CONNECTICUT
DEPARTMENT OF TRANSPORTATION

Final Plans for Review Submission

Special Provisions

I-95 Resurfacing and Safety Improvements
Town of Old Saybrook, Old Lyme and East Lyme, Connecticut

ConnDOT Project No. 104-164

Prepared by:

Luchs
CONSULTING ENGINEERS

April, 2014

INDEX TO SPECIAL PROVISIONS

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.

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ON-THE-JOB TRAINING (OJT) WORKFORCE DEVELOPMENT PILOT:

Description

To provide construction industry related job opportunities to minorities, women and economically disadvantaged individuals; and to increase the likelihood of a diverse and inclusive workforce on Connecticut Department of Transportation (ConnDOT) projects.

All contractors (existing and newcomers) will be automatically placed in the Workforce Development Pilot. Standard OJT requirements typically associated with individual projects will no longer be applied at the project level for new projects. Instead, these requirements will be applicable on an annual basis for each contractor performing work on ConnDOT projects.

The OJT Workforce Development Pilot will allow a contractor to train employees on Federal, State and privately funded projects located in Connecticut. However, contractors should give priority to training employees on ConnDOT Federal-Aid funded projects.

Funding

The Department will establish an OJT fund annually from which contractors may bill the Department directly for eligible trainee hours. The funds for payment of trainee hours on federal-aid projects will be allocated from the ½ of 1% provided for OJT funding, and will be based on hours trained, not to exceed a maximum of $25,000.00 per year; per contractor.

Minorities and Women

Developing, training and upgrading of minorities, women and economically disadvantaged individuals toward journeyperson level status is the primary objective of this special training provision. Accordingly, the Contractor shall make every effort to enroll minority, women and economically disadvantaged individuals as trainees to the extent that such persons are available within a reasonable area of recruitment. This training commitment is not intended, and shall not be used, to discriminate against any applicant for training whether a member of a minority group or not.

Assigning Training Goals

The Department, through the OJT Program Coordinator, will assign training goals for a calendar year based on the contractor's past two year's activities and the contractor's anticipated upcoming year's activity with the Department. At the beginning of each year, all contractors eligible will be contacted by the Department to determine the number of trainees that will be assigned for the upcoming calendar year. At that time, the Contractor shall enter into an agreement with the Department to provide a self-imposed on-the-job training program for the calendar year. This agreement will include a specific number of annual training goals agreed to by both parties. The number of training assignments may range from one (1) to six (6) per

contractor per calendar year. Each January, a summary of the trainees required and the OJT Workforce Development Pilot package will be sent to participating contractors. The number of trainees assigned to each contractor in the summary will increase proportionately not to exceed 6, as shown in the following table. This package will also be provided to contractors as they become newly eligible for the OJT Workforce Development Pilot throughout the remainder of the year. Projects awarded after September 30 will be included in the following year's Program.

The dollar thresholds for training assignments are as follows:

$4.5 – 8 million=	1 trainee
$ 9 – 15 million=	2 trainees
$16 – 23 million=	3 trainees
$24 – 30 million=	4 trainees
$31 – 40 million=	5 trainees
$41 – and above=	6 trainees

Training Classifications

Preference shall be given to providing training in the following skilled work classifications. However, the classifications established are not all-inclusive:

Equipment Operators	Electricians
Laborers	Painters
Carpenters	Iron / Reinforcing Steel Workers
Concrete Finishers	Mechanics
Pipe Layers	Welders

The Department has on file common training classifications and their respective training requirements; that may be used by the contractors. Contractors shall submit new classifications for specific job functions that their employees are performing. The Department will review and recommend for acceptance the new classifications proposed by contractors, if applicable. New classifications shall meet the following requirements:

Proposed training classifications are reasonable and realistic based on the job skill classification needs, and the number of training hours specified in the training classification is consistent with common practices and provides enough time for the trainee to obtain journeyman level status.

Where feasible, 25% percent of apprentices or trainees in each occupation shall be in their first year of apprenticeship or training. The number of trainees shall be distributed among the work classifications on the basis of the contractor's needs and the availability of journeymen in the various classifications within a reasonable area of recruitment.

No employee shall be employed as a trainee in any classification in which they have successfully completed a training course leading to journeyman level status or in which they have been employed as a journeyman.

Records and Reports

The Contractor shall maintain enrollment in the program and submit all required reports documenting company compliance under these contract requirements. These documents and any other information shall be submitted to the OJT Program Coordinator as requested.

Upon the trainee's completion and graduation from the program, the Contractor shall provide each trainee with a certification Certificate showing the type and length of training satisfactorily completed.

Trainee Interviews

In order to determine the continued effectiveness of the OJT Program in Connecticut, the department will periodically conduct personal interviews with current trainees and may survey recent graduates of the program. This enables the OJT Program Coordinator to modify and improve the program as necessary. Trainee interviews are generally conducted at the job site to ensure that the trainees' work and training is consistent with the approved training program.

Trainee Wages

Contractors shall compensate trainees on a graduating pay scale based upon a percentage of the prevailing minimum journeyman wages (Davis-Bacon Act). Minimum pay shall be as follows:

60 percent	of the journeyman wage for the first half of the training period
75 percent	of the journeyman wage for the third quarter of the training period
90 percent	of the journeyman wage for the last quarter of the training period

In no case, will the trainee be paid less than the prevailing rate for general laborer as shown in the contract wage decision (must be approved by the Department of Labor).

Achieving or Failing to Meet Training Goals

The Contractor will be credited for each trainee currently enrolled or who becomes enrolled in the approved training program and providing they receive the required training under the specific training program. Trainees will be allowed to be transferred between projects if required by the Contractor's schedule and workload. The OJT Program Coordinator must be notified of transfers within five (5) days of the transfer or reassignments by e-mail (Phylisha.Coles@ct.gov).

Where a contractor does not or cannot achieve its annual training goal with female or minority trainees, they must produce adequate Good Faith Efforts documentation. Good Faith Efforts are those designed to achieve equal opportunity through positive, aggressive, and continuous result-oriented measures. 23 CFR § 230.409(g) (4). Contractors should request minorities and females from unions when minorities and females are under-represented in the contractor's workforce.

Whenever a contractor requests ConnDOT approval of someone other than a minority or female, the contractor must submit documented evidence of its Good Faith Efforts to fill that position with a minority or female. When a non-minority male is accepted, a contractor must continue to attempt to meet its remaining annual training goals with females and minorities.

Where a contractor has neither attained its goal nor submitted adequate Good Faith Efforts documentation, ConnDOT will issue a letter of non-compliance. Within thirty (30) days of receiving the letter of non-compliance, the contractor must submit a written Corrective Action Plan (CAP) outlining the steps that it will take to remedy the non-compliance. The CAP must be approved by ConnDOT. Failure to comply with the CAP may result in your firm being found non-responsive for future projects.

Measurement and Payment

Optional reimbursement will be made to the contractor for providing the required training under this special provision on ConnDOT Federal-Aid funded projects only.

Contractor will be reimbursed at $0.80 for each hour of training given to an employee in accordance with an approved training or apprenticeship program. This reimbursement will be made even though the Contractor receives additional training program funds from other sources, provided such other source does not specifically prohibit the contractor from receiving other reimbursement.

Reimbursement for training is made annually or upon the trainees completion and not on a monthly basis. No payment shall be made to the Contractor if either the failure to provide the required training, or the failure to hire the trainee as a journeyperson, is caused by the Contractor.

Program reimbursements will be made directly to the prime contractor on an annual basis. To request reimbursement, prime contractors must complete the Voucher for OJT Workforce Development Pilot Hourly Reimbursement for each trainee in the OJT Program. This form is included in the OJT Workforce Development Pilot package and is available on the Department's web site at:

www.ct.gov/dot

The completed form must be submitted to the Office of Contract Compliance for approval. The form is due on the 15th day of January for each trainee currently enrolled and for hours worked on ConnDOT Federal-Aid funded projects only.

NOTICE TO CONTRACTOR – COORDINATION WITH FLAT ROCK ROAD PROJECT.

It is anticipated that work on adjacent project Bridge No. 00245 – Flat Rock Hill Road over I-95 (CTDOT Project No. 104-167) will be ongoing simultaneously with this project. The Contractor shall be aware of the work and shall coordinate all construction activities that will be required to maintain proper traffic flow at all times on the project roadways, in a manner consistent with these specifications and acceptable to the Engineer.

NOTICE TO CONTRACTOR – PAVING EQUIPMENT

There are long sections where a left shoulder is to be constructed next to a median. There are also substantial sections where a shoulder estimated to be 6 to 10 feet in width is to be reconstructed next to the low speed lane.

Shoulders and medians 2 or more feet wide shall be paved with a paver or road widener that is advertised by the manufacturer as being designed for the width and layer thickness of the paving being performed. Other means, such as dumping bituminous material from a front end loader or skid steer directly onto the granular base, shall not be used, except for small (roughly 300 feet), localized sections and only with the approval of the Engineer. While an MTV may be used or needed for loading a paver or road widener to place a base course, the MTV pay item only applies to surface courses.

Before bidding, the Contractor should take careful measurements in the field as to the actual widths to be paved and size equipment accordingly. Width estimates herein are for approximations only and should not be relied on for bidding.

Where NB and SB Right Shoulder Paving is 6.5 feet or more wide

In these sections the width of the right shoulder paving varies, extending from the right edge of the PCC to the front edge of the catch basins, where they exist. The typical NB width to be paved is estimated to be about 6.5 feet.

The paver or road widener must be able to place HMA S1 for the 5.5 to 6.25 inch base course inside the "trough" from the edge of the PCC to the front edge of the catch basins (or limit of paving) in a single lift. If a paver is used, the paver shall have a track width or wheel width that is narrow enough to ride inside the "trough" where the HMA is being placed. Any part of the paver undercarriage that overhangs beyond the 6.5 foot width shall be high enough (e.g. at least 7 inches) to provide the necessary vertical clearance over the pavement on either side of the trough, which is roughly 6.25 inches deep.

All Areas

Pavers or road wideners shall be narrow enough so that HMA or PMA laid down by the machine does not extend more than one foot beyond the shoulder or median limits (longitudinal joint). Cut-off plates may be used. The machine shall not spill loose HMA or PMA onto the adjoining travel lane. Exceptions are only allowed for short irregularities in shoulder width less than 300 feet in length.

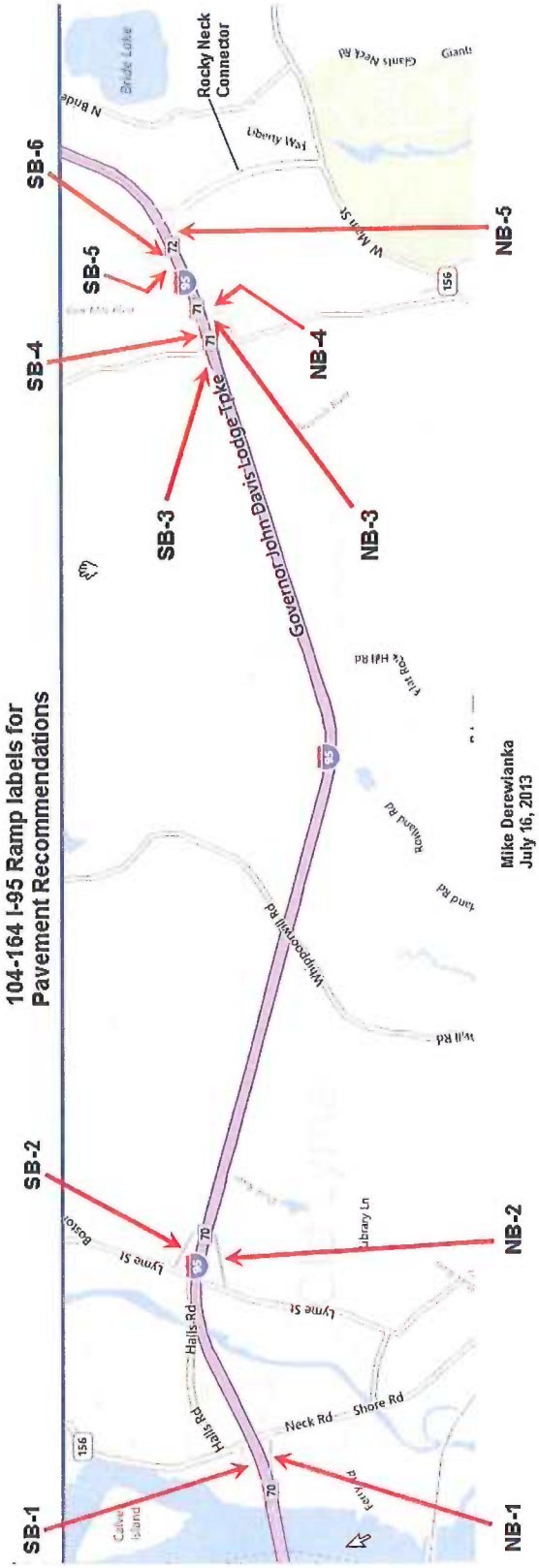
The Contractor shall keep in mind the two main reasons for specifying the use of a narrow paver or road widener for the shoulders and medians:

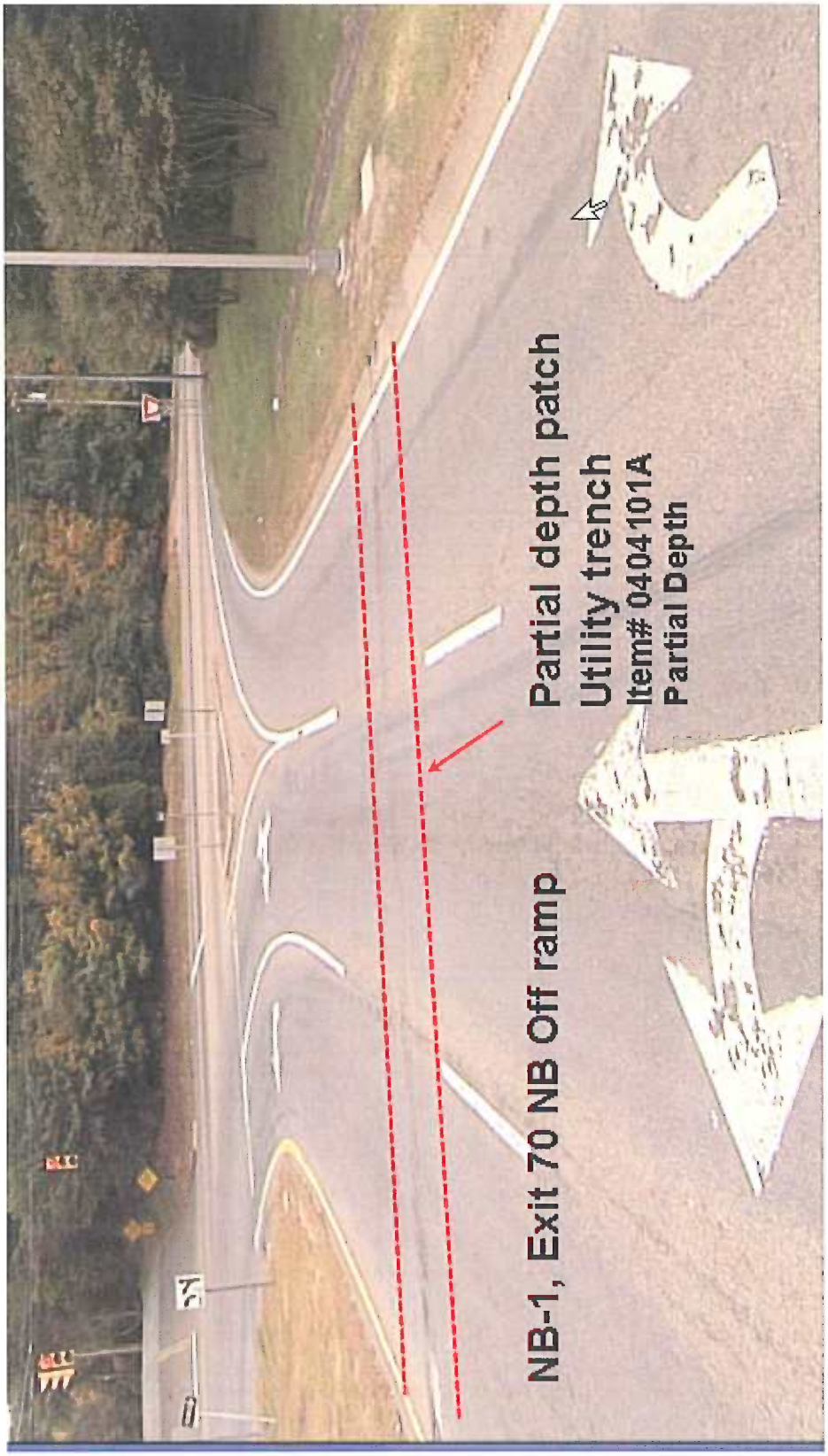
1. To ensure the quality of the bituminous layer, including uniformity (no segregation), density, and smoothness.
2. To make the work proceed as quickly as possible to avoid delaying traffic due to lane closures.

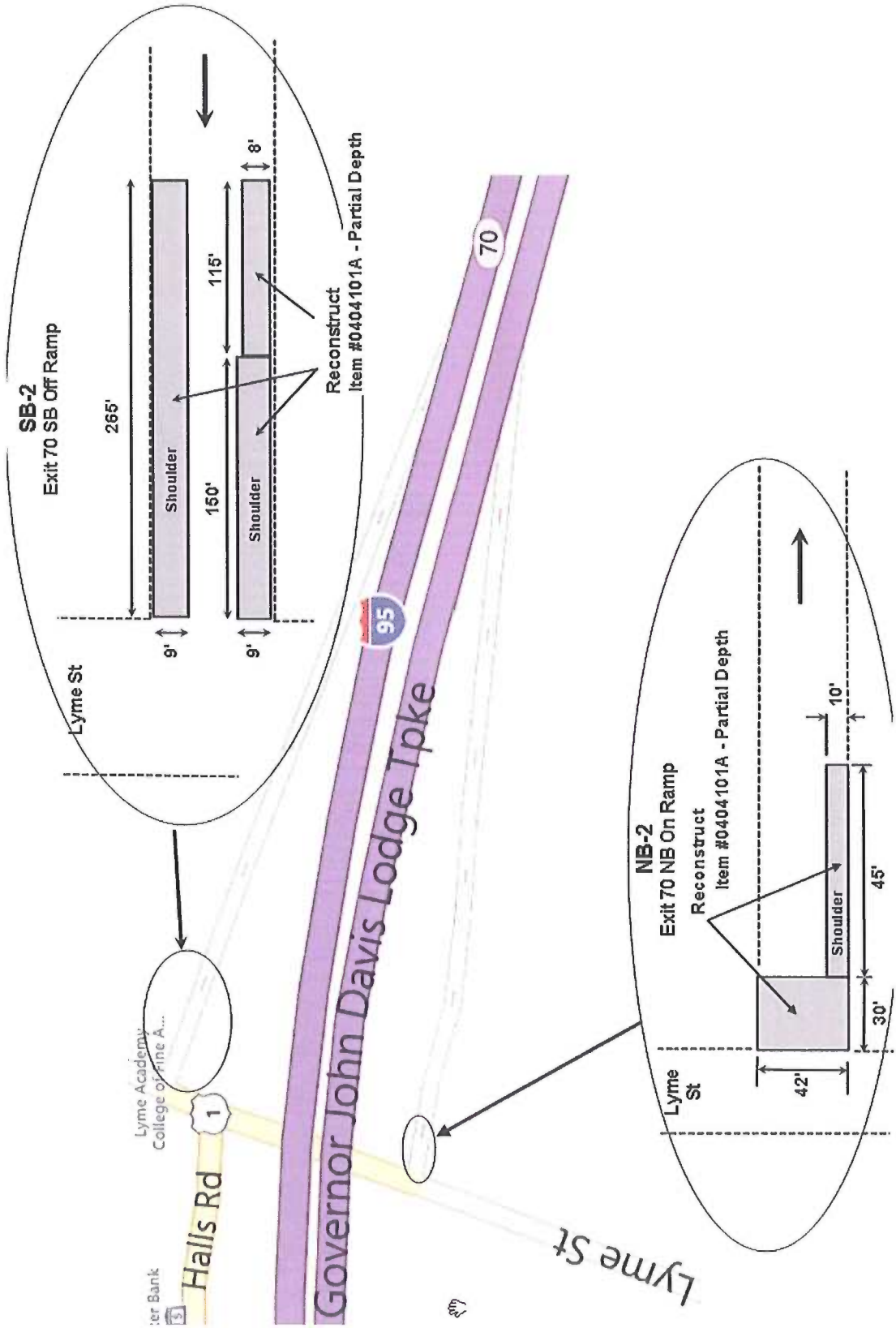
and shall conduct all work in accordance with these goals.

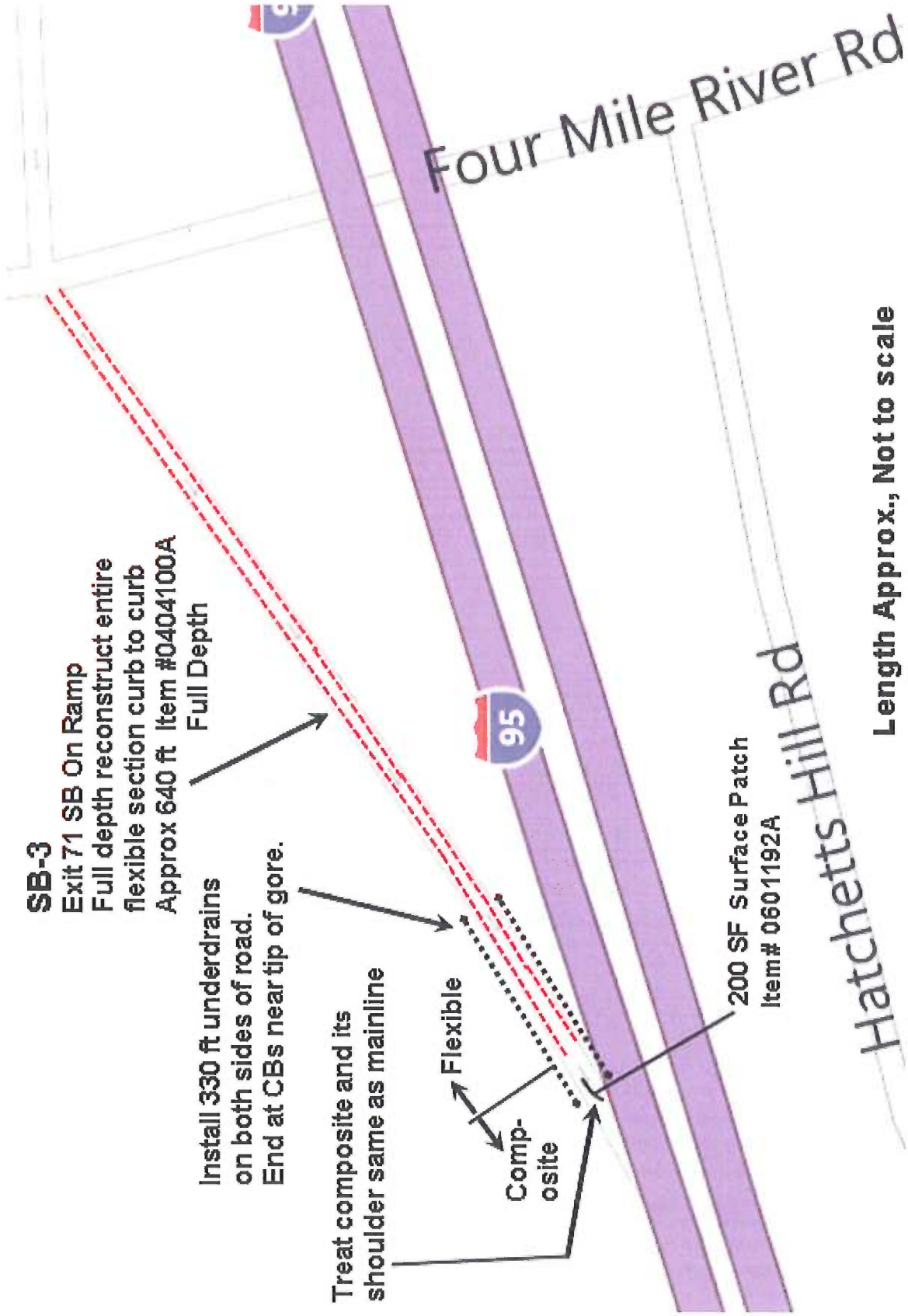
NOTICE TO CONTRACTOR – PAVEMENT REPLACEMENT LOCATIONS

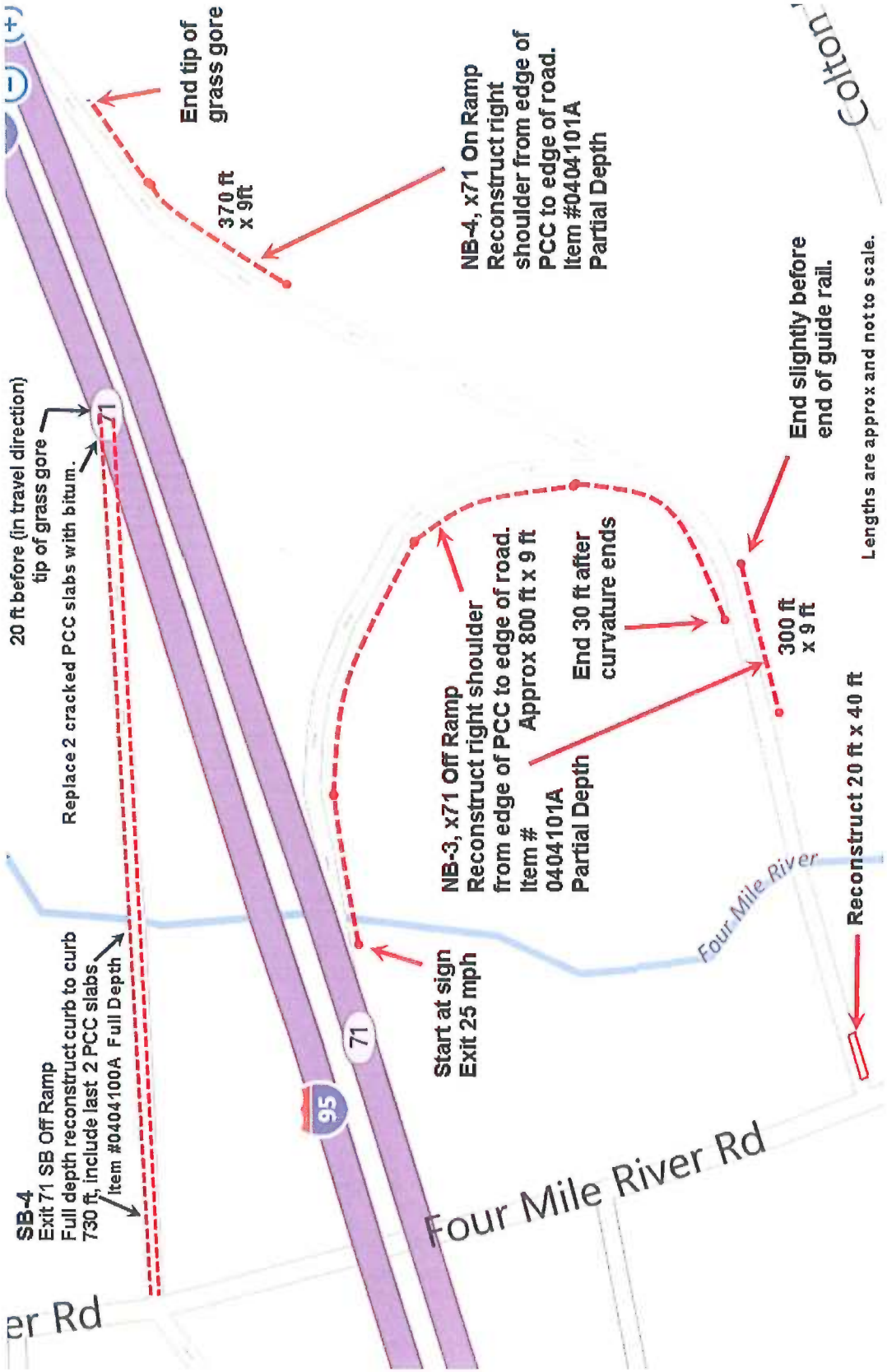
Attached herewith are documentations prepared by ConnDOT's Pavement Management Unit which provides locations for pavement repairs to be performed as part of this construction contract. This material is being provided for informational purposes. Bidders are reminded that the limits of any pavement repairs shall be determined by the Engineer in the field.

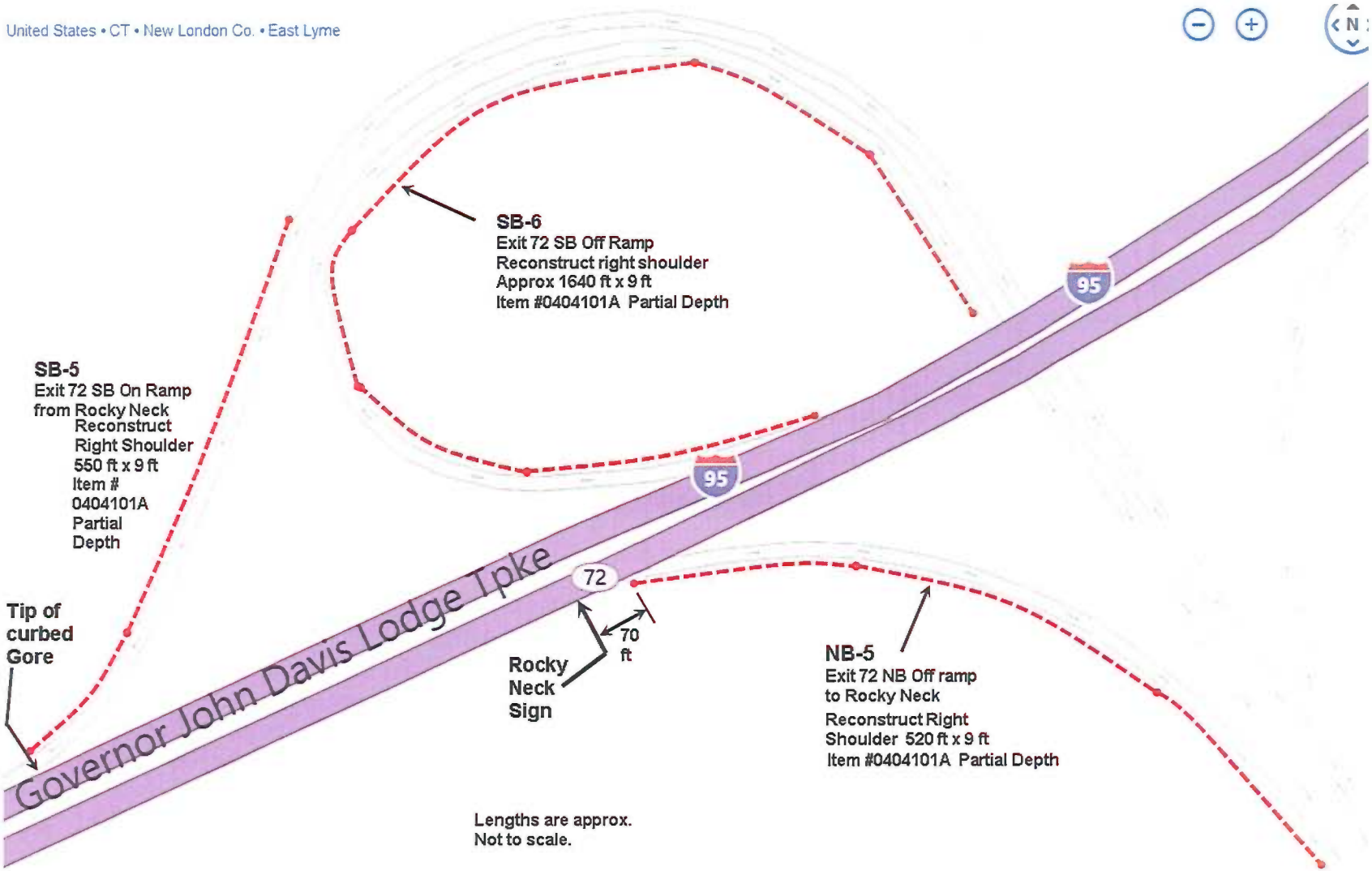

104-164 I-95 Ramp labels for
Pavement Recommendations
Mike Derewianka
July 16, 2013
SB-1
SB-2
SB-3
SB-4
SB-5
SB-6
NB-1
NB-2
NB-3
NB-4
NB-5
Governor John Davis Lodge Tpke
Rocky Neck
Connector
Bride Lake
Whippoorwill Rd
Lyme St
Hails Rd
Neck Rd
Shore Rd
Library Ln
Flat Rock Hill Rd
Rowland Rd
Giants Neck Rd
W Main St
Calve
Island
156
70
71
72
95


NB-1, Exit 70 NB Off ramp
Partial depth patch
Utility trench
Item# 0404101A
Partial Depth


SB-2
Exit 70 SB Off Ramp
Lyme St
265'
Shoulder
9'
150'
Shoulder
9'
115'
8'
Reconstruct
Item #0404101A - Partial Depth
95
70
Governor John Davis Lodge Tpke
Halls Rd
Lyme Academy
College of Fine A...
1
Lyme St
NB-2
Exit 70 NB On Ramp
Reconstruct
Item #0404101A - Partial Depth
Lyme St
42'
Shoulder
30'
45'
10'


SB-3
Exit 71 SB On Ramp
Full depth reconstruct entire
flexible section curb to curb
Approx 640 ft Item #0404100A
Full Depth
Install 330 ft underdrains
on both sides of road.
End at CBs near tip of gore.
Treat composite and its
shoulder same as mainline
Flexible
Comp-
osite
95
Four Mile River Rd
Hatchetts Hill Rd
200 SF Surface Patch
Item# 0601192A
Length Approx., Not to scale


End tip of grass gore
370 ft x 9ft
NB-4, x71 On Ramp
Reconstruct right shoulder from edge of PCC to edge of road.
Item #0404101A
Partial Depth
Colton
End slightly before end of guide rail.
Lengths are approx and not to scale.
20 ft before (in travel direction) tip of grass gore
Replace 2 cracked PCC slabs with bitum.
71
End 30 ft after curvature ends
300 ft x 9 ft
NB-3, x71 Off Ramp
Reconstruct right shoulder from edge of PCC to edge of road.
Approx 800 ft x 9 ft
Item # 0404101A
Partial Depth
Four Mile River
Reconstruct 20 ft x 4.0 ft
Start at sign
Exit 25 mph
71
95
SB-4
Exit 71 SB Off Ramp
Full depth reconstruct curb to curb
730 ft, include last 2 PCC slabs
Item #0404100A Full Depth
Four Mile River Rd
er Rd


United States • CT • New London Co. • East Lyme
SB-6
Exit 72 SB Off Ramp
Reconstruct right shoulder
Approx 1640 ft x 9 ft
Item #0404101A Partial Depth
SB-5
Exit 72 SB On Ramp
from Rocky Neck
Reconstruct
Right Shoulder
550 ft x 9 ft
Item #
0404101A
Partial
Depth
Tip of
curbed
Gore
Governor John Davis Lodge Tpke
95
95
72
70
ft
Rocky
Neck
Sign
NB-5
Exit 72 NB Off ramp
to Rocky Neck
Reconstruct Right
Shoulder 520 ft x 9 ft
Item #0404101A Partial Depth
Lengths are approx.
Not to scale.

NOTICE TO CONTRACTOR - BALDWIN BRIDGE FINE MILLING, PATCHING, AND PAVING

See the attached diagrams for milling, patching, and paving instructions on the Baldwin Bridge. Fine milling shall be used on the Baldwin Bridge. The speed of milling on the Baldwin Bridge shall not be greater than 25 feet per minute. In some locations the thickness of the existing bituminous over the bridge deck is 2 inches and even as low as 1.5 inches in one place. To minimize forces on the bituminous pavement that is to remain and to minimize the risk of damaging the membrane, milling speeds are to be slow.

As shown on the diagram, use Item 0406125A to surface patch a two foot wide strip adjacent to the northern bridge header in the NB direction. This patch is to be overlaid with the 0406178A - Ultra-Thin-Bonded Hot-Mix Asphalt layer. The Contractor may construct this patch before or after milling 5/8" on the northern 500 feet of the NB bridge, but the compacted surface of the patch should match the surface of the surrounding bituminous in either case. Refer to the attached diagram that shows the core thicknesses of existing bituminous on the bridge deck. Where possible, mill 1.625 inches for the patch. However, reduce the milling depth as necessary to come no closer than 0.5 inches to the membrane.

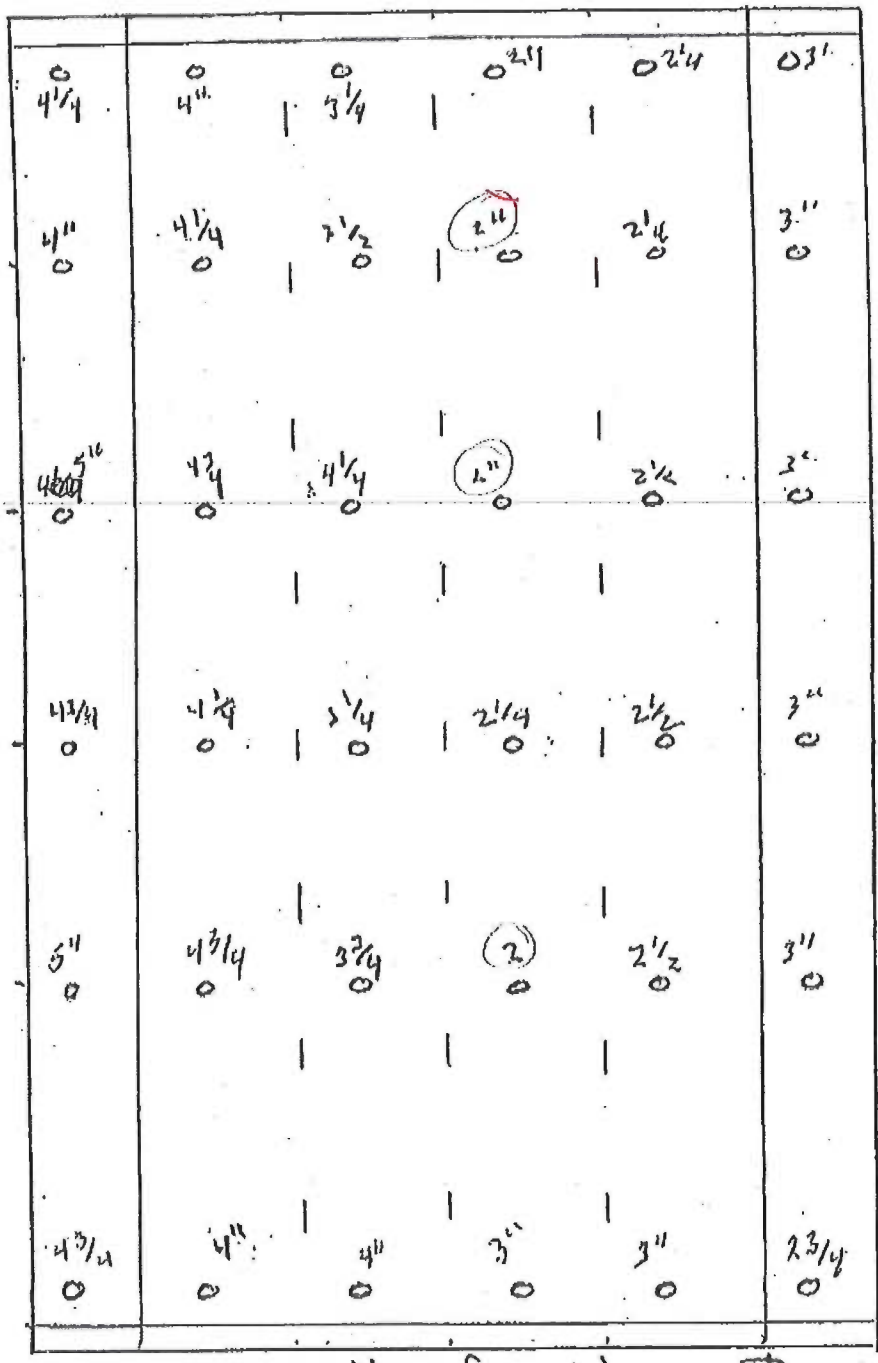
Where the bridge is being milled 1.5 inches (this is most of the bridge), the milled area shall be vacuum swept, surface patched with Item 0601192A as necessary, tacked, and paved with a one inch leveling course of PMA S0.25 in the same night. Once the Contractor begins milling and paving a side (NB or SB) of the bridge the Contractor shall complete paving operations on that side of the bridge as quickly as possible. This means that, weather permitting, the Contract shall continue paving operations each subsequent night other than Saturdays or Sundays until the side of the bridge is completely paved. However, the Contractor is allowed to wait up to seven (7) calendar days before placing the ultrathin pavement after finishing the other paving operations on the same side of the bridge. Milling, patching, and paving operations for an individual side of the bridge (NB or SB), except for the ultrathin final layer, shall be completed within a ten (10) Created by Derewianka, Michaelpractical after that, within no more than seven (7) days after the other paving operations are completed.

During all milling operations the Contractor shall keep ready a container of suitable material at a suitable temperature so it is available for the immediate repair of any accidental damage to the bridge deck membrane. The suitable material shall be hot-applied crack sealing material composed of a hot-applied, rubberized asphalt meeting AASHTO M-324 Type 2 requirements.

Baldwin Bridge SB Paving and Cores
Cores show bitum thickness over deck

S/B

Old Saybrook



All SB receives same treatment

<u>In one night</u>:
- Fine mill 1.5"
- Vacuum sweep
- Surface Patch Item 0601192A
- Pave 1 inch PMA S0.25

Entire deck does not have to be done in 1 night.

<u>Within 7 days Later</u>
Overlay whole SB side of bridge with Ultrathin

Max fine milling speed on bridge to be 25 ft per min

Old Lyme

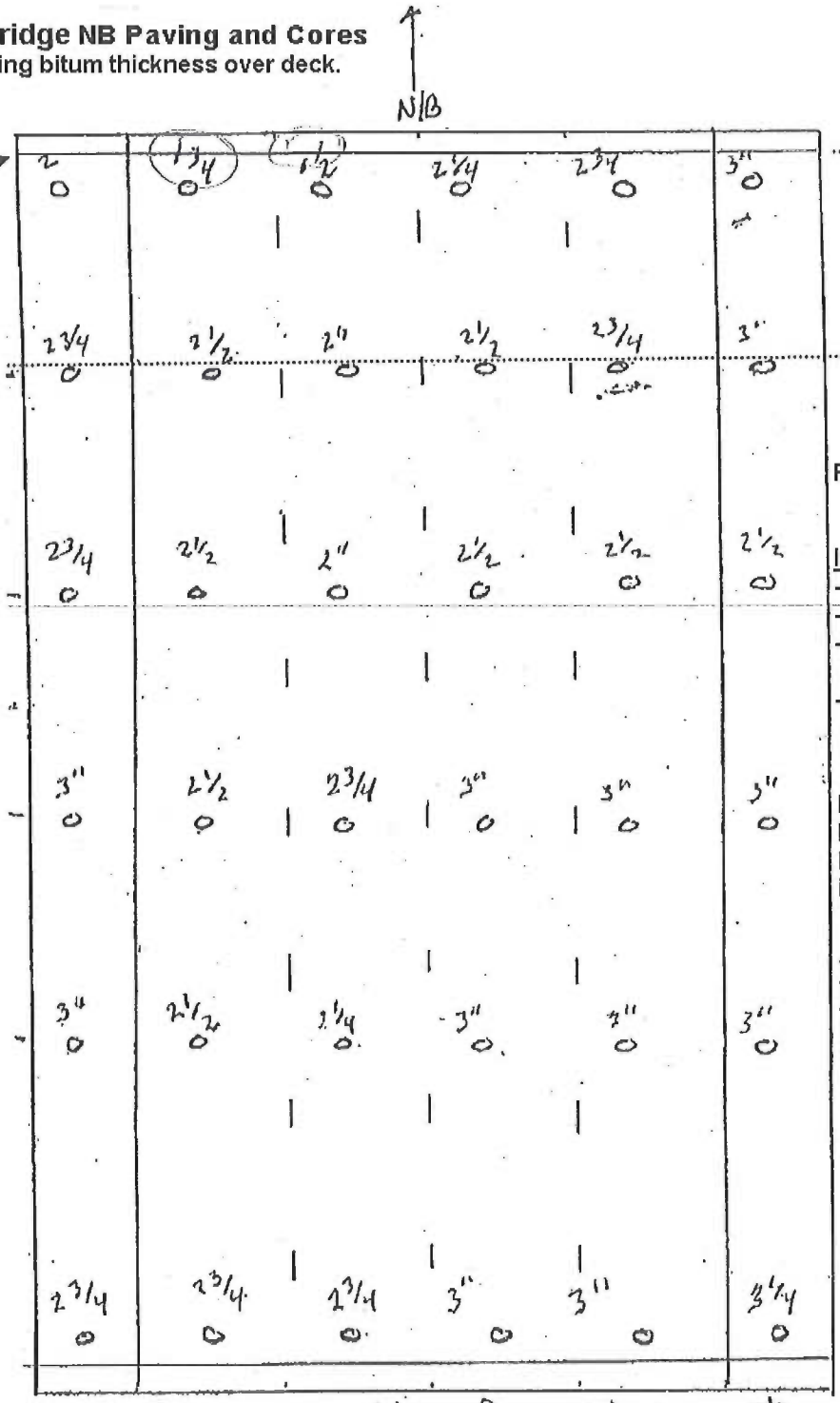
1/10 of a mile apart

Br# 06200B

I-95 S/B o/ G. River Ferry Rd.

DATE: 04/25/13

Baldwin Bridge NB Paving and Cores
Cores showing bitum thickness over deck.



At this one header, north end of NB bridge, on bridge side, mill 2 ft wide bitum. adjacent to header down to 0.5" above membrane or 1.625", whichever is less depth, and patch using Item# 0406125A

NB, north header

500 ft Mill 5/8 inch then Ultrathin

Rest of NB

In one night:
- Fine mill 1.5"
- Vacuum sweep
- Surface Patch Item 0601192A
- Pave 1 inch PMA S0.25

Entire NB side of bridge does not have to be done in one night.

Within 7 Days Later
Overlay entire side of bridge with ultrathin

Max fine milling speed on bridge to be 25 ft per min

1/10 of a mile apart

Be# 06200A

OLD SAYBROOK

I-95 N/B o/ CT River Freeway Rd.

Date: 04/25/13

NOTICE TO CONTRACTOR – SIGN INVENTORY

Prior to the commencement of construction, the Contractor and the Engineer shall conduct a joint inventory of signs, delineators and object markers. Signs, delineators or object markers that are knocked down or destroyed by the Contractor during construction of the project shall be replaced by the contractor at no cost to the State.

NOTICE TO CONTRACTOR - SALVAGEABLE MATERIALS

The Contractor shall salvage the following materials:

ITEMS	DESTINATIONS
Guide Rail Posts and Beams Catch Basin Tops	ConnDOT Maintenance Facility 20 Industrial Drive Waterford, CT 06385 Contact: Brian Brouillard Phone: (860) 443-1617
Metal Bridge Rail System and Posts Bridge # 00243	ConnDOT Bridge Maintenance Garage 49 Jennings Road Hartford, CT 06120 Contact: Bill Morrison Phone: (860) 566-3103

The Contractor and Engineer shall review all guide rail elements and catch basin tops prior to their removal so that their condition can be assessed and a determination can be made as to if they can be salvaged.

The materials to be salvaged shall be delivered by the Contractor to the destination indicated above between the hours of 8:00 a.m. and 3:30 p.m. Monday through Friday, holidays excluded. Please call to make arrangements minimum of 48 hours prior to delivery of salvaged material.

The salvage materials shall be delivered and unloaded by the Contractor.

The Contractor shall not receive payment for this work. The costs shall be included in the overall cost of this project.

NOTICE TO CONTRACTOR – DISPOSAL OF SURPLUS EXCAVATED MATERIAL

The Contractor is hereby notified that all surplus excavated material from this project must be trucked to the location sites indicated on the contract drawings. The Contractor will also be responsible for all work required for the construction an embankment at each site. No direct payment will be made for this work. All costs associated with delivery the surplus material to the specified location and associated embankment construction shall be included under the appropriate excavation / removal items in accordance with Section 2.02 of Form 816.

NOTICE TO CONTRACTOR – STAGING AND STORAGE AREAS

The Contractor is hereby notified that there is to be no staging and/or storing of material and/or equipment within the 100-year floodplain, floodway, stream channel encroachment line, gore areas, or areas with a natural resource impact without review and written approval by the Office of Environmental Planning (OEP) or by the District Environmental Coordinator (DEC). If staging and/or storing of material and/or equipment is allowed within these regulated areas, the Contractor must provide a flood contingency plan to the OEP or the DEC for review and approval.

The Contractor is also hereby notified that any staging and/or storing of material and/or equipment throughout the project is only permitted on existing pavement surfaces without review and written approval by the Office of Environmental Planning (OEP) or by the District Environmental Coordinator (DEC).

All staging and/or storage areas will be reviewed and approved by the Engineer.

No surplus material due to construction activities is to be disposed of on Department property.

The Contractor's attention is directed to the fact that only limited stockpiling and storage within the project are available for use. It may be required that the Contractor, according to his means and methods, make arrangements to have available for his use sufficient storage and staging areas outside of the limits of the project.

In all cases, the Contractor shall adhere to and comply with Section 1.10 - Environmental Compliance, of the Standard Specifications for Roads, Bridges and Incidental Construction Form 816 and any Supplements thereto.

NOTICE TO CONTRACTOR – WETLANDS AND 100-YEAR FLOODPLAINS PROTECTION AREAS

The Contractor is hereby advised that there are wetlands and 100 year floodplains areas within the I-95 project limits. The 100-year floodplains have been identified and are shown on the roadway plans. The Contractor shall take precautionary measures to assure that the wetlands and 100 year floodplains will not be impacted by the construction.

NOTICE TO CONTRACTOR – CLEANING OF CATCH BASINS, PIPES AND OUTLETS

All existing and proposed drainage structures and drainage pipes (including outlets) within the project limits shall be routinely inspected and cleaned throughout the project duration and at post construction.

The cleaning of drainage structures or drainage pipes in non-regulated areas must be reported under the Department of Transportation's (Department) MS4 Permit requirements. In addition, the cleaning of outfalls or areas within the Department's right-of-way which is located in a regulated area must be reported under the Statewide Drainage Maintenance Activities Permit.

Prior to the commencement of any work associated with the cleaning of catch basins, pipes and outlets, the Contractor and Inspector shall meet with the District Drainage Engineer for the purpose of reviewing the requirements and restrictions specified in the MS4 Permit and the Statewide Drainage Maintenance Activities Permit and report all activities at each location and establish reporting protocols to the District Drainage Engineer that will be adhered to during construction.

NOTICE TO CONTRACTOR – CURED-IN-PLACE PIPE LINING

The Contractor is hereby advised that, due to the proximity of wetlands and 100 year floodplains within the I-95 project limits, no water used in the cured-in-place pipe lining process may be discharged to the outfall. The Contractor shall take all measures necessary to ensure that the wastewater is not discharged to the outfall.

Any steps to minimize the amount of wastewater used in the pipe lining process should be considered by the Contractor. All water used for the pipe lining process shall be collected and disposed of in a lawful manner. A ticket from an approved wastewater treatment plant shall be furnished to the project Inspector for the disposal of the wastewater from the pipe lining operations. The Contractor will not receive any compensation for the disposal of wastewater, the price of disposal shall be included in the unit price for the cured-in-place pipe lining.

NOTICE TO CONTRACTOR – EXISTING IMS

The Contractor is herein made aware of existing Incident Management System (IMS) conduit and appurtenances located in the vicinity of the project area .

The Contractor will be responsible for locating, verifying the location of and protecting all IMS below and above the ground. Prior to the start of construction, the Contractor shall contact "Call Before You Dig" and all utility within the towns along the project corridor. The Contractor shall also contact Mr. James Gannon of ConnDOT Highway Operations at 203-673-7373 to mark out IMS conduit and appurtenances.

In areas adjacent to existing incident management system equipment, the Contractor is required to hand excavate. Any damage caused to the IMS conduit/equipment will be the responsibility of the Contractor, and will be replaced by the Contractor at the Contractor's expense, as directed by the Engineer. Mark out of the IMS will not relieve the Contractor of responsibility for repair of damage caused by the Contractor or the Contractor's sub-contractors.

NOTICE TO CONTRACTOR - TRAFFIC SIGNALS

The Contractor is hereby notified that certain conditions pertaining to the installation of new signals and maintenance of traffic signal operations are required when relevant, as part of this contract.

Qualified/Unqualified Workers

U.S. Department of Labor
Occupational Safety & Health Administration (OSHA) www.osha.gov

Part Number	**1910**
Part Title	**Occupational Safety & Health Administration**
Subpart	**S**
Subpart Title	**Electrical**
Standard Number	**1910.333**
Title	**Selection and use of work practices**

Completion of this project will require Contractor employees to be near overhead utility lines. All workers and their activities when near utility lines shall comply with the above OSHA regulations. In general, unqualified workers are not allowed within 10 feet of overhead, energized lines. It is the contractor's responsibility to ensure that workers in this area are qualified in accordance with OSHA regulations.

The electric distribution company is responsible to provide and install all necessary anchors and guy strands on utility poles. It is the Contractors responsibility to coordinate with the utility company to ensure proper placement of the anchor. The Contractor will also reimburse the utility company the full cost for the installation of the anchor and guy.

This project includes countdown pedestrian signals. The countdown display is allowed only during the flashing don't walk time of the pedestrian movement.

The Controller Unit (CU) shall conform to the current edition of the Functional Specifications for Traffic Control Equipment. The Functional Specifications require the CU meet NEMA Standard Publication No. TS2-1992 Type 2. The Functional Specifications are available on the Departments' web site, www.ct.gov/dot/.

Under Maintenance and Protection of Traffic (M&PT) and Temporary Signalization the Contractor is required to keep in operation the following: all vehicle and pedestrian signals including necessary support structures; all vehicle and pedestrian detection; the pre-emption system; and coordination to the master, if in a system.

Existing or new span poles or utility poles cannot be double loaded without proper guying.

The contractor will be held liable for all damage to existing equipment resulting from his or his subcontractor's actions.

A credit will be deducted from monies due the Contractor for all maintenance calls responded to by Department of Transportation personnel.

All existing traffic appurtenances, in particular steel span poles, controller cabinets and pedestals shall be removed from the proposed roadway prior to excavation. The Contractor shall work with the utility companies to either relocate or install all traffic signal appurtenances prior to the roadway reconstruction.

The Contractor must install permanent or temporary spans in conjunction with utility company relocations. He then must either install the new signal equipment and controller or relocate the existing equipment.

The 30 Day Test on traffic control equipment, as specified in Section 10.00, Article 10.00.10 - TESTS, will not begin until the items listed below are delivered to the Department of Transportation, Traffic Signal Lab in Rocky Hill.

Four (4) sets of cabinet wiring diagrams. Leave one set in the controller cabinet.
All spare load switches and flash relays.

The following notes apply to projects which include Optical or Siren Pre-emption:

- Pre-emption is to operate through the internal pre-emption of the signal controller.
- If not present in a controller cabinet the contractor shall install the following items:
    - Pre-emption disconnect switch.
    - Pre-emption termination panel with "D" harness.
    - Pre-emption test pushbuttons.
- Contractor must provide a chart, or print out of the program steps and settings.
- Detector locations are for illustration only. Exact locations shall be determined by the Manufacturer or his designated representative. Detector cables are to be installed continuous between each detector and the auxiliary equipment cabinet.

NOTICE TO CONTRACTOR – WEDGING TO INCREASE CROSS SLOPE

As noted on the Plans, a wedge course will be used to increase the cross slope in normal roadway sections areas. The intent is to wedge to increase the cross slope as much as possible, but not above 2%, subject to the following constraints:

1) In wedge course sections the first constraint is that the thickness of the PMA S0.375 on the thin side of the wedge shall be 1.5".

2) The second constraint is that the high side of the wedge shall not be more than 2.5" thick. This has to do with the stability of this mix under compaction.

With these constraints, the lift of PMA S0.375 is capable of providing up to 0.7% of additional cross-slope as required by existing conditions at any one location. Surveys and staking should be performed prior to milling so that the paving operation has information to guide the paver settings.

NOTICE TO CONTRACTOR – PROTECTION OF UNDERGROUND UTILITIES

The contractor is hereby advised that there is potential underground electrical illumination conduits located close to the roadway along entire project of I-95 northbound and southbound and at off and on ramps. The Contractor shall use extreme caution when placing guide rail posts in areas where underground electrical conduits are located. The Contractor will be responsible for any damages to existing conduits. The work to repair or replace any damage caused by the Contractor's operations will be made solely at the Contractor's expenses.

The Contractor shall be advised that the existing underground electrical conduits and concrete handholes for existing illumination shall be identified and located prior to the installation of the precast concrete barrier curbing and guide railing.

NOTICE TO CONTRACTOR – LIGHTING FOR NIGHT WORK

The Contractor shall provide sufficient light for work areas during all night work. The light provided shall be a minimum of 10 foot candles. The light shall be provided by light plants, balloon lights or any other acceptable equivalent as determined by the Engineer.

The Contractor shall provide lighting for all night work operations – no exceptions are to be made. Any Contractor personnel working outside the lighted area will be directed to return to a lighted area or the operation shall be stopped.

The Contractor shall supply appropriate light meters and assign supervisory personnel to verify that all work is performed with proper lighting.

No work is to be performed at night without adequate light, as determined by the Engineer and in accordance with the above specifications.

THERE WILL BE NO DIRECT PAYMENT FOR LIGHTING. ALL COSTS ASSOCIATED WITH THIS REQUIREMENT SHALL BE INCLUDED IN THE GENERAL COST OF THE WORK.

NOTICE TO CONTRACTOR – SEQUENCING

The Contractor shall submit sequencing plans to the Department for review and approval. The plans should show the proposed sequence of construction of at least the following major items:

-clean and repair existing drainage
-reconstruct NB & SB right shoulder
-placement of new drainage
-installation of precast concrete barrier curb
-milling work
-paving work
-installation of metal beam rail

Date 01/29/14

NOTICE TO CONTRACTOR - GENERAL PERMIT FOR STORMWATER DISCHARGE

This notice is provided to summarize some of the requirements of the Connecticut Department of Energy and Environmental Protection's General Permit for the Discharge of Stormwater and Dewatering Wastewaters associated with Construction Activities (Permit) issued on August 21, 2013, effective October 01, 2013. In no way, does this Notice alleviate the Contractor from understanding and complying with all the requirements and conditions of the Permit.

The Stormwater Pollution Control Plan (SWPCP) addresses pollution caused by soil erosion and sedimentation during construction as well as the long term post-maintenance use of the facility after construction is completed. The Contractor and all subcontractors will be required to sign a certified statement to comply with all applicable conditions of the SWPCP. There will be no additional payment for the Contractor to sign the certification statement and no additional payment for the Contractor to comply with the conditions of the SWPCP.

Erosion and Sedimentation Controls - Structural Measures:

When construction activities will result in the disturbance of a total of 1 acre or more of land regardless of phasing, the Connecticut Department of Transportation (Department) will incorporate a Stormwater Registration and SWPCP as part of the Contract documents in order to insure compliance with all conditions of this Permit. The Permit's 'Construction activities' means activities including but not limited to clearing and grubbing, grading, excavation, and dewatering.

Unless specifically outlined in the Contract Plans and/or SWPCP, the Contractor is not allowed to disturb more than two (2) acres of erodible material per discharge point at any one time regardless of phasing. If the Contractor elects to deviate from the Contract Plans and/or SWPCP to disturb more than two (2) acres of erodible material per discharge point at any one time regardless of phasing, the Contractor must provide a sequenced staging plan outlining the proposed disturbed activities. In all cases, the Contractor must meet the following conditions:

- *If the area of disturbance is maintained less than two (2) acres per discharge point*, the Contractor may disturb additional areas if and only if the previously disturbed areas are temporarily or permanently stabilized immediately using acceptable measures such as the standard controls which are provided in the SWPCP or as shown on the Contract Plans.

- *If the construction activities create an area of disturbance between (2) acres and (5) acres per discharge point*, the Contactor must submit to the Engineer a revised SWPCP for review and approval. The SWPCP must include locations of the temporary sedimentation trap per discharge point with a capacity to contain 134 cubic yards per acre of material in accordance with the 2002 Connecticut Guidelines for Erosion and Sediment Control (Guidelines). The Contractor shall provide an inspection and maintenance plan for the temporary sedimentation trap as part of the amended SWPCP.

- *If the area of disturbance has a potential to reach more than five (5) acres per discharge point*, the Contactor must submit to the Engineer a revised SWPCP for review and approval. The SWPCP must include locations of the temporary sediment basin designed and installed in accordance with the Guidelines. The Contractor shall provide an inspection and maintenance plan for the temporary sediment basin as part of the amended SWPCP.

Other Controls – Washout Areas:

Unless specifically outlined in the Contract Plans and/or SWPCP, the Contractor will be required to identify a designated washout area(s) to collect concrete, paint and other materials from applicators, containers, vehicles and equipment. There shall be no surface discharge of washout wastewaters from this area. In addition to the above, the following conditions must be met:

- Washout shall be conducted outside of any buffers and at least 50 feet from any stream, wetland or sensitive resource.
- Washout shall be conducted in an entirely self-contained system.
- Designated washout areas are to be clearly flagged.
- All washwater is to be directed into a container or pit designed that no overflows can occur during a rainfall event or snowmelt.
- Hardened concrete is considered "Waste Disposal" and is to be removed from the project and disposed of at an approved facility.

Routine Inspections:

At a minimum, the Contractor along with a qualified inspector (provided by the permittee) shall inspect, at minimum, the following: disturbed areas of the construction activity that have not been finally stabilized; all erosion and sedimentation control measures; all structural control measures; soil stockpile areas; washout areas and locations where vehicles enter or exit the site at least once a week and within 24 hours at the end of a storm event that is equal to or exceeds 0.5 inches. If a potential source of pollution is identified, pollution preventive measures shall be implemented within 24 hours and the SWPCP must be amended within three calendar days.

Keeping Plans Current:

If the Contractor requires a modification to the SWPCP, it shall be in accordance with the Guidelines and the 2004 Connecticut Stormwater Quality Manual or amended. The Department shall approve or reject the modification to the SWPCP and notify the Contractor in writing as to any revisions or additional information required for approval. No damage for delays will be granted to the Contractor based on time taken by the Department to review the Contractor's proposal, or to apply for or secure the Permit amendment, modification or revision as per Section 1.10 - Environmental Compliance, of the Standard Specifications for Roads, Bridges, and Incidental Construction Form 816 and any Supplements thereto.

At no time shall the Contractor proceed with the proposed SWPCP amendment, modification, or revision unless the Engineer approves, in writing, the Contractor's request. The permittee shall amend the SWPCP whenever there is a change in Contactors or subcontractors at the site, or a change in design, construction, operation, or maintenance at the site which has the potential for the discharge of pollutants. In all cases as described above, the amended SWPCP shall adhere to and comply with Section 1.10 - Environmental Compliance, of the Standard Specifications for Roads, Bridges and Incidental Construction Form 816 and any Supplements thereto. No additional payment will be made for any Permit amendment, modification, or revision which alters the Contract Plans, SWPCP, and/or estimated quantities as a result of the Department's approval of the modifications to the Contract by the Contractor. Changes or variations to the Contract Plans and/or SWPCP by the Contractor shall not result in any additional cost to the State.

In order for the Contractor to meet the requirements set forth in the SWPCP, the Contractor shall comply with additional erosion and sedimentation control provisions included in the project or as identified in the Guidelines.

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 workshifts may be required to complete the work in accordance within the specified contract time.

NOTICE TO CONTRACTOR - NCHRP 350 REQ. FOR WORK ZONE TRAFFIC CONTROL DEVICES

CATEGORY 1 DEVICES (traffic cones, traffic drums, tubular markers, flexible delineator posts)

Prior to using the Category 1 Devices on the project, the Contractor shall submit to the Engineer a copy of the manufacturer's self-certification that the devices conform to NCHRP Report 350.

CATEGORY 2 DEVICES (construction barricades, construction signs and portable sign supports)

Prior to using Category 2 Devices on the project, 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).

Specific requirements for these devices are included in the Special Provisions.

Information regarding NCHRP Report 350 devices may be found at the following web sites:

FHWA: http://safety.fhwa.dot.gov/roadway_dept/road_hardware/index.htm

ATSSA: http://www.atssa.com/resources/NCHRP350Crashtesting.asp

NOTE: The portable wooden sign supports that have been traditionally used by most contractors in the State of Connecticut do NOT meet NCHRP Report 350 criteria and shall not be utilized on any project advertised after October 01, 2000.

CATEGORY 3 DEVICES (Truck-Mounted Attenuators & Work Zone Crash Cushions)

Prior to using Category 3 Devices on the project, 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 conform to NCHRP Report 350.

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 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 – SUPERPAVE DESIGN LEVELS

Hot-Mix Asphalt (HMA) and Polymer-Modified Asphalt (PMA) constructed according to the Superpave mix-design system are required to attain a Superpave Design Level and are 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

			Baldwin Bridge	Surface Patch Item	All other areas
Mix Designation	**PG Binder PG 64-22**	**PG Binder PG 76-22**	**Design Level**	**Design Level**	**Design Level**
HMA S0.25	--	--	--	--	--
HMA S0.375	X	--	--	2	--
HMA S0.5	--	--	--	--	--
HMA S1	X	--	--	--	2
PMA S0.25	--	X		--	2
PMA S0.375	--	X	3	--	3
PMA S0.5	--	X	--	--	3
PMA S1	--	--	--	--	--

Note: The PMA S0.375 specification for this project requires a coarser gradation than typically used in prior projects.

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 parenthesis.

(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 parenthesis.

(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.

SECTION 1.03 - AWARD AND EXECUTION OF CONTRACT

Article 1.03.02 - Award and Execution of Contract:

After the second sentence of the only paragraph add the following:

The successful bidder is hereby notified of the Department's intent to award this contract within __ days of the bid opening.

Article 1.03.08 - Notice to Proceed and Commencement of Work:

Change the first paragraph to read as follows:

The Contractor shall commence and proceed with the Contract work on the date specified in a written Notice to Proceed issued by the Engineer to the Contractor. The date specified will be no later than 45 calendar days after the date of the execution of the Contract by the Department, however, the contractor is hereby put on notice that it is the Department's intent to issue the Notice to Proceed no later than 24 calendar days after the date of the execution of the Contract by the Department.

SECTION 1.05 - CONTROL OF THE WORK

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

Subarticle 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 catalog cuts, working drawings and/or shop drawings for all traffic signal items to the Division of Traffic Engineering for approval before fabrication. The packaged set of catalog cuts, working drawings 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. Catalog cuts 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 mail to:

Lisa N. Conroy, P.E.
Transportation Supervising Engineer
Connecticut Department of Transportation
Division of Traffic Engineering – Electrical
2800 Berlin Turnpike
P.O. Box 317546
Newington, Connecticut 06131-7546
(860) 594-2985

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 catalog cuts 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:

lisa.conroy@ct.gov

SECTION 1.05 - CONTROL OF THE WORK

Article 1.05.08 - Schedules and Reports

1. Baseline Bar Chart Construction Schedule: The Contractor will develop a comprehensive bar-chart construction schedule for the project based on the following guidelines:

1. The bar chart schedule will contain a list of activities that represents the major elements of the project. At a minimum, this list should include a breakdown by individual structure or stage, including major components of each. The following is provided as an example only and is not meant to be all-inclusive (or all-applicable):

Project Management items
- -Winter shutdowns
- -Environmental permit "window" periods
- -Milestones
- -Third Party approvals
- -Long lead time items
- -Fabrication of major elements (Structural steel, precast units, span poles etc.)
- -Adjacent Work by others

Award
Notice to Proceed
Signing (Construction, temporary, permanent by location)
Mobilization
Permit Acquisition
Field Office
Utility Relocations
Submittals/shop drawings/working drawings/product data
Material procurement/fabrication

Construction of Waste Stock pile area
Clearing and Grubbing
Earthwork (Borrow, earth ex, rock ex etc.)
TPCBC
Temporary markings
Roadway Construction (Breakdown into excavation, fill, subbase, membrane, pavement, curbing, sidewalk, guiderail etc.)
Drainage (Breakdown into excavation, bedding, pipe, manholes, catch basins, backfill, rip-rap etc.)
Culverts

**** For bridges, include major components such as: Abutments, wingwalls, piers, decks and retaining walls; further breakdown by footings, wall sections, parapets etc.

Temporary Sheeting
Cofferdam and Dewatering
Structure Excavation
Piles/test piles
Temporary Structures
Removal of Superstructure
Bearing Pads
Structural Steel (Breakdown by fabrication, delivery, installation, splicing, painting etc.)
Illumination
Signalization
Pavement Markings
Plantings
Turf Establishment
Clean-up

Traffic signal, incident management, lighting, planting and guiderail projects will be driven more by multiple locations, than multiple operations. Therefore, the list of major elements should be broken down first by location, then by operation e.g. Route 2 and 165 – "Trenching and backfilling", Rte 12 and Rte 184 – "Span pole installation". Other major elements of these types of projects should include, but are not limited to:

Material submittals
Material procurement/fabrication
Installation of anchors
Driving posts
Foundations
Trenching and Backfilling
Installation of Span poles/mast arms
Installation of luminaries
Installation of cameras
Installation of VMS
Hanging heads
Sawcut loops
Energized by power company
Pavement markings
Excavation of plant pits
Setting Plants
Establishment Period
Fertilization

2. The comprehensive bar-chart construction schedule will be compiled using this list of major activities. It will be the responsibility of the contractor to identify all milestones, environmental permit "window" periods, winter shutdowns etc. and include them on their schedule under the corresponding dates.

3. If the Department determines that additional detail is necessary, the contractor will provide it.

4. Each activity shall have a separate schedule bar. The schedule timeline shall be broken into weekly time periods with a vertical line to identify the first working day of each week and shall be detailed to show all elements of the Project.

5. The schedule shall show relationships among activities. The critical path for the Project shall be clearly defined on the schedule. The schedule shall show milestones for major elements of work. Prepare the schedule on a sheet, or series of sheets of sufficient width to show data for the entire construction period.

6. Project work shall be scheduled to ensure that a Construction Completion Date for the Project will be obtained prior to expiration of the Contract time.

7. Following the Engineer's acceptance of the initial submittal, the Contractor shall distribute copies of the schedule (as and whenever it may be revised) to the Engineer, and the Contractor's subcontractors.

8. Whenever and however often the schedule is revised, the Contractor shall distribute the latest schedule in the manner described above.

9. There will be no direct payment for furnishing schedules, the cost thereof shall be considered as included in the general cost of the work.

2. Monthly Updates: No later than the 10th day of each month, unless directed otherwise by the Engineer, the Contractor shall deliver to the Engineer 3 copies of the schedule to show the work actually accomplished during the preceding month, the actual time spent on each activity, and the estimated time needed to complete any activity which has been started but not completed. Each time bar shall indicate, in 10% increments, the estimated percentage of that activity which remains to be completed. As the Project progresses, the Contractor shall place a contrasting mark in each bar to indicate the actual percentage of the activity that has been completed.

The monthly update shall include revisions of the schedule necessitated by revisions to the Project directed by the Engineer (including, but not limited to extra work), during the month preceding the update. Similarly, any changes of the schedule required due to changes in the Contractor's planning or progress shall also be included within the schedule.

Any schedule revisions shall be identified and explained in a cover letter accompanying the monthly update. The Engineer reserves the right to approve or reject any such revisions. The letter shall also describe in general terms the progress of the Project since the last schedule update and shall identify any items of special interest. If the schedule revisions extend the contract completion date, due to extra or added work or delays beyond the control of the Contractor, the Contractor must submit a request in writing for an extension of time in accordance with Article 1.08.08. This request should be supported by the schedules submitted previously.

If the Contractor fails to provide monthly schedule updates, the Engineer has the right to hold 10% of the monthly estimated payment, or $5,000, whichever is less, until such time as an acceptable update has been provided..

3. Biweekly Schedules: Each week, the Contractor shall be required to produce and submit to the Engineer a biweekly schedule. This short-term schedule may be handwritten but shall clearly indicate all work planned for the following two week period.

4. Recovery Schedules: If the Engineer determines that the updated schedule indicates that the Contractor has fallen behind schedule, absent a justifiable time extension, the Contractor shall immediately institute steps acceptable to the Engineer to improve its progress of the Project. In such a case, the Contractor shall submit a revised plan, as may be deemed necessary by the Engineer, to demonstrate the manner in which an acceptable rate of progress will be regained.

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, working drawings, catalog cuts and other descriptive literature which completely illustrates such items presented for formal approval. Such approval shall not change the requirements for a certified test report and materials certificate as may be called for. All shop drawings shall be submitted at one time, unless otherwise approved by the engineer.

Vehicle Detectors
Loop Sawcut Sealant

SECTION 1.06 - CONTROL OF MATERIALS

Article 1.06.07 - Certified Test Reports and Materials Certificate.

Add the following:

1) For the materials in the following items, a Materials Certificate will be required confirming their conformance to the requirements set forth in these plans or specifications or both.

   Vehicle Detectors
   Loop Sawcut Sealant

SECTION 1.07 - LEGAL RELATIONS AND RESPONSIBILITIES

Article 1.07.10 - Contractor's Duty to Indemnify the State against Claims for Injury or Damage:

Add the following after the only paragraph:

"It is further understood and agreed by the parties hereto, that the Contractor shall not use the defense of Sovereign Immunity in the adjustment of claims or in the defense of any suit, including any suit between the State and the Contractor, unless requested to do so by the State."

SECTION 1.07 – LEGAL RELATIONS AND RESPONSIBILITIES

Article 1.07.11 Opening of Section of project to Traffic or Occupancy:

Add the following sentence to the last paragraph;

"In cases in which guiderail is damaged by the traveling public, repair or replacement will be reimbursable as contained elsewhere herein."

SECTION 1.08 – PROSECUTION AND PROGRESS

Article 1.08.01—Transfer of Work or Contract: Replace 1.08.01 with the following:

1.08.01 – Transfer of Work or Contract: The Contractor shall perform with its own organization Contract work with a value under the Contract of at least 50% of the original total Contract value. If the Contractor sublets, sells, transfer, or otherwise disposes of any part of the Contract work without the Commissioner's prior written consent, the Contractor will not be relieved of any Contractual or other legal responsibility in connection therewith. Such an unauthorized act by the Contractor shall constitute a material breach of the Contract, and the Commissioner may, in such a case, terminate the Contract without further compensation to the Contractor.

The Contractor shall include the following alternative dispute resolution clause in all of its Project subcontracts:

"For any dispute arising out of the agreement between the Contractor and a subcontractor, including claims of late payment or non-payment, which cannot be settled within 60 days of the subcontractor submitting a written claim to the Contractor, either party may bring the dispute before an alternative dispute resolution entity for resolution. If the parties do not agree upon a particular dispute resolution entity for that purpose, the dispute shall be resolved under the auspices and construction arbitration rules of the American Arbitration Association, or under the rules of any other alternative dispute resolution entity approved by the Department either generally or for the specific dispute. These rights and restrictions may not be waived, and if these provisions are not included in the Contractor's subcontracts for the Project, these provisions shall nonetheless be read into them."

The Contractor shall not knowingly enter into any lower tier transaction on a Department project with any person or entity which, under any federal or state law or regulation, or by voluntary agreement, is currently debarred or disqualified from bidding for construction contracts or participating in construction projects in any jurisdiction within the United States, unless after disclosure of such ineligibility, such participation is authorized by appropriate federal and State authorities, including the Commissioner.

The Contractor shall not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portion thereof, or of the work provided for therein, or of its right, title, or interested therein, to any individual or entity without the prior written consent of the Commissioner. No payment will be made for any part of the work sublet, sold, transferred, assigned, or otherwise disposed of by the Contractor, prior to the authorization date given in the written consent of the Commissioner. Such an unauthorized act by the Contractor shall constitute a material breach of the Contract, and the Commissioner may, in such a case, terminate the Contract without further compensation to the Contractor.

The Contractor shall pay the subcontractor for work performed within thirty (30) days after the Contractor receives payment for the work performed by the subcontractor. Withholding retainage by the Contractor, subcontractor or lower tier subcontractors is not allowed.

Payment for work has been performed by a subcontractor does not eliminate the Contractor's responsibilities for all the work as defined in Article 1.07.12, "Contractor's Responsibility for Work."

Payment for work that has been performed by a subcontractor also does not release the subcontractor from its responsibility for maintenance and other periods of subcontractor responsibility specified for the subcontractor's items of work. Failure of a subcontractor to meet its maintenance, warranty and/or defective work responsibilities may result in administrative action on future Department contracts.

For any dispute regarding prompt payment, the alternate dispute resolution provisions of this article shall apply.

The above requirements are also applicable to all sub-tier subcontractors and the above provisions shall be made a part of all subcontract agreements.

Failure of the Contractor to comply with the provisions of this section may result in a finding that the Contractor is non-responsible on future projects.

Article 1.08.13 – Termination of the Contractor's Responsibility Replace with the following:

Article 1.08.13 – Acceptance of Work and Termination of the Contractor's Responsibility:

The Contractor's responsibility for non-administrative Project work will be considered terminated when the final inspection has been held, any required additional work and final cleaning-up have been completed, all final operation and maintenance manuals have been submitted, and all of the Contractors' equipment and construction signs have been removed from the Project site. When these requirements have been met to the satisfaction of the Engineer, the Commissioner will accept the work by certifying in writing to the Contractor, that the non-administrative Project work has been satisfactorily completed.

SECTION 1.08 - PROSECUTION AND PROGRESS

Article 1.08.03 - Prosecution of Work:

Add the following:

The Contractor shall notify the Traffic Systems Unit at Telephone # (860) 594-3450 forty -five (45) days prior to starting work on computer controlled signalized intersections only. This notice will initiate work to be completed by others. The Contractor shall be responsible for any timely updates that need to be reported to this Unit for the successful coordination of work by others.

The Contractor shall notify the project engineer on construction projects, or the district permit agent on permit jobs, when all traffic signal work is completed. This will include all work at signalized intersections including loop replacements, adjusting existing traffic signals or any relocation work including handholes. The project engineer or district permit agent will notify the Division of Traffic Engineering to coordinate a field inspection of all work.

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SECTION 1.08 - PROSECUTION AND PROGRESS

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:

Route I-95

On the following State observed Legal Holidays:
New Year's Day
Good Friday, Easter*
Memorial Day
Independence Day
Labor Day
Thanksgiving Day**
Christmas Day

The following restrictions also apply:

On the day before and the day after any of the above Legal Holidays.

On the Friday, Saturday, and Sunday immediately preceding any of the above Holidays celebrated on a Monday.

On the Saturday, Sunday, and Monday immediately following any of the above Holidays celebrated on a Friday.

* From 6:00 a.m. the Thursday before the Holiday to 8:00 p.m. the Monday after the Holiday.

** From 6:00 a.m. the Wednesday before the Holiday to 8:00 p.m. the Monday after the Holiday.

During all other times
The Contractor shall maintain and protect traffic as shown on the accompanying "Limitation of Operations" charts, which dictate the minimum number of lanes that must remain open for each day of the week.

Limitation of Operations Chart
Minimum Number of Lanes to Remain Open

Route: I-95 NB Location: MP 78.45 - 83.95 Number of Through Lanes: 2							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	1	1	1	1	1	1	1
1 AM	1	1	1	1	1	1	1
2 AM	1	1	1	1	1	1	1
3 AM	1	1	1	1	1	1	1
4 AM	1	1	1	1	1	1	1
5 AM	1	1	1	1	1	1	1
6 AM	1	1	1	1	1	1	1
7 AM	2	2	2	2	2	2	1
8 AM	2	2	2	2	2	2	1
9 AM	2	2	2	2	2	2	2
10 AM	2	2	2	2	2	2	2
11 AM	2	2	2	2	2	2	2
Noon	2	2	2	2	2	2	2
1 PM	2	2	2	2	2	2	2
2 PM	2	2	2	2	2	2	2
3 PM	2	2	2	2	2	2	2
4 PM	2	2	2	2	2	2	2
5 PM	2	2	2	2	2	2	2
6 PM	2	2	2	2	2	2	2
7 PM	1	2	1	1	2	2	2
8 PM	1	1	1	1	2	2	1
9 PM	1	1	1	1	2	1	1
10 PM	1	1	1	1	1	1	1
11 PM	1	1	1	1	1	1	1

Route: I-95 SB Location: MP 78.45 - 83.95 Number of Through Lanes: 2							
Hour Beginning	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Mid	1	1	1	1	1	1	1
1 AM	1	1	1	1	1	1	1
2 AM	1	1	1	1	1	1	1
3 AM	1	1	1	1	1	1	1
4 AM	1	1	1	1	1	1	1
5 AM	1	1	1	1	1	1	1
6 AM	2	1	1	1	1	1	1
7 AM	2	2	2	2	2	1	1
8 AM	2	2	2	2	2	2	1
9 AM	2	2	2	2	2	2	2
10 AM	2	2	2	2	2	2	2
11 AM	2	2	2	2	2	2	2
Noon	2	2	2	2	2	2	2
1 PM	2	2	2	2	2	2	2
2 PM	2	2	2	2	2	2	2
3 PM	2	2	2	2	2	2	2
4 PM	2	2	2	2	2	2	2
5 PM	2	2	2	2	2	2	2
6 PM	2	2	2	2	2	2	2
7 PM	1	1	1	1	2	2	2
8 PM	1	1	1	1	2	2	2
9 PM	1	1	1	1	1	2	2
10 PM	1	1	1	1	1	2	1
11 PM	1	1	1	1	1	1	1

On Holidays and within Holiday Periods, all Hours shall be "E"

"E" = maintain existing traffic operations = all available travel lanes, including exit only lanes, climbing lanes and all available shoulder widths shall be open to traffic during this period

LIQUIDATED DAMAGES PER HOUR
Project No. 104-164

Route I-95 NB 2 Lane Section	
If Working Periods Extends Into	A.M. 1 Lane Closure
1st Hour of Restrictive Period	$500
2st Hour of Restrictive Period	$8,000
3rd Hour or any Subsequent Hour of Restrictive Period	$15,000

Route I-95 SB 2 Lane Section	
If Working Periods Extends Into	A.M. & P.M. 1 Lane Closure
1st Hour of Restrictive Period	$500
2st Hour of Restrictive Period	$500
3rd Hour or any Subsequent Hour of Restrictive Period	$500

The above liquidated damages apply to those hours shown on the Limitation of Operations charts designated with a "2" or "E"

For each hour shown on the Limitation of Operations charts designated with an "E", liquidated damage of $500 per hour shall apply if all available shoulder widths are not available to traffic.

Liquidated damages in the amount of $500 shall apply for each hour that the Contractor interferes with existing traffic operations on any ramps during the non-allowable hours.

Ramps and Turning Roadways

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 6:00 p.m.

All Other Roadways

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 3:00 p.m. and 6:00 p.m.
Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Additional Lane Closure Restrictions

It is anticipated that work on adjacent projects 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 an expressway when traffic operations are being restricted on that same expressway, unless there is at least a one 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 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.

SECTION 1.09 - MEASUREMENT AND PAYMENT

Article 1.09.06—Partial Payments: Replace 1.09.06 with the following:

1.09.06 – Partial Payments
A. Monthly and Semi-monthly Estimates.
(1) Once each month, the Engineer will make, in writing, current estimates of the value of work performed in accordance with the Contract, calculated at Contract unit prices, including but not limited to the value of materials complete in place and materials not yet incorporated into the Project, but approved by the Engineer for payment (as provided for elsewhere in this article). Retainage will not be held.

Exceptions may be made as follows:
(a) When not in conflict with the interests of the State, the Contractor may request, and the Engineer may make, semi-monthly estimates for payment.
(b) No estimates for payments will be made when, in the judgment of the Engineer, the Project is not proceeding in accordance with the Contract.

(2) The Engineer may also make payment at Contract unit prices for the number of units that represent the value of the Project work performed to date, if said units are essentially, though not totally, complete.

(3) As soon as possible after the final inspection, the apparent final quantities will be sent to the Contractor. The Contractor shall respond in writing within 21 days of receipt by either signing and thus accepting the final quantities or by disagreeing in writing, citing the pay items involved with documentation and justification of such agreement. Failure to respond within the 21 days will be considered as acceptance of the final quantities and the Department may proceed with final payment,

B. Payment for Stored Materials: Non-perishable materials that meet Contract requirements, that have been produced or purchased specifically for incorporation into the Project, and that have been delivered to the Project site or to such location as the Engineer may have approved, but which have not yet been incorporated into the Project, may be included in current estimates at such fraction of the applicable Contract unit price or lump sum price as the Engineer may deem to represent a fair value for the material, if such materials have been paid for by the Contractor as shown by receipted bills or, in lieu of such receipted bill(s), a duly-executed Certification of Title executed by the Contractor and the Vendor in the form approved by the Department. When partial payment is made for stored materials, such materials shall become the property of the State; but such payment shall in no way release the Contractor from its responsibility for the condition, protection and, in case of loss, replacement of such materials, or from any liability resulting in any manner from the presence of such materials wherever they may be stored or kept. All materials shall be stored in accordance with Article 1.06.03 and in accordance with the manufacturer's recommendations. Material test approval by the Department shall be required prior to payment for such materials.

Offsite storage may be approved by the Engineer provided that the materials proposed for payment are segregated from other materials, clearly labeled as being owned by the Department for use on the identified Project, otherwise handled in compliance with Article 1.06.03, and stored in accordance with the manufacturer's recommendations. All such materials must be readily-available for inventory and inspection by the Engineer. Storage outside of the State of Connecticut may be considered only when a representative of the Department is able to verify that the above requirements have been satisfied.

For items requiring extended fabrication, manufacturing or assembly time, the Contractor may propose to the Engineer a schedule of values for the related material costs. If the Engineer approves such a schedule of values, it shall become the Basis of Payment for the stored materials, so long as all other pertinent Contract requirements have been satisfied.

Generic materials having a use on many projects will be considered for payment prior to their incorporation into the Project only if stored in unopened packaging or in large lots. Stock and raw materials will not be considered for such advance payment without the Engineer's prior written consent thereto.

In no case shall material payments exceed the Contract unit price or lump sum price less the actual value of delivery and installation of the materials; if they do exceed such a price, the Engineer reserves the right to reduce any related payment accordingly. Such reductions in payment shall in no way affect the Department's ownership interest in the stored materials.

Article 1.09.07 - Final Payment: Replace 1.09.07 with the following:

1.09.07—Final Payment: When the Commissioner has accepted the Project, the Engineer will prepare a final payment estimate and a list of final item quantities. The list will include the entire amount of each item of Project work performed, the value thereof, and the amount of all payments made on prior estimates, all such estimated payments being merely partial payments and subject to correction in the calculation of the final payment.

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 and placement of a non-segregated, smooth and dense bituminous concrete mixture brought to proper grade and cross section. This section shall also include the method and construction of longitudinal joints. The Contractor shall furnish ConnDOT with a Quality Control Plan as described in Article 4.06.03.

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

Bituminous Concrete: A concrete material that uses a bituminous material (typically asphalt) as the binding agent and stone and sand as the principal aggregate components. Bituminous concrete may also contain any of a number of additives engineered to modify specific properties and/or behavior of the concrete material. For the purposes of this Specification, references to bituminous concrete apply to all of its sub-categories, for instance those defined on the basis of production and placement temperatures, such as hot-mix asphalt (HMA) or warm-mix asphalt (WMA), those categories derived from the mix-design procedure used, such as "Marshall" mixes or "Superpave" mixes, or those defined on the basis of composition, such as polymer-modified asphalt (PMA).

Course: A lift or multiple lifts comprised of the same bituminous concrete mixture placed as part of the pavement structure.

Density Lot: All material placed in a single lift and as defined in Article 4.06.03.

Disintegration: Wearing away or fragmentation of the pavement. Disintegration will be evident in the following forms: Polishing, weathering-oxidizing, scaling, spalling, raveling, potholes or loss of material.

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

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

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

Marshall: A bituminous concrete mix design used in mixtures designated as "Bituminous Concrete Class ( )".

Polymer Modified Asphalt (PMA): A bituminous concrete mixture containing a polymer modified asphalt binder in accordance with contract specifications.

Production Lot: All material placed during a continuous daily paving operation.

Quality Assurance (QA): All those planned and systematic actions necessary to provide confidence that a product or facility will perform as designed.

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 volumetrics, gradation or temperature.

Warm Mix Asphalt (WMA): A bituminous concrete mixture that can be produced and placed at reduced temperatures than HMA using a qualified additive or technology.

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. Bituminous Concrete plant QC plan requirements are defined in Section M.04.

2. Recycle Option: The Contractor has the option of recycling reclaimed asphalt pavement (RAP) or Crushed Recycled Container Glass (CRCG) in bituminous concrete mixtures in accordance with Section M.04. CRCG shall not be used in the final lift of the surface course.

4.06.03—Construction Methods:

1. Material Documentation: All vendors producing bituminous concrete must have their truck-weighing scales, storage scales, and mixing plant automated to provide a detailed ticket.

Delivery tickets must include the following information:

a. State of Connecticut printed on ticket.
b. Name of producer, identification of plant, and specific storage bin (silo) if used.
c. Date and time of day.

d. Mixture Designation If RAP is used, the plant printouts shall include RAP dry weight, percentage and daily moisture content. If WMA technology is used, the technology and the additive rate or the water injection rate must be noted on the ticket. Class 3 mixtures for machine-placed curbing must state "curb mix only".
e. Net weight of mixture loaded into truck (When RAP is used, RAP moisture shall be excluded from mixture net weight).
f. Gross weight (Either equal to the net weight plus the tare weight or the loaded scale weight).
g. Tare weight of truck – Daily scale weight.
h. Project number, purchase order number, name of Contractor (if Contractor other than Producer).
i. Truck number for specific identification of truck.
j. Individual aggregate, RAP, and virgin asphalt high/target/low weights shall be printed on batch plant tickets (For drum plants and silo loadings, the plant printouts shall be printed out at 5 minute intervals maintained by the vendor for a period of three years after the completion of the project).
k. For every mixture designation the running daily total delivered and sequential load number.

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

The Contractor must notify the Engineer immediately if, during the production day, there is a malfunction of the weighing or recording system in the automated plant or truck-weighing scales. Manually written tickets containing all required information will be allowed for one hour, but for no longer, provided that each load is weighed on State-approved scales. At the Engineer's sole discretion, trucks may be approved to leave the plant if a State inspector is present to monitor weighing. If such a malfunction is not fixed within forty-eight hours, mixture will not be approved to leave the plant until the system is fixed to the Engineer's satisfaction. No damages will be considered should the State be unable to provide an inspector at the plant.

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

2. Transportation of Mixture: Trucks 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 of all vehicles and allowable weights transporting mixture.

The State reserves the right to check the gross and tare weight of any delivery truck. A variation of 0.4 percent or less in the gross or tare weight shown on the delivery ticket and the certified scale weight shall be considered evidence that the weight shown on the delivery ticket is correct. 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 take action to correct discrepancy to the satisfaction of the Engineer.

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

The mixture shall be transported from the mixing plant in trucks that have previously been cleaned of all foreign material and that have no gaps through which mixture might inadvertently escape. The Contractor shall take care in loading trucks uniformly so that segregation is minimized. Loaded trucks shall be tightly covered with waterproof covers acceptable to the Engineer. Mesh covers are prohibited. The front and rear of the cover must be fastened to minimize air infiltration. The Contractor shall assure that all trucks are in conformance with this specification. Trucks found not to be in conformance shall not be allowed to be loaded until re-inspected to the satisfaction of the Engineer.

Truck body coating and cleaning agents must not have a deleterious effect on the transported mixture. The use of solvents or fuel oil, in any concentration, is strictly prohibited for the coating of the inside of truck bodies. When acceptable coating or agents are applied, truck bodies shall be raised immediately prior to loading to remove any excess agent in an environmentally acceptable manner.

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 strictly prohibited as a release agent or cleaner on any paving equipment (i.e., rollers, pavers, transfer devices, etc.).

Refueling of equipment is prohibited in any location on the paving project where fuel might come in contact with bituminous concrete mixtures already placed or to be placed. Solvents for use in cleaning mechanical equipment or hand tools shall be stored clear of areas paved or to be paved. Before any such equipment and tools are cleaned, they shall be moved off the paved or to be paved area; and they shall not be returned for use until after they have been allowed to dry.

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. Rollers types shall include steel-wheeled, pneumatic or a combination thereof and may be capable of operating in a static or dynamic mode. Rollers that operate in a dynamic mode shall have drums that use a vibratory or oscillatory system or combination of. The vibratory system achieves compaction through vertical amplitude forces. Rollers with this system shall be equipped with indicators that provide the operator with amplitude, frequency and speed settings/readouts to measure the impacts per foot during the compaction process. The oscillatory system achieves compaction through horizontal shear forces. Rollers with this system 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 self-propelled and 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, adjusting ballast and tire inflation pressure as required. The Contractor shall furnish evidence regarding tire size; pressure and loading to confirm that the proper contact pressure is being developed and that the loading and contact pressure are 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 approved lighting fixtures of equivalent light output characteristics. A sufficient number of spare lamps shall be available on site as replacements in the event of failures. The Contractor shall provide brackets and hardware for mounting light fixtures and generators to suit the configuration of the rollers and pavers. Mounting brackets and hardware shall provide for secure connection of the fixtures, minimize vibration, and allow for adjustable positioning and aiming of the light fixtures. Lighting shall be aimed to maximize the illumination on each task and minimize glare to passing traffic. The Contractor shall provide generators on rollers and pavers of the type, size, and wattage, to adequately furnish 120 V AC of electric power to operate the specified lighting equipment. A sufficient amount of fuel shall be available on site. There shall be switches to control the lights. Wiring shall be weatherproof and installed to all applicable codes. The minimum lighting requirements are found in tables 4.06-1 and 4.06-2:

Table 4.06-1: Paver Lighting

Fixture	Quantity	Remarks
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

Table 4.06-2: Roller Lighting

Fixture*	Quantity	Remarks
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
OR		
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

*All fixtures shall be mounted above the roller.

Type A: Fluorescent fixture shall be heavy-duty industrial type. It shall be enclosed and sealed to keep out dirt and dampness. It shall be UL listed as suitable for wet locations. The fixture shall contain two 4-foot long lamps - Type "F48T12CWHO". The integral ballast shall be a high power factor, cold weather ballast, and 120 volts for 800 MA HO lamps. The housing shall be aluminum, and the lens shall be acrylic with the lens frame secured to the housing by hinging latches. The fixture shall be horizontal surface mounting, and be made for continuous row installation.

Type B: The floodlight fixture shall be heavy-duty cast aluminum housing, full swivel and tilt mounting, tempered-glass lens, sealed door, reflector to provide a wide distribution or narrow distribution as required, mogul lamp socket for 250 watt Metal Halide lamp, 120 volt integral ballast, and be UL listed as suitable for wet locations.
Type C: The power beam holder shall have ribbed die cast aluminum housing and a clear tempered-glass lens to enclose the fixture. There shall be an arm fully adjustable for aiming, with a male-threaded mount with serrated teeth and lock nuts. There shall be a 120-volt heatproof socket with extended fixture wiring for an "Extended Mogul End Prong" lamp base. The fixture shall have gaskets, and shall be UL listed as suitable for wet locations. The lamps shall be 1000-watt quartz PAR64, both Q1000PAR64MFL (flood) and Q1000PARNSP (spot) will be required.

Material Transfer Vehicle (MTV): A MTV shall be used when placing a bituminous concrete surface course as indicated in the contract documents. A surface course is defined as the total thickness of the same bituminous concrete mix that extends up to and includes the final wearing surface whether it is placed in a single or multiple lifts, and regardless of any time delays between lifts.

The MTV must be a self-propelled vehicle specifically designed for the purpose of delivering the bituminous concrete mixture from the delivery truck to the paver. The MTV must have the capability to remix the bituminous concrete mixture.

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

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

- Bituminous concrete mixes shall not be placed when the air or subbase temperature is below 40°F regardless of the season.
- Should paving operations be scheduled during the Extended Season, the Contractor's Quality Control Plan for placement described in Section 9. "Contractor Quality Control Plan for Placement" shall include a separate section titled "Extended Season Paving" and address minimum delivered mix temperature, maximum paver speed, enhanced rolling patterns and the method to balance mixture delivery and placement operations. Work covered by the section on Extended Season paving shall not commence until the Engineer's comments have been incorporated into the section and approved.
- Should placement of the final lift of bituminous concrete be scheduled during the Extended Season, the Contractor is required to submit this plan to the Engineer for review 30 days prior to the paving operation.

5. Superpave 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 acceptance by the Engineer. The 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.

6. 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.

<u>Permanent Transitions</u>: A permanent transition is defined as any transition that remains as a permanent part of the work. All permanent transitions, leading and trailing ends shall meet the following length requirements:

a) Posted speed limit is greater than 35 MPH: 30 feet per inch of vertical change (thickness)
b) Posted speed limit is 35 MPH or less: 15 feet per inch of vertical change (thickness).
c) Bridge Overpass and underpass transition length will be 75 feet either
   (1) Before and after the bridge expansion joint, or
   (2) Before or after the parapet face of the overpass.

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 35 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 35 MPH or less
   (1) Leading and Trailing = 4 feet per inch of vertical change (thickness)

Note: Any temporary transition to be in-place over the winter shutdown period, holidays, or during extended periods of inactivity (more than 7 calendar days) shall conform to the "Permanent Transition" requirements shown above.

7. Spreading and Finishing of Mixture: Prior to the placement of the bituminous concrete, the underlying base course shall be brought to the plan grade and cross section within the allowable tolerance. Immediately before placing the mixture, the area to be surfaced shall be cleaned by sweeping or by other means acceptable to the Engineer. The bituminous concrete mixture shall not be placed whenever the surface is wet or frozen. The Engineer will verify the mix temperature by means of a probe or infrared type of thermometer. A probe type thermometer, verified by the Department on an annual basis, must be used in order to reject a load of mixture based on temperatures outside the range stated in the placement QC plan.

Placement: The bituminous concrete 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 mix, 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 daily, 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 uniform 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 total thickness of the lift of mixture exceeds that shown on the plans beyond the tolerances shown in Table 4.06-3, the longitudinal limits of such variation including locations and intervals of the measurements will be documented by the Engineer for use in calculating an adjustment in accordance with Article 4.06.04.

TABLE 4.06-3 Thickness Tolerances

Mixture Designation	Lift Tolerance
Class 4 and S1	+/- ⅜ inch
Class 1, 2 and 12 and S0.25, S0.375, S0.5	+/- ¼ 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 of each lift, the longitudinal limits of such variation including locations and intervals of the measurements will be documented by the Engineer for use in calculating the adjustment in Article 4.06.04.

c) Delivered Weight of Mixture - When the delivery ticket shows that the truck exceeds the allowable gross weight for the vehicle type the quantity of tons representing the overweight amount will be documented by the Engineer for use in calculating an adjustment in accordance with Article 4.06.04.

Transverse Joints: All transverse joints shall be formed by saw-cutting a sufficient distance back from the previous run, existing bituminous concrete pavement or bituminous concrete driveways to expose the full thickness of the lift. A brush of tack coat shall be used on any cold joint immediately prior to additional bituminous concrete mixture being placed.

Tack Coat Application: A thin uniform coating of tack coat shall be applied to the pavement immediately before overlaying and be allowed sufficient time to break (set). All surfaces in contact with the bituminous concrete that have been in place longer than 3 calendar days shall have an application of tack coat. The tack coat shall be applied by a non-gravity 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.

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.

The Contractor shall only operate rollers in the dynamic mode using the oscillatory system at the lowest frequency setting on concrete structures such as bridges and catch basins. The use of the vibratory system on concrete structures is prohibited. Rollers operating in the dynamic mode shall be shut off when reversing directions.

If the Engineer determines that the use of compaction equipment in the dynamic vibratory 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.

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

Surface Requirements: The pavement surface of any lift shall meet the following requirements for smoothness and uniformity. Any irregularity of the surface exceeding these requirements shall be corrected by the Contractor.

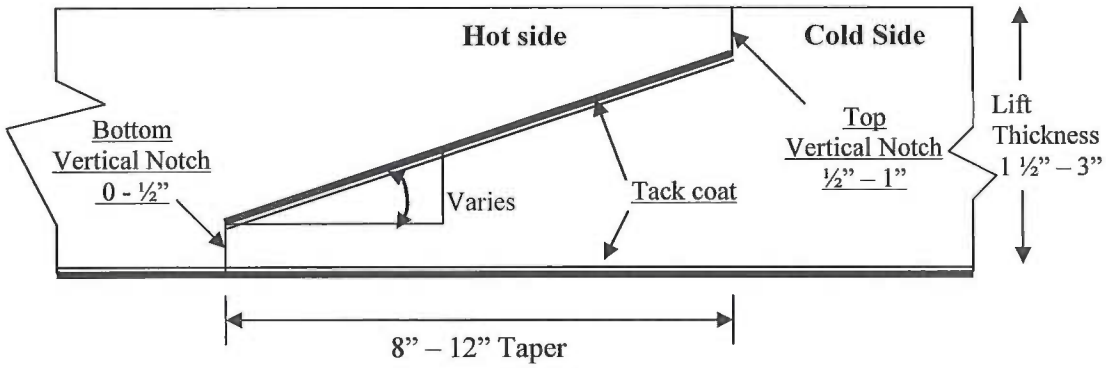
a) Smoothness- Each lift of the surface course shall not vary more than ¼ inch from a Contractor-supplied 10 foot straightedge. For all other lifts of bituminous concrete, the tolerance shall be ⅜ inch. Such tolerance will apply to all paved areas.

b) Uniformity- The paved surface shall not exhibit segregation, rutting, cracking, disintegration, flushing or vary in composition as determined by the Engineer.

8. Longitudinal Joint Construction Methods: Unless noted on the plans or the contract documents or directed by the Engineer, 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, except for S1 and Class 4 mixes. Method II Butt Joint (see figure 4.06-2) shall be used for lifts less than 1½ inches or greater than 3 inches, and S1 and Class 4 mixes. During placement of multiple lifts of bituminous concrete, 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.

Method I - Notched Wedge Joint:

Figure 4.06-1



A notched wedge joint shall be constructed, as shown in the figure using a device that is capable of adjusting the top and bottom vertical notches independently and is attached to the paver screed.
The taper portion of the 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 compacted and not be exposed to traffic for more than 5 calendar days.

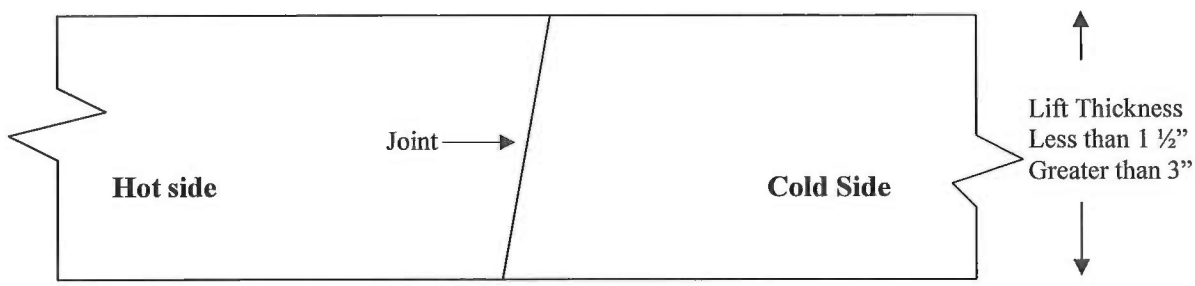
The pavement surface under the wedge joint must have an application of tack coat material. Prior to placing the completing pass (hot side), an application of tack coat must be applied to the exposed surface of the tapered section; regardless of time elapsed between paver passes. The in-place time allowance described in Sub article 4.06.03-7 does not apply to joint construction.

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.

Method II - Butt Joint:

Figure 4.06-2

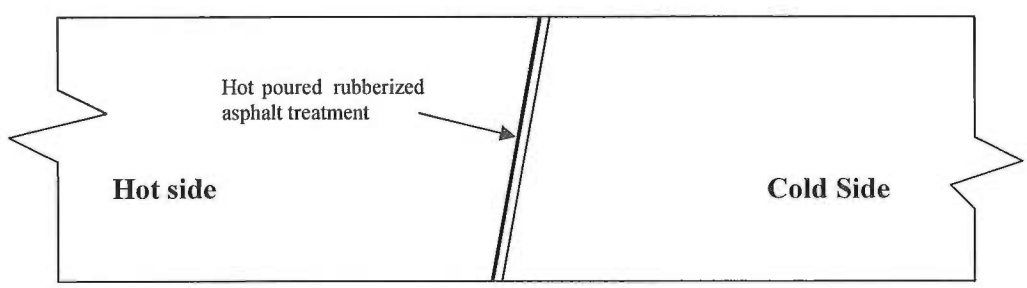


When adjoining passes are placed, the Contractor shall utilize equipment that creates a near vertical edge (refer to figure). The completing pass (hot side) shall have sufficient mixture so that the compacted thickness is not less than the previous pass (cold side). The end gate on the paver should be 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: When required by the contract or allowed by the Engineer, Method III (see figure 4.06-3) may be used.

Figure 4.06-3



All of the requirements of Method II must be met with Method III. In addition, the longitudinal vertical edge must be treated with a joint seal material meeting the requirements of Section M.04 prior to placing a completing pass. 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.

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

Quality Control Plan: Prior to placement the Contractor shall submit a QCP to the Engineer for approval. The QCP shall be submitted at the pre-construction meeting or a minimum 30 days prior to any production or paving. The QCP shall be in the format provided by the Engineer. Work covered by the QCP shall not commence until the Engineer's comments have been incorporated into the QCP and approved. The QCP shall detail every aspect of the placement process and if required, include a separate section on Extended Season paving as described in Section 4. "Seasonal Requirements". Information provided shall include the organization and procedures which the Contractor shall use to control all project site activity. The QCP must 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 QCP shall also include details on when and who will communicate with personnel at the bituminous concrete plant to determine when immediate changes to the production or placement processes are needed, and to implement the required changes.

In addition the QCP shall also 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.

Approval of the QCP will be based on the inclusion of all of the required information. Approval of the QCP does not relieve the Contractor of its responsibility to comply with the project specifications. The Contractor may modify the QCP as work progresses and must document the changes in writing prior to commencing the next paving operation. These changes include but are not limited to changes in quality control procedures or personnel. Placement may be suspended by the Engineer until the revisions to the QCP have been put into effect.

The Quality Control Plan shall also include the name and qualifications of any outside testing laboratory performing any QC functions on behalf of the Contractor.

Quality Control Inspection, Sampling and Testing: The Contractor shall perform all quality control sampling and testing, provide inspection, and exercise management control to ensure that

bituminous concrete production and placement conforms to the requirements as outlined in its diameter for S1.0 mixtures -wet sawed) from sampling locations determined by the Engineer. QCP during all phases of the work.

a) Control Charts: The Contractor shall develop and maintain density control charts and shall submit them to the Engineer. The control charts shall include the project number, test numbers, test parameter, applicable upper and lower specification limits, and test data. The control charts shall be used as part of the quality control system to document the placement process. The control chart(s) shall be updated each day of production, and e a copy shall be submitted prior to the next day's production.

b) Records of Inspection and Testing: For each day of placement, the Contractor shall document all test results and inspections on forms approved by the Engineer. The document shall be certified by the Quality Control Manager or his representative that the information in the document is accurate, and that all work complies with the requirements of the contract.

The Contractor shall submit complete and accurate density sampling, testing and inspection documents to the Engineer within 48 hours. The documents shall be submitted in a manner acceptable to the Engineer.

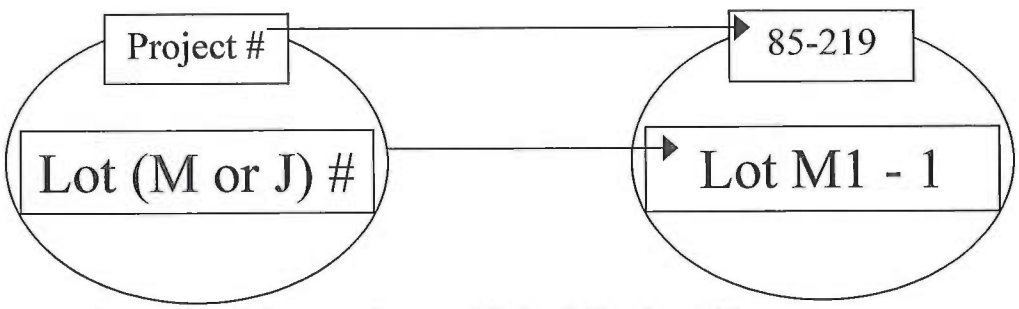
The Contractor may obtain one (1) mat core and one (1) joint core per day for process control, provided this process is detailed in the QCP. The results of these process control cores shall not be used to dispute the Department determinations from the acceptance cores. The Contractor shall submit the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

10. Density Testing of Bituminous Concrete Utilizing Core Samples: This procedure describes the frequency and the method the Contractor shall use to obtain pavement cores for acceptance from the project. Coring shall be performed on each lift specified to a thickness of one and one-half (1 ½) inches or more. Each lift including the longitudinal joints shall be compacted to the degree specified in Tables 4.06-9 and 4.06-10. The density of each core shall be determined using the production lot's average maximum theoretical gravity established from the plant production testing. Bituminous concrete Class 4 and HMA S1 are excluded from the longitudinal joint density requirements.

The Contractor shall extract cores (4 or 6 inch diameter for S0.25, S0.375 and S0.5 mixes, 6 inch The Engineer must witness the extraction and labeling of cores, as well as the filling of the core holes. The cores shall be labeled by the Contractor with the project number, lot number, and sub-lot number on the top surface of the core. When labeling the core lot number, include whether the core is from a mat lot or joint lot by using an "M" for a mat core and "J" for a joint core. For example, a core from the first sub-lot of the first mat lot shall be labeled with "Lot M1 – 1". The first number refers to the lot and the second number refers to the sub-lot. Refer to Figure 4.06-4. The side of the cores shall be labeled with the core lot number and date placed. The project inspector shall fill out a MAT-109 containing the same information to accompany

the cores. The Contractor shall deliver the cores and MAT-109 to the Department's Central Testing Lab in a safe manner to ensure no damage occurs to the cores. The Contractor shall use a container approved by the Engineer. In general the container shall consist of an attached lid container made out of plastic 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 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. The Central Lab will break the security seal and take possession of the cores upon receipt.

Figure 4.06-4



Frequency of sampling is in accordance with the following tables:

TABLE 4.06-4 - TESTING REQUIREMENT FOR BRIDGE DENSITY LOT

Length of Each Structure (Feet)	MAT – No. of Cores	JOINT - No. of 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 – TESTING REQUIREMENT FOR DENSITY LOTS ≥ 500 TONS

Lot Type	No. of Mat Cores		No. of Joint Cores		Target Lot Size (Tons)
Lot Without Bridge(1)	4		4		2000
Lot With Bridge(s)(1)(2)	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 – TESTING REQUIREMENT FOR DENSITY LOTS < 500 TONS

Lot Type	No. of Mat Cores	No. of Joint Cores	Lot Size (Tons)
Lot Without Bridge(1)	3	3	1 per lift
Lot With Bridge(s)(1)(2)	3	3	1 per lift

Note (1): The number of "Required Paver Passes for Full Width" shall be used to determine the sub-lot sizes within the lot. The number of paver passes for full width is determined by the contractor.

Note (2): If a non-bridge 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.

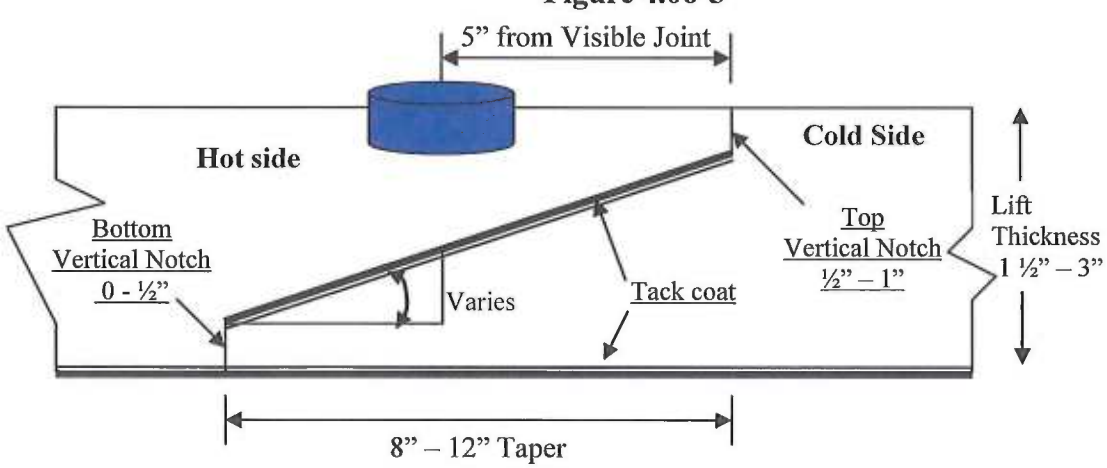
A density lot will be complete when the full designed paving width of the established lot length has been completed and shall include all longitudinal joints that exist between the curb lines regardless of date(s) paved. Quantity of material placed on structures less than or equal to 500 feet long is inclusive of the standard lot. Prior to paving, the total length of the project to be paved shall be split up into lots that contain approximately 2000 tons each. Areas such as highway ramps may be combined to create one lot. In general, combined areas should be set up to target a 2000 ton lot size. One adjustment will apply for each lot. The tons shall be determined using the yield calculation in Article 4.06.04. The last lot shall be the difference between the total payable tons for the project and the sum of the previous lots.

After the compaction process has been completed, the material shall be allowed to cool sufficiently to allow the cutting and removal of the core without damage. The Contractor shall core to a depth that allows extraction so that the uppermost layer being tested for density will not be affected.

A mat core shall not be taken 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, locate the core so that the sample is one foot from the edge.

Joint cores must be taken so that the center of the core is 5 inches from the visible joint on the hot mat side. Refer to figure 4.06-5.

Figure 4.06-5



Cores may be obtained daily or weekly. All cores must be cut within 5 calendar days of placement. 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.

Core holes shall be filled immediately 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 with a mixture containing the same nominal maximum aggregate size and compacted with a hand compactor or other mechanical means to the maximum compaction possible. The bituminous concrete mixture shall be compacted to ⅛ inch above the finished pavement prior to opening the roadway to traffic.

11. Acceptance Inspection, Sampling and Testing: Inspection, sampling, and testing to be used by the Engineer shall be performed at the minimum frequency specified in Section M.04 and stated herein.

Sampling for acceptance shall be established using ASTM D 3665, or a statistically based procedure of random sampling approved by the Engineer.

Plant Material Acceptance: The Contractor shall provide the required acceptance sampling, testing and inspection during all phases of the work in accordance with Section M.04. The Department will perform verification testing on the Contractor's acceptance test results. Should binder content or air void results exceed the specified tolerances in the Department's current QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures, the Department will investigate to determine an assignable cause. Contractor's test results for a subject lot or sub lot may be replaced with verification's result for the purpose of assessing adjustments. The verification procedure is included in the Department's current QA Program for Materials.

Density Acceptance: The Engineer will perform all acceptance testing on the cores in accordance with AASHTO T 331(M).

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 10 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. 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 30 calendar days from the date of Engineer's authorization. The number and type (mat, joint, or structure) of the cores taken for dispute resolution must reflect the number and type of the cores taken for acceptance. The location of each core shall be 36" from the original

acceptance core location forward along a line parallel to the baseline that results in the same type (mat, joint, or structure) of core. All such core samples shall be extracted and filled using the procedure outlined in Article 4.06.03. The results from the dispute resolution cores shall be added to the results from the acceptance cores and averaged for determining the final in-place density value.

13. Corrective Work Procedures: Any portion of the completed pavement that does not meet the requirements of the specification shall be corrected at the expense of the Contractor. Any corrective courses placed as the final wearing surface shall not be less than 1½ inches in thickness after compaction.

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) Perform all corrective work in accordance with the Contract and the approved corrective procedure.

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. Prior to the Engineer's authorization to open the pavement to traffic, the Contractor is responsible to protect the pavement from damage.

15. Cut Bituminous Concrete Pavement: Work under this item shall consist of making a straight-line cut in the bituminous concrete 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. Bituminous Concrete Class ( ) or 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 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: If the quantity of bituminous concrete representing the produced mixture exceeds one or more of the production tolerances for Marshall (Table 4.06-6) or Superpave mix designs (Table 4.06-7 and 4.06-8) , an adjustment will be made using the following formulas. The Department's Division of Material Testing will calculate the daily adjustment values for T_{MD} and T_{SD}.

(1) *Marshall Design*- The tolerances shown in Table 4.06-6 for gradation and binder content will be used to determine whether a mixture adjustment will apply. If the

mixture does not meet the requirements of Section M.04, an adjustment will be computed using the following formula:

Tons Adjusted for Marshall Design (T_{MD}) = M x 0.10

Where: M= Tons of bituminous concrete mixture exceeding the tolerances in Table 4.06-5.

TABLE 4.06-6
TOLERANCES FOR CONSECUTIVE TESTS (MARSHALL)

Classes	Criteria	% Tolerances (+/-)
-	Binder	0.4
1, 2, 4, 5, 5A & 5B	#200	2.0
1, 2, 4	#50	4
1, 2, 5, 5A & 5B	#30	5
1, 2, 4, 5, 5A & 5B	#8	6
1, 2, 4, 5, 5A & 5B	#4	7
1, 2, 4, 5, 5A & 5B	⅜ & ½ inch	8

(2) *Superpave Design-* The adjustment values in Table 4.06-7 and 4.06-8 shall be calculated for each sub lot based on the Air Void and Liquid Binder Content test results for that sub lot. The total adjustment for each day's production (lot) will be computed using tables and the following formulas:

Tons Adjusted for Superpave Design (T_{SD}) = $[(AdjAV_t + AdjPB_t) / 100]$ X Tons

<u>Percent Adjustment for Air Voids</u> = $AdjAV_t = [AdjAV_1 + AdjAV_2 + AdjAV_i + \ldots + AdjAV_n)] /n$

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.04.03-1

TABLE 4.06-7
ADJUSTMENT VALUES FOR AIR VOIDS (SUPERPAVE)

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	$\leq$ 2.2 or $\geq$ 5.8

Percent Adjustment for Liquid Binder = $AdjPB_t = [(AdjPB_1 + AdjPB_2 + AdjPB_i + \ldots + AdjPB_n)] / n$

Where: $AdjPB_t$= Total percent liquid 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 4.06-8

Adjustment Value ($AdjAV_i$) (%)	**S0.25, S0.375, S0.5, S1 Pb (refer to Table M.04.03-5)**
0.0	Equal to or above the min. liquid content
- 10.0	Below the min. liquid content

e) Density Adjustment: The quantity of bituminous concrete measured for payment for a specified lift of pavement 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. If either the Mat or Joint adjustment value is "remove and replace", the density lot shall be removed and replaced (curb to curb).

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

Method of Measurement:

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. Truck Method- The Engineer will establish a weight per gallon of the bituminous material based on the specific gravity at 60°F for the material furnished. The number of

gallons furnished will be determined by weighing the material on scales furnished by and at the expense of the Contractor.

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. Bituminous Concrete Class ( ), HMA S* or PMA S*: The furnishing and placing of bituminous concrete will be paid for at the Contract unit price per ton for "Bituminous Concrete, Class ( )" or "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 constructing longitudinal joints are included in the general cost of the work.
- All costs associated with obtaining cores for core correlation 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 do not equal zero. A payment will be made for a positive adjustment. A deduction from monies due the Contractor will be made for a negative adjustment.

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

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 estimated cost figure if included in the bid proposal or estimate is not to be altered in any manner by the bidder. If the bidder should alter the amount shown, the altered figure will be disregarded and the original cost figure will be used to determine the amount of the bid for the Contract.

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 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".

Pay Item*	Pay Unit*
Bituminous Concrete, Class ( )	ton
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.

H. ADDITIONAL INFORMATION

30. PROVIDE ANY ADDITIONAL INFORMATION REQUESTED BY THE AGENCY. ATTACH ADDITIONAL SHEETS AS NEEDED.

Luchs Consulting Engineers is a Connecticut based and licensed Engineering & Land Surveying – offering complete, in-house surveying, engineering, planning, design, permitting, shop drawing review, environmental, and construction inspection and administration services.

We are currently working with Bridgeport Landing Development on the redevelopment of Steelpointe Peninsula. The Steelpointe peninsula project includes the reconstruction and modernization of 4.6 lane-miles of urban minor arterial roadways and 0.75 miles of pedestrian/bicycle pathways within the City of Bridgeport. Roadway improvements follow the complete streets model, including roadway reconstruction, separation/reduction of site drainage, and inclusion of bikeways, enhanced landscaping, and substantially enhanced pedestrian connections to the surrounding neighborhoods, Bridgeport's downtown intermodal transportation center, and public waterfront.

Above and beyond our wide ranging roadway and street design experience on behalf of Connecticut municipalities and the ConnDOT, the Luchs/DeCarlo & Doll Team is very familiar with the special design needs of your infrastructure project. In addition to our Bridgeport experience, we have extensive experience with the policies and requirements of the ConnDOT, and the various State agencies and other potential funding sources. Our Project Team members have worked directly for these agencies and have successfully completed numerous projects utilizing their procedures.

Our subconsultant TRC also has experience with the City of Bridgeport and the proposed Seaview Avenue Corridor Project. TRC provided BEDCO with environmental investigations and remediation performed under TASA guidance. This work included supplemental Phase I site assessments, and designing and implementing Phase II and Phase III investigation programs at several properties within the Industrial Park area. Activities performed during the investigations included soil and concrete sampling, well installation, ground water sampling, remedial evaluations, and remediation/contractor oversight. TRC has also prepared two Remedial Action Plans (RAPs) for remedial work at two of the BEDCO sites. Both CTDEP approved RAPs call for additional field investigation and characterization of the areas of concern during the remediation. These are considered "dynamic" RAPs in that TRC will be on-site during the demolition and remediation process to collect samples and to determine if further remedial actions are warranted. In addition, TRC prepared a bid document for the implementation of these RAPs. The work was overseen by the CTDEP and the CTDECD. TRC has completed 100% of the site remediation required by the findings of the Phase III investigations at the BEDCO sites and received CTDEP approval. Post-remediation monitoring was completed at two of the sites.

I. AUTHORIZED REPRESENTATIVE

The foregoing is a statement of facts.

31. SIGNATURE	32. DATE
	March 7, 2014

33. NAME AND TITLE

Doron Dagan, P.E., President

SECTION M.04 BITUMINOUS CONCRETE

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 material, and facility or plant used to produce and test bituminous concrete must be qualified on an annual basis by the Engineer. Test Procedures and Specifications referenced herein are in accordance with the latest AASHTO and ASTM Standard Test Procedures and Specifications. Such references when noted with an (M) have been modified by the Engineer and are detailed in Table M.04.03-6.

The Contractor shall submit to the Engineer all sources of coarse aggregate, fine aggregate, mineral filler, PG binder, and if applicable any additives such as but not limited to anti-strip, warm mix, and polymer modifiers. The Contractor shall submit a Material Safety Data Sheet (MSDS) for each grade of binder, and additive to be used on the Project. The Contractor shall not change any material sources without prior approval of the Engineer.

An adequate quantity of each size aggregate, mineral filler, bitumen, and additives, shall be maintained at the bituminous concrete plant site at all times while the plant is in operation to ensure that the plant can consistently produce bituminous concrete mixtures that meet the job mix formula (JMF) as specified in Article M.04.02. The quantity of such material shall be reviewed by the Engineer on an individual plant basis and is dependent upon the plant's daily production capacity. A total quantity of any material on site that amounts to less than one day's production capacity may be cause for the job mix formula to be rejected.

1. Coarse Aggregate:

a. Requirements: The coarse aggregate shall consist of clean, hard, tough, durable fragments of crushed stone or crushed gravel of uniform quality. Aggregates from multiple sources of supply must not be mixed or stored in the same stockpile.

b. Basis of Approval: The request for approval of the source of supply shall include a washed sieve analysis in accordance with AASHTO T 27. The Gsa, Gsb, and Pw_a shall be determined in accordance with AASHTO T 85. The coarse aggregate must not contain more than 1% crusher dust, sand, soft disintegrated pieces, mud, dirt, organic and other injurious materials. When tested for abrasion using AASHTO T 96, the aggregate loss must not exceed 40%. When tested for soundness using AASHTO T 104 with a magnesium sulfate solution, the coarse aggregate must not have a loss exceeding 10% at the end of 5 cycles.

For all bituminous mixtures, materials shall also meet the coarse aggregate angularity criteria as specified in Tables M.04.02-2 thru M.04.02-4 for blended aggregates retained

on the #4 sieve when tested according to ASTM D 5821. The amount of aggregate particles of the coarse aggregate blend retained on the #4 sieve that are flat or elongated shall be determined in accordance with ASTM D 4791 and shall not exceed 10% by weight when tested to a 3:1 ratio, as shown in Tables M.04.02-2 thru M.04.02-4.

2. Fine Aggregate:

Requirements: The fine aggregate from each source quarry/pit deposit shall consist of clean, hard, tough, rough-surfaced and angular grains of natural sand; manufactured sand prepared from washed stone screenings; stone screenings, slag or gravel; or combinations thereof, after mechanical screening or manufactured by a process approved by the Engineer. The Contractor is prohibited from mixing two or more sources of fine aggregate on the ground for the purpose of feeding into a plant.

a. All fine aggregate shall meet the listed criteria shown in items #1 thru #7 of Table M.04.01-1. Table M.04.01-1 indicates the quality tests and criteria required for all fine aggregate sources. Individually approved sources of supply shall not be mixed or stored in the same stockpile. The fine aggregates must be free from injurious amounts of clay, loam, and other deleterious materials.

For Superpave mixtures, in addition to the above requirements, the fine aggregate angularity shall be determined by testing the materials passing the #8 sieve in accordance with AASHTO T 304, Method A. Qualification shall be based on the criteria listed in Tables M.04.02-2 thru M.04.02-4. The fine aggregate shall also be tested for clay content as a percentage contained in materials finer than the #8 sieve in accordance with AASHTO T 176.

Table M.04.01-1: Fine Aggregate Criteria by Pit/Quarry Source

Item	Title	AASHTO Protocol(s)	Criteria
1	Grading	T 27 & T 11	100% Passing 3/8 inch 95% Passing the #4 min.
2	Absorption	T 84	3% maximum
3	Plasticity limits	T 90	0 or not detectable
4	L.A. Wear	T 96	50% maximum(fine agg. particle size # 8 and above)
5	Soundness by Magnesium Sulfate	T 104	20% maximum @ 5 cycles
6	Clay Lumps and Friable Particles	T 112	3% maximum
7	Deleterious Material	As determined by the Engineer	Organic or inorganic calcite, hematite, shale, clay or clay lumps, friable materials, coal-lignite, shells, loam, mica, clinkers, or organic matter (wood, etc). -Shall