will not be permitted unless substantiated written proof is supplied that a specified plant is not obtainable. In this situation a proposal to use the nearest equivalent size or variety with an equitable adjustment of Contract Price will be considered.

Plant material sources: Submit proposed sources for all plant material within 30 days of award of contract. Provide name and location of nursery, contract person, and telephone number.

Nursery-grown trees shall conform to the requirements as specified in the current edition of "U.S. American Standards for Nursery Stock."

All plants shall be subject to inspection and approval by a ConnDOT Landscaping Department representative, Engineer, and the Contractor shall be represented during the inspection.

All trees shall be high branched, having a 5 foot minimum branching height.

Tree Staple shall be 36" Tree Staple stabilizer (2-4" cal. trees) or 42" (4-6" cal. trees) as provided by Tree Staple Inc. which is located at: 1390 Valley Rd. Suite 2B ; Stirling, NJ 07980; Toll Free Tel: 877-873-3749; Tel: 908 626-9300; Fax: 908-626-9707; Email: request info (sales@treestaple.com); Web: www.treestaple.com or approved equivalent. Install according to planting detail and per manufacturer's instructions.

9.49.03 Construction Methods:

Schedule and Work Plan: Submit detailed schedule and Work plan, indicating start and finish dates of planting activities, including layout, soil preparation, delivery of plant material from nursery sources, excavation, and installation. If planting work is being installed in phases, submit plan with definable areas outlined and keyed, and provide schedule for planting work within each area.

Planting Season: Unless otherwise specified or directed by the Engineer, the planting seasons shall be those indicated below. No planting shall be done in frozen ground or when snow covers the ground, or the soil is otherwise in an unsuitable condition for planting.

Deciduous Material Planting Seasons

Spring: March 1 - May 15 (inclusive)

Fall: October 15 to Ground Freezes

Evergreen Material Planting Seasons

Spring: March 1 – June 1 (inclusive)

Fall: August 15 - October 1st (inclusive)

Locations: Plants shall be planted in locations as shown on the plans or as directed by the Engineer. The Contractor shall properly locate trees to carry out the intent of the plans. Trees near street intersections shall be planted no less than 25' from any street corner for safety in sight at cross streets. In the event that rock or underground construction work or other obstructions are encountered in any planting pit, the Engineer shall be notified immediately, and the plant not planted until special instructions are given, or alternative locations are selected.

Digging, Handling and Protection: Plants shall be handled at all times in accordance with the best horticultural practices, so the roots or balls are adequately protected from sun and drying winds. Balled and burlapped plants shall be dug with firm, natural balls of soil of a sufficient diameter to encompass fibrous and feeding roots. The depth of the planting pit shall be coordinated with the height of the root ball in the field and adjusted accordingly. The soil below the ball must be well compacted to avoid settling.

Preparation for Planting: Pits - Reasonable care shall be exercised to have pits dug and prepared prior to moving trees to their respective locations for planting to ensure that they will not be unnecessarily exposed to drying elements or physical damage.

Pit preparation shall include the excavation to the required depth, removal and disposal of existing unsuitable material and the furnishing of planting soil and peat backfill mixture.

Diameter: Diameter of pits for trees shall be as indicated on the plans and details. The depth of pits for trees shall be enough to accommodate the ball when the tree is set to finished grade allowing for 12" of compacted soil in the bottom of tree's pits.

Soil Preparation: Soil used in the pits shall be planting soil as herein before specified, thoroughly mixed equally with a mixture of five parts of peat humus and one part of fertilizer (5-10-5) to twenty parts of acceptable planting soil.

Tree Staple Staking: Install in accordance with manufacturer's recommended installation instructions for project conditions and the following.

Leaving burlap intact, heel the plant's root ball into place.

Remove plastic safety caps from tree staples.

Set each tree staple opposite the other and against the outside edge of the root ball. The shorter prong shall be positioned over the root ball, halfway between the trunk and the ball's outer edge.

Drive each tree staple into the ground until the cross bar is recessed one to two inches below the surface of the root ball. Alternate between hitting either of the prongs to ensure that the tree staples are completely below-grade.

Place safety caps on exposed ends.

Cut back burlap, leaving material under cross bars.

Fill and finish planting using best practices.

When balled and burlapped trees are set, planting soil mixture shall be compacted and watered to fill all voids. All burlap, ropes or wires shall be rolled down one-third of the way from the top of the ball. A shallow basin slightly larger than pit shall be formed to contain water. Backfill for the planting pits shall be with approved planting soil mixture, up to the surrounding elevations.

Pruning - All dead wood, sucker branches, and all broken or badly bruised branches shall be removed with a clean cut. Perform pruning with clean, sharp tools. If other pruning is required and approved by engineer, perform in accordance with American Association of Nurseryman Standards to preserve the nature and character of the plant.

Mulching -All trees shall be mulched with a 3" layer of pine bark mulch or gravel mulch within two days of planting. This mulch shall entirely cover the area of the planting pit.

Water - Water used in this work will be clean, pure water furnished by the Owner. Hoses, connections, and other watering equipment required for the work shall also be furnished by the Contractor.

Maintenance: Submit full and complete written program for maintenance of the planting including detailed watering program specific to plant type requirements. Maintenance shall begin immediately after each plant is planted and shall continue for two (2) years after initial acceptance. The two year period does not begin until all plant materials stipulated in the contract have been planted. When the plant establishment period begins at the end of the spring planting season, an inspection to determine the acceptability of plant establishment will be held by the Contractor and the Engineer no later than November 1st in the following year. When the plant establishment period begins at the end of the fall planting season, an inspection to determine the acceptability of plant establishment will be held by the Contractor and the Engineer by August 1st of the second year. All plants shall be watered (a minimum of once per week from April 1st to October 1st or as necessary to keep the plant materials in their best condition-applied slowly to penetrate the entire root zone), remulched, weeded, pruned, sprayed, fertilized, cultivated and otherwise maintained and protected until two year final acceptance. Ornamental grasses shall be cut to 4" above the crown of the plant using a sickle or a hedge trimmer in late February or March. Settled plants shall be re-set to proper grade and position, planting saucer restored, and dead material removed. Defective work shall be corrected as soon as possible after it becomes apparent and weather and season permit. Upon completion of planting and prior to initial acceptance, the Contractor shall remove any excess soil and debris from the site and repair any damage to structures, etc., resulting from the planting operation. Dangerous conditions shall be repaired immediately.

Any damage to lawn areas, sidewalks or pavement as the result of planting operations shall be repaired by the Contractor at no additional cost to the Town or State and to the satisfaction of the Engineer.

All replacements shall be plants of the same kind and size as specified in the plant list. They shall be furnished and planted as specified under Planting Operations. The cost shall be replacement resulting from removal, loss, or damage due to vandalism.

Warranty: All plants shall be warranted by the Contractor to be true to name and size, and in vigorous growing conditions and shall be warranted by the Contractor for two (2) years after all plant material is installed.

During the warranty period, the Contractor shall replace, in accordance with the contract, any plants that are dead, or in the opinion of the Engineer or representative, in an unhealthy or unsightly condition due to dead branches, excessive pruning, or other causes at no additional cost to the Town or State.

Replacement shall be made as soon as weather or season conditions permit as directed by the Engineer. The Contractor's responsibility for replacing plants shall end with final acceptance by the Town. Cost is considered to be included in the Bid and Contract price. Guarantee all replaced material for a period of 2 years from date of replacement.

9.49.04 Method of Measurement:

1. Planting-The quantity of which payment will be made is the number of each size and kind of plant counted in place, planted, and accepted.

2. Mulching- This work will be measured for payment by the number of square yards surface measurement of the specified thickness for the area on which pine bark mulch has been completed and accepted.

9.49.05 Basis of Payment:

Payment for this work will be made at the contract unit price each for the kind and size of tree, shrub, and perennial completed and accepted in place. The unit price shall include all excavation and preparation, tree staples, planting soil to the depths indicated on the details, mulching, watering, and maintenance as well as any other materials, equipment, tools, labor, transportation, operations, and all work incidentals thereto.

Pay Item

Pay Unit

Pine Bark Mulch

S.Y.

ITEM #0949606A – ROOT BARRIER

09.49.01 Description:

This item shall include furnishing material for and placing tree root barrier on a prepared base or subbase in accordance with these specifications and in conformity with the lines, grades and compacted thickness as shown on the plans, details, or as ordered by the engineer.

Required Submittals:

A. Material Certificate of Compliance:

Submit material certificate of compliance for materials in accordance with the contract general requirements. Product data and complete installation instructions for item specified.

B. Samples

Submit one full length panel of tree root barrier.

C. Approved supplier: Certificate showing material is from an approved supplier (Deep Root Partners, L.P. San Francisco, CA 1-800-458-7668 or approved equal).

9.49.02 Materials:

Deep Root Tree Root Barrier (UB24-2) or equal 24” wide by 24” depth; black 85 mil wall thickness injection molded 50% post-consumer recycled polypropylene panels with UV inhibitors. 7/16” wide integral molded 85 mil thickness double top edge attached to vertical root deflecting ribs; bottom edge attached to vertical root deflecting ribs, integral molded 85 mil thickness by 2-inch deep vertical root directing ribs spaced at 6-inch on center; integral molded 85 mil thickness by 2-inch-long by 3/8-inch-wide horizontal anti-lift ground lock tabs, min. 9 per panel.

9.49.03 Construction Methods:

Install on properly prepared base and subgrade with accordance with manufacturer’s instructions. Connect panels together as required. Dig the trench, place the tree root guide in the trench with the vertical root directing ribs facing inwards to the root ball and align with the hardscape, set 2” below finish grade of sidewalk. The double top edge shall be ½” above finished soil grade. Using the hardscape as a guide, backfill and compact to requirements against the tree root guides to promote a clean, smooth fit to the paving. Trees and plants shall be immediately installed after placement of root barrier.

9.49.04 Method of Measurement:

All root barrier required for this work shall be measured for payment at the number of linear feet for "Root Barrier" completed and accepted, including all equipment, materials, tools, labor and incidental expenses thereto.

9.49.05 Basis of Payment:

This work will be paid for at the contract unit price per linear foot for "Root Barrier", complete in place, which price shall include all materials, tools, equipment, labor and work incidental thereto.

Pay Item

Pay Unit

Root Barrier

LF

ITEM #0950005A - TURF ESTABLISHMENT

Work under this item shall conform to the requirements of Section 9.50, amended as follows:

Article 9.50.03 – Construction Methods

4. Compaction - *Replace the first two words in the section with the following:*

"Following seeding, the entire area shall be rolled with a 100 pound manual landscape roller. Otherwise the Contractor".

M.13.04 - Seed Mixtures

Delete subsection (a) and replace with:

(a) The grass seed mixture shall conform to the

following: Trifecta Perennial Ryegrass Blend

Pure Seed:

40% Charismatic Perennial Ryegrass

30% Exacta Perennial Ryegrass

30% Affirmed Perennial Ryegrass

Under no circumstances should annual Ryegrass, Italian Rye or any other seed be added to the seed mixture.

Pay Item

Turf Establishment

Pay Unit

SY

ITEM #0970006A - TRAFFICPERSON (MUNICIPAL POLICE OFFICER)
ITEM #0970007A - TRAFFICPERSON (UNIFORMED FLAGGER)

9.70.01—Description: Under this item the Contractor shall provide the services of Trafficpersons of the type and number, and for such periods, as the Engineer approves for the control and direction of vehicular traffic and pedestrians. Traffic persons requested solely for the contractor's operational needs will not be approved for payment.

9.70.03—Construction Method: Prior to the start of operations on the project requiring the use of Trafficpersons, a meeting will be held with the Contractor, Trafficperson agency or firm, Engineer, and State Police, if applicable, to review the Trafficperson operations, lines of responsibility, and operating guidelines which will be used on the project. A copy of the municipality's billing rates for Municipal Police Officers and vehicles, if applicable, will be provided to the Engineer prior to start of work.

On a weekly basis, the Contractor shall inform the Engineer of their scheduled operations for the following week and the number of Trafficpersons requested. The Engineer shall review this schedule and approve the type and number of Trafficpersons required. In the event of an unplanned, emergency, or short term operation, the Engineer may approve the temporary use of properly clothed persons for traffic control until such time as an authorized Trafficperson may be obtained. In no case shall this temporary use exceed 8 hours for any particular operation.

If the Contractor changes or cancels any scheduled operations without prior notice of same as required by the agency providing the Trafficpersons, and such that Trafficperson services are no longer required, the Contractor will be responsible for payment at no cost to the Department of any show-up cost for any Trafficperson not used because of the change. Exceptions, as approved by the Engineer, may be granted for adverse weather conditions and unforeseeable causes beyond the control and without the fault or negligence of the Contractor.

Trafficpersons assigned to a work site are to only take direction from the Engineer.

Trafficpersons shall wear a high visibility safety garment that complies with OSHA, MUTCD, ASTM Standards and the safety garment shall have the words "Traffic Control" clearly visible on the front and rear panels (minimum letter size 2 inches (50 millimeters)). Worn/faded safety garments that are no longer highly visible shall not be used. The Engineer shall direct the replacement of any worn/faded garment at no cost to the State.

A Trafficperson shall assist in implementing the traffic control specified in the Maintenance and Protection of Traffic contained elsewhere in these specifications or as directed by the Engineer. Any situation requiring a Trafficperson to operate in a manner contrary to the Maintenance and Protection of Traffic specification shall be authorized in writing by the Engineer.

Traffic persons shall consist of the following types:

1. Uniformed Law Enforcement Personnel: Law enforcement personnel shall wear the high visibility safety garment provided by their law enforcement agency. If no high visibility safety garment is provided, the Contractor shall provide the law enforcement personnel with a garment meeting the requirements stated for the Uniformed Flaggers' garment.

Law Enforcement Personnel may be also be used to conduct motor vehicle enforcement operations in and around work areas as directed and approved by the Engineer.

Municipal Police Officers: Uniformed Municipal Police Officers shall be sworn Municipal Police Officers or Uniformed Constables who perform criminal law enforcement duties from the Municipality in which the project is located. Their services will also include an official Municipal Police vehicle when requested by the Engineer. Uniformed Municipal Police Officers will be used on non-limited access highways. If Uniformed Municipal Police Officers are unavailable, other Trafficpersons may be used when authorized in writing by the Engineer. Uniformed Municipal Police Officers and requested Municipal Police vehicles will be used at such locations and for such periods as the Engineer deems necessary to control traffic operations and promote increased safety to motorists through the construction sites.

2. Uniformed Flagger: Uniformed Flaggers shall be persons who have successfully completed flagger training by the American Traffic Safety Services Association (ATSSA), National Safety Council (NSC) or other programs approved by the Engineer. A copy of the Flagger's training certificate shall be provided to the Engineer before the Flagger performs any work on the project. Uniformed Flaggers shall conform to Chapter 6E, Flagger Control, in the Manual of Uniformed Traffic Control Devices (MUTCD) and shall wear high-visibility safety apparel, use a STOP/SLOW paddle that is at least 18 inches (450 millimeters) in width with letters at least 6 inches (150 millimeters) high. The paddle shall be mounted on a pole of sufficient length to be 6 feet (1.8 meters) above the ground as measured from the bottom of the sign.

Uniformed Flaggers will only be used on non-limited access highways to control traffic operations when authorized in writing by the Engineer.

9.70.04—Method of Measurement: Services of Traffic persons will be measured for payment by the actual number of hours for each person rendering services approved by the Engineer. These services shall include, however, only such trafficpersons as are employed within the limits of construction, project right of way of the project or along detours authorized by the Engineer to assist the motoring public through the construction work zone. Services for continued use of a detour or bypass beyond the limitations approved by the Engineer, for movement of construction vehicles and equipment, or at locations where traffic is unnecessarily restricted by the Contractor's method of operation, will not be measured for payment.

Trafficpersons shall not work more than twelve hours in any one 24 hour period. In case such services are required for more than twelve hours, additional Trafficpersons shall be furnished and measured for payment. In cases where the Trafficperson is an employee on the Contractor's payroll, payment under the item "Trafficperson (Uniformed Flagger)" will be made only for those hours when the Contractor's employee is performing Trafficperson services.

Travel time will not be measured for payment for services provided by Uniformed Municipal Police Officers or Uniformed Flaggers.

Mileage fees associated with Trafficperson services will not be measured for payment.

Safety garments and STOP/SLOW paddles will not be measured for payment.

9.70.05—Basis of Payment: Trafficpersons will be paid in accordance with the schedule described herein.

There will be no direct payment for safety garments or STOP/SLOW paddles. All costs associated with furnishing safety garments and STOP/SLOW paddles shall be considered included in the general cost of the item.

1. Uniformed Law Enforcement Personnel: The sum of money shown on the Estimate and in the itemized proposal as "Estimated Cost" for this work will be considered the bid price even though payment will be made as described below. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount for the contract.

The Department will pay the Contractor its actual costs for “Trafficperson (Municipal Police Officer)” plus an additional 5% as reimbursement for the Contractor’s administrative expense in connection with the services provided.

The invoice must include a breakdown of each officer’s actual hours of work and actual rate applied. Mileage fees associated with Trafficperson services are not reimbursable expenses and are not to be included in the billing invoice. The use of a municipal police vehicle authorized by the Engineer will be paid at the actual rate charged by the municipality. Upon receipt of the invoice from the municipality, the Contractor shall forward a copy to the Engineer. The invoice will be reviewed and approved by the Engineer prior to any payments. *Eighty (80%) of the invoice will be paid upon completion of review and approval. The balance (20%) will be paid upon receipt of cancelled check or receipted invoice, as proof of payment.* The rate charged by the municipality for use of a uniformed municipal police officer and/or a municipal police vehicle shall not be greater than the rate it normally charges others for similar services.

2. Uniformed Flagger: Uniformed flaggers will be paid for at the contract unit price per hour for “Trafficperson (Uniformed Flagger)”, which price shall include all compensation, insurance benefits and any other cost or liability incidental to the furnishing of the trafficpersons ordered.

Pay Item

Pay Unit

Trafficperson (Municipal Police Officer)
Trafficperson (Uniformed Flagger)

EST.
HR.

ITEM #1003894A – ORNAMENTAL LIGHTING SYSTEM

Work under this item shall conform to the requirements of Section 10.00 and 11.13 of the Standard Specifications, amended and supplemented as follows:

Description: Work under this item shall consist of furnishing and installing an ornamental street light system at the locations and to the dimensions and details shown on the plans or as directed by the Engineer and in conformity with these specifications. The work shall include furnishing and installing all necessary components of the system, including the pole, concrete foundation, fixture, accessories, conduit, power and control cable, lighting controller, controller foundation, metered service, bedding, backfill, and appurtenances, along with coordinating with local utility representatives. The work shall include furnishing mounting and assembling all components, receptacle installation, and wiring. The work shall also include verifying the proper operation of the pole, fixture(s) and GFI receptacle to the satisfaction of the engineer.

Materials:

General: The Ornamental Street Light Standards shall be installed at the locations shown on the plans. Four types shall be used – SL4, SL3C, SL5B and SL3D, as indicated on the plans.

SL4: 14' Pole, Type 4 Optics

SL3C: 12' Pole, Type 3 Optics, Dimming Resistor Board

SL5B: 12' Pole, Type 5 Optics, Dimming Resistor Board

SL3D: 12' Pole, Type 3 Optics w/ House Side Shield& Dimming Resistor Board

Pole: The pole and accessories shall be designed in accordance with AASHTO Standard Specification for Structural Support of Highway Signs, Luminaires and Traffic Signs. Wind pressures for design purposes shall be determined in accordance with the above AASHTO Standard utilizing a 93 mph wind speed. The pole shall be aluminum, one- piece construction with an 18" diameter cast aluminum fluted base, Sternberg Lighting Model #6200 (Oxford Series). The SL3a pole shall be a 12 foot tall smooth tapered shaft, made of ASTM 6063 extruded aluminum and tempered to a T6 condition, tapering from 5" to 4" in diameter (Part number 62 12 T5-4). The SL4a pole shall be a 14 foot tall smooth tapered shaft, made of ASTM 6063 extruded aluminum and tempered to a T6 condition, tapering from 5" to 4" in diameter (Part number 62 14 T5-4).

Anchor Bolts: All Light Standards shall use four ¾” diameter, hot-dipped galvanized “L” type anchor bolts in accordance with the requirements of ASTM A-153-03, Class C. Field welding and field bending of anchor bolts is prohibited.

Fixture: The fixture shall be designed in accordance with AASHTO Standard Specification for Structural Support of Highway Signs, Luminaires and Traffic Signs. Wind pressures for design purposes shall be determined in accordance with the above AASHTO Standard utilizing a 93 mph wind speed. The fixture shall meet the design requirements and style as shown on the plans.

The fixture shall be wired using No. 10 AWG stranded copper conductors with 600V, 167 degree F, type THHN/THWN insulation, or as required by the manufacturer. The luminaire shall be connected to the wiring provided within the pole.

The fixture shall include:

- an individual photo cell
- Black Textured Finish
- Frosted Hurricane Chimney (not lighted)
- Clear Seeded Acrylic Lens

- Solid Roof

Optional Equipment: The Ornamental Lighting poles shall be supplied with the following options:

Double Banner Arms: The banner arms shall be part “DBA” as manufactured by Sternberg Lighting, and shall meet the style as shown on the details.

Single Planter Arm: The single planter arm shall be part “SPA” as manufactured by Sternberg Lighting, and shall meet the style as shown on the details.

Ground Fault Receptacle: The pole shall be equipped with a GFI duplex receptacle with a weatherproof cover. The receptacle shall be part “GFI” as manufactured by Sternberg Lighting, and shall meet the style as shown on the details.

Cable: The provisions of sections 10.12.02 and 10.15.02 shall apply.

Conduit: The provisions of sections 10.01.02 and 10.08.02 shall apply.

Concrete Handhole: The provisions of section 10.10.02 shall apply.

Light Pole Foundations: The provisions of section 10.02.02 shall apply.

Service Control Box: The provisions of section 10.17.02 shall apply.

Construction Methods: Construction methods for this work shall be in accordance with the manufacturer's recommendations. The contractor shall be responsible for coordinating all necessary prerequisite work with the utility company. This shall include, but not be limited to de-energizing existing light poles, energizing new light poles, coordinating and verifying new conduit installations, and coordinating and verifying the location of the service control box. Eversource shall be responsible for pulling new wiring from energy source to service control box location and energizing new lighting system. The contractor shall be responsible for installing all underground conduit between the service control box and the service pole, in accordance with Eversource requirements.

The Contractor shall be responsible for all coordination with the Utility company that is required to obtain the required metered service connection to the lighting system. This includes any necessary computations, applications and fees paid on the behalf of the Town of Brookfield.

The contractor shall be responsible for installing the poles plumb, connection to the power supply, wiring, attaching the ground connection to the pole and all testing.

REQUIRED SUBMITTALS:

The contractor is responsible for providing the complete lighting design to provide an operational lighting system as shown on the plans and these specifications. The design will include selecting the appropriate load and service equipment to be installed in the service control box, selection of the control box and foundation, and design of all lighting circuits, including cable routing and sizing to supply the luminaires and GFI receptacles at each pole. Structural design computations are to be provided for each pole to demonstrate adequacy of the pole, foundation, and anchor bolt design, taking into account loading produced by the pole accessories,

such as the banner arms, in accordance with AASHTO Standard Specification for Structural Support of Highway Signs, Luminaires and Traffic Signs. Wind pressures for design purposes shall be determined in accordance with the above AASHTO Standard utilizing a 93 mph wind speed. Details provided with the plans are for guidance only, and may be modified as necessary to provide adequate design to meet AASHTO requirements. Proposed modifications should be provided with the design submittal.

All electrical calculations, structural calculations, working drawings, shop drawings and catalog cuts shall be submitted to the Engineer in a single submittal package for review and approval. The submittal shall demonstrate the adequacy of the design and the adherence to the details provided. The assembly, in its completed form, shall meet the design requirements and style as shown on the plans.

Following approval of the design, the equipment can be ordered. Submit 5 copies of material certificates in accordance with the contract general requirements.

Method of Measurement: The Ornamental Lighting System will not be measured for payment and the cost thereof shall be included in the Lump sum cost of the item “Ornamental Lighting System”.

Basis of Payment: This work will be paid for at the contract Lump Sum price for “Ornamental Lighting System” which shall include poles, foundations, excavation, luminaires, appurtenances, designated optional equipment, service controller unit(s), cabinet(s) and foundation(s), trenching and backfilling, electrical conduits, cables, connectors and power supplies, service connections, permits, coordination, and all work required within the project limits. This price shall include all materials, labor and materials, material disposal and work incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Ornamental Lighting System	LS

ITEM NO. 1206023A - REMOVAL AND RELOCATION OF EXISTING SIGNS

Section 12.06 is supplemented as follows:

Article 12.06.01 – Description is supplemented with the following:

Work under this item shall consist of the removal and/or relocation of designated side-mounted extruded aluminum and sheet aluminum signs, sign posts, sign supports, and foundations where indicated on the plans or as directed by the Engineer. Work under this item shall also include furnishing and installing new sign posts and associated hardware for signs designated for relocation.

Article 12.06.03 – Construction Methods is supplemented with the following:

The Contractor shall take care during the removal and relocation of existing signs, sign posts, and sign supports that are to be relocated so that they are not damaged. Any material that is damaged shall be replaced by the Contractor at no cost to the State.

Foundations and other materials designated for removal shall be removed and disposed of by the Contractor as directed by the Engineer and in accordance with existing standards for Removal of Existing Signing.

Sheet aluminum signs designated for relocation are to be re-installed on new sign posts.

Article 12.06.04 – Method of Measurement is supplemented with the following:

Payment under Removal and Relocation of Existing Signs shall be at the contract lump sum price which shall include all extruded aluminum and sheet aluminum signs, sign posts, and sign supports designated for relocation, all new sign posts and associated hardware for signs designated for relocation, all extruded aluminum signs, sheet aluminum signs, sign posts and sign supports designated for scrap, and foundations and other materials designated for removal and disposal, and all work and equipment required.

Article 12.06.05 – Basis of Payment is supplemented with the following:

This work will be paid for at the contract lump sum price for “Removal and Relocation of Existing Signs” which price shall include relocating designated extruded aluminum and sheet aluminum signs, sign posts, and sign supports, providing new posts and associated hardware for relocated signs, removing and disposing of foundations and other materials, and all equipment, material,

tools and labor incidental thereto. This price shall also include removing, loading, transporting, and unloading of extruded aluminum signs, sheet aluminum signs, sign posts, and sign supports designated for scrap and all equipment, material, tools and labor incidental thereto.

Pay Item

Pay Unit

Removal and Relocation of Existing Signs

L.S.

ITEM # 1210101A – 4” (100 mm) WHITE EPOXY RESIN PAVEMENT MARKINGS

SECTION 12.10 – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS is amended as follows:

Delete “SYMBOLS AND LEGENDS” from the title of the section.

SECTION 12.10.03 – Construction Methods is amended as follows:

Delete the entire sections titled “3. Performance and Warranty:” and “WARRANTY:” and replace them with the following:

3. Initial Performance: The retroreflectivity of the markings applied must be measured by the Contractor three (3) to fourteen (14) days after installation. A Certified Test Report (CTR), in accordance with Section 1.06.07, must be submitted to the Engineer no later than ten (10) days after the measurements are taken using the procedures and equipment detailed below:

Test Lots - The following test lots shall be randomly selected by the Engineer to represent the line markings applied:

Table 3.1: Line Test Lots

Length of line	Number of Lots	Length of Test Lot
< 1.0 mi. (1.5 km)	1	1000 ft. (300 m)
≥1.0 mi. (1.5 km)	1 per 1.0 mi. (1.5 km)	1000 ft. (300 m)

Measurement Equipment and Procedure

Portable Retroreflectometer

1. Skip line measurements shall be obtained for every other stripe, taking no more than two readings per stripe with readings no closer than 20 in. (0.5 m) from either end of the marking.
2. Solid line test lots shall be divided into ten sub-lots of 100 ft. (30 m) length and measurements obtained at one randomly select location within each subplot.
3. For symbols and legends, 10 percent of each type shall be measured by obtaining five (5) measurements at random locations on the symbol or legend.
4. The Apparatus and Measurements shall be made in accordance with ASTM E1710 (Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer) and evaluated in accordance with ASTM D7585/D7585M (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments).

Mobile Retroreflectometer

1. Calibration of the instruments shall be in accordance with the manufacturer's instructions.
2. Retroreflectivity shall be measured in a manner proposed by the Contractor and approved by the Engineer. The basis of approval of the test method will be conformance to a recognized standard test method or provisional standard test method.

The measurements shall be obtained when the pavement surface is clean and dry and shall be reported in millicandellas per square foot per foot candle - $\text{mcd}/\text{ft}^2/\text{fc}$ (millicandelas per square meter per lux ($\text{mcd}/\text{m}^2/\text{lux}$)). Measurements shall be obtained sequentially in the direction of traffic flow.

Additional Contents of Certified Test Report

The CTR shall also list:

- Project and Route number
- Geographical location of the test site(s), including distance from the nearest reference point.
- Manufacturer and model of retroreflectometer used.
- Most recent calibration date for equipment used.

- Grand Average and standard deviation of the retroreflectivity readings for each line, symbol or legend.

Initial Performance:

In order to be accepted, all epoxy resin pavement markings must meet the following minimum retroreflectivity reading requirement:

White Epoxy: minimum retroreflectivity reading of 400 mcd/ft²/fc (mcd/m²/lux)

Yellow Epoxy: minimum retroreflectivity reading of 325 mcd/ft²/fc (mcd/m²/lux)

At the discretion of the Engineer, the Contractor shall replace, at its expense, such amount of lines, symbols and legends that the grand average reading falls below the minimum value for retroreflectivity. The Engineer will determine the areas and lines to be replaced. The cost of replacement shall include all materials, equipment, labor and work incidental thereto.

ITEM # 1210102A – 4” (100 mm) YELLOW EPOXY RESIN PAVEMENT MARKINGS

SECTION 12.10 – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS is amended as follows:

Delete “SYMBOLS AND LEGENDS” from the title of the section.

SECTION 12.10.03 – Construction Methods is amended as follows:

Delete the entire sections titled “3. Performance and Warranty:” and “WARRANTY:” and replace them with the following:

3. Initial Performance: The retroreflectivity of the markings applied must be measured by the Contractor three (3) to fourteen (14) days after installation. A Certified Test Report (CTR), in accordance with Section 1.06.07, must be submitted to the Engineer no later than ten (10) days after the measurements are taken using the procedures and equipment detailed below:

Test Lots - The following test lots shall be randomly selected by the Engineer to represent the line markings applied:

Table 3.1: Line Test Lots

Length of line	Number of Lots	Length of Test Lot
< 1.0 mi. (1.5 km)	1	1000 ft. (300 m)
≥1.0 mi. (1.5 km)	1 per 1.0 mi. (1.5 km)	1000 ft. (300 m)

Measurement Equipment and Procedure

Portable Retroreflectometer

1. Skip line measurements shall be obtained for every other stripe, taking no more than two readings per stripe with readings no closer than 20 in. (0.5 m) from either end of the marking.
2. Solid line test lots shall be divided into ten sub-lots of 100 ft. (30 m) length and measurements obtained at one randomly select location within each subplot.
3. For symbols and legends, 10 percent of each type shall be measured by obtaining five (5) measurements at random locations on the symbol or legend.
4. The Apparatus and Measurements shall be made in accordance with ASTM E1710 (Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer) and evaluated in accordance with ASTM D7585/D7585M (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments).

Mobile Retroreflectometer

1. Calibration of the instruments shall be in accordance with the manufacturer's instructions.
2. Retroreflectivity shall be measured in a manner proposed by the Contractor and approved by the Engineer. The basis of approval of the test method will be conformance to a recognized standard test method or provisional standard test method.

The measurements shall be obtained when the pavement surface is clean and dry and shall be reported in millicandellas per square foot per foot candle - $\text{mcd}/\text{ft}^2/\text{fc}$ (millicandelas per square meter per lux ($\text{mcd}/\text{m}^2/\text{lux}$)). Measurements shall be obtained sequentially in the direction of traffic flow.

Additional Contents of Certified Test Report

The CTR shall also list:

- Project and Route number
- Geographical location of the test site(s), including distance from the nearest reference point.
- Manufacturer and model of retroreflectometer used.
- Most recent calibration date for equipment used.

- Grand Average and standard deviation of the retroreflectivity readings for each line, symbol or legend.

Initial Performance:

In order to be accepted, all epoxy resin pavement markings must meet the following minimum retroreflectivity reading requirement:

White Epoxy: minimum retroreflectivity reading of $400 \text{ mcd/ft}^2/\text{fc}$ ($\text{mcd/m}^2/\text{lux}$)

Yellow Epoxy: minimum retroreflectivity reading of $325 \text{ mcd/ft}^2/\text{fc}$ ($\text{mcd/m}^2/\text{lux}$)

At the discretion of the Engineer, the Contractor shall replace, at its expense, such amount of lines, symbols and legends that the grand average reading falls below the minimum value for retroreflectivity. The Engineer will determine the areas and lines to be replaced. The cost of replacement shall include all materials, equipment, labor and work incidental thereto.

ITEM # 1210105A – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS

SECTION 12.10 – EPOXY RESIN PAVEMENT MARKINGS, SYMBOLS AND LEGENDS is amended as follows:

Delete “SYMBOLS AND LEGENDS” from the title of the section.

SECTION 12.10.03 – Construction Methods is amended as follows:

Delete the entire sections titled “3. Performance and Warranty:” and “WARRANTY:” and replace them with the following:

3. Initial Performance: The retroreflectivity of the markings applied must be measured by the Contractor three (3) to fourteen (14) days after installation. A Certified Test Report (CTR), in accordance with Section 1.06.07, must be submitted to the Engineer no later than ten (10) days after the measurements are taken using the procedures and equipment detailed below:

Test Lots - The following test lots shall be randomly selected by the Engineer to represent the line markings applied:

Table 3.1: Line Test Lots

Length of line	Number of Lots	Length of Test Lot
< 1.0 mi. (1.5 km)	1	1000 ft. (300 m)
≥1.0 mi. (1.5 km)	1 per 1.0 mi. (1.5 km)	1000 ft. (300 m)

Measurement Equipment and Procedure

Portable Retroreflectometer

1. Skip line measurements shall be obtained for every other stripe, taking no more than two readings per stripe with readings no closer than 20 in. (0.5 m) from either end of the marking.
2. Solid line test lots shall be divided into ten sub-lots of 100 ft. (30 m) length and measurements obtained at one randomly select location within each subplot.
3. For symbols and legends, 10 percent of each type shall be measured by obtaining five (5) measurements at random locations on the symbol or legend.
4. The Apparatus and Measurements shall be made in accordance with ASTM E1710 (Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer) and evaluated in accordance with ASTM D7585/D7585M (Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments).

Mobile Retroreflectometer

1. Calibration of the instruments shall be in accordance with the manufacturer's instructions.
2. Retroreflectivity shall be measured in a manner proposed by the Contractor and approved by the Engineer. The basis of approval of the test method will be conformance to a recognized standard test method or provisional standard test method.

The measurements shall be obtained when the pavement surface is clean and dry and shall be reported in millicandellas per square foot per foot candle - $\text{mcd}/\text{ft}^2/\text{fc}$ (millicandelas per square meter per lux ($\text{mcd}/\text{m}^2/\text{lux}$)). Measurements shall be obtained sequentially in the direction of traffic flow.

Additional Contents of Certified Test Report

The CTR shall also list:

- Project and Route number
- Geographical location of the test site(s), including distance from the nearest reference point.
- Manufacturer and model of retroreflectometer used.
- Most recent calibration date for equipment used.

- Grand Average and standard deviation of the retroreflectivity readings for each line, symbol or legend.

Initial Performance:

In order to be accepted, all epoxy resin pavement markings must meet the following minimum retroreflectivity reading requirement:

White Epoxy: minimum retroreflectivity reading of $400 \text{ mcd/ft}^2/\text{fc}$ ($\text{mcd/m}^2/\text{lux}$)

Yellow Epoxy: minimum retroreflectivity reading of $325 \text{ mcd/ft}^2/\text{fc}$ ($\text{mcd/m}^2/\text{lux}$)

At the discretion of the Engineer, the Contractor shall replace, at its expense, such amount of lines, symbols and legends that the grand average reading falls below the minimum value for retroreflectivity. The Engineer will determine the areas and lines to be replaced. The cost of replacement shall include all materials, equipment, labor and work incidental thereto.

ITEM #1220013A - CONSTRUCTION SIGNS - BRIGHT FLUORESCENT SHEETING

Description: The Contractor shall furnish construction signs with bright fluorescent sheeting and their required portable supports or metal sign posts that conform to the requirements of NCHRP Report 350 (TL-3). The construction signs and their required portable supports or metal sign posts shall conform to the signing requirements stated in Article 9.71 "Maintenance and Protection of Traffic", as shown on the plans and/or as directed by the Engineer.

Materials: Prior to using the construction signs and their portable supports, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices (both sign and portable support tested together) conform to NCHRP Report 350 (TL-3).

Portable sign supports shall be designed and fabricated so as to prevent signs from being blown over or displaced by the wind from passing vehicles. Portable sign supports shall be approved by the Engineer before they are used. Mounting height of signs on portable sign supports shall be a minimum of 1 foot and a maximum of 2 feet, measured from the pavement to the bottom of the sign.

All sign faces shall be rigid and reflectorized. Sheet aluminum sign blanks shall conform to the requirements of Article M.18.13. Metal sign posts shall conform to the requirements of Article M.18.14. Application of reflective sheeting, legends, symbols, and borders shall conform to the requirements specified by the reflective sheeting manufacturer. Attachments shall be provided so that the signs can be firmly attached to the portable sign supports or metal posts without causing damage to the signs. A Materials Certificate and Certified Test Report conforming to Article 1.06.07 shall be required for the reflective sheeting.

The following types of construction signs shall not be used: mesh, non-rigid, roll-up, corrugated or waffle board types substrates, foam core and composite aluminum sign substrates.

Reflective sheeting shall conform to the following:

The fluorescent orange prismatic retroreflective sheeting shall consist of prismatic lenses formed in a transparent fluorescent orange synthetic resin, sealed, and backed with an aggressive pressure sensitive adhesive protected by a removable liner. The sheeting shall have a smooth surface.

Physical Properties:

A. Photometric - Coefficient of Retroreflection R_A

When the sheeting applied on test panels is measured in accordance with ASTM E 810, it shall have minimum coefficient of retroreflection values as shown in Table I. The rotation angle shall be as designated by the manufacturer for test purposes, the observation angles shall be 0.2 degrees and 0.5 degrees, the entrance angles (component B₁) shall be -4 degrees and +30 degrees.

TABLE I

Minimum Coefficient of Retroreflection R_A

Observation Angle (deg.)	Entrance Angle (deg.)	R _A Orange
0.2	-4	200
0.2	30	90
0.5	-4	80
0.5	30	50

The rotation shall be as designated by the manufacturer.

B. Daytime Color

Color shall conform to the requirements of Table II. Daytime color and maximum spectral radiance factor (peak reflectance) of sheeting mounted on test panels shall be determined instrumentally in accordance with ASTM E 991. The values shall be determined on a Hunter Lab Labscan 6000 0/45 Spectrocolorimeter with option CMR 559 (or approved equal 0/45 instrument with circumferential viewing illumination). Computations shall be done in accordance with ASTM E 308 for the 2 degree observer.

TABLE II

COLOUR SPECIFICATION LIMITS (DAY TIME)**

Color	1		2		3		4		Reflectance	
	Limit Y (%)								MIN	MAX
	X	Y	X	Y	X	Y	X	Y		
Orange (new)	0.583	0.416	0.523	0.397	0.56	0.36	0.631	0.369	28	-
Orange (weathered)	0.583	0.416	0.523	0.397	0.56	0.36	0.631	0.369	20	45

Maximum Spectral Radiance Factor, new: 110% min
weathered: 60% min

** The four pairs of chromaticity coordinates determine the acceptable color in terms of the CIE 1931 standard colorimetric system measured with standard illuminant D65.

C. Nighttime Color

Nighttime color of the sheeting applied to test panels shall be determined instrumentally in accordance with ASTM E 811 and calculated in the u' , v' coordinate system in accordance with ASTM E 308. Shheeting shall be measured at 0.33 degrees observation and -4 degree entrance at rotation as determined by the manufacturer for test purposes. Color shall conform to the requirements of Table III.

TABLE III

Color Specification Limits ** (Nighttime)

Color	1		2		3		4	
	u'	v'	u'	v'	u'	v'	u'	v'
Orange (new and weathered)	.400	.540	.475	.529	.448	.522	.372	.534

D. Resistance to Accelerated Weathering

The retroreflective surface of the sheeting shall be weather resistant and show no appreciable cracking, blistering, crazing, or dimensional change after one year's unprotected outdoor exposure in south Florida, south-facing and inclined 45 degrees from the vertical, or after 1500 hours exposure in a xenon arc weather meter in accordance with ASTM G26, Type B, Method A. Following exposure, panels shall be washed in a 5% HCL solution for 45 seconds, rinsed thoroughly with clean water, blotted with a soft clean cloth and brought to equilibrium at standard conditions. After cleaning, the coefficient of retroreflection shall be not less than 100 when measured as in D.2, below, and the color is expected to conform to the requirements of Tables II and III for weathered sheeting. The sample shall:

1. Show no appreciable evidence of cracking, scaling, pitting, blistering, edge lifting or curling or more than 0.031 inch shrinkage or expansion.
2. Be measured only at angles of 0.2 degrees observation, -4 degrees entrance, and rotation as determined by the manufacturer for test purposes. Where more than one panel of color is measured, the coefficient of retroreflection shall be the average of all determinations.

E. Impact Resistance

The retroreflective sheeting applied according to the manufacturer's recommendations to a test panel of alloy 6061-T6, 0.040 inch by 3 inches by 5 inches and conditioned for 24 hours, shall show no cracking outside the impact area when the face of the panel is subjected to an impact of 100 inch-pounds, using a weight with a 0.625-inch diameter rounded tip dropped from a height necessary to generate an impact of 100 inch-pounds, at test temperatures of both 32° F and 72° F.

F. Resistance to Heat

The retroreflective sheeting, applied to a test panel as in E., above, and conditioned for 24 hours, shall be measured in accordance with Paragraph A. at 0.2 degree observation and -4 degree entrance angles at rotation as determined by the manufacturer for test purposes and exposed to 170° ± 5° F for 24 hours in an air circulating oven. After heat exposure the sheeting shall retain a minimum of 70% of the original coefficient of retroreflection.

G. Field Performance:

Retroreflective sheeting processed and applied to sign blank materials in accordance with the sheeting manufacturer's recommendations, shall perform effectively for a minimum of 3 years. The retroreflective sheeting will be considered unsatisfactory if it has deteriorated due to natural causes to the extent that: (1) the sign is ineffective for its intended purpose when viewed from a moving vehicle under normal day and night driving conditions; or (2) the coefficient of retroreflection is less than 100 when measured at 0.2 degrees observation and -4 degree entrance. All measurements shall be made after sign cleaning according to the sheeting manufacturer's recommendations.

Construction Methods: Ineffective signs, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices", shall be replaced by the Contractor at no cost to the State.

Signs and their portable sign supports or metal posts that are no longer required shall be removed from the project and shall remain the property of the Contractor.

Method of Measurement: Construction Signs - Bright Fluorescent Sheeting will be measured for payment by the number of square feet of sign face. Sign supports will not be measured for payment.

Basis of Payment: "Construction Signs - Bright Fluorescent Sheeting" required and used on the project will be paid for at the Contact unit price per square foot. This price shall include the furnishing and maintenance of the signs, portable sign supports, metal sign posts and all hardware. Each sign and support or posts will be paid for once, regardless of the number of times it is used.

Pay Item

Pay Unit

Construction Signs – Bright Fluorescent Sheeting

SF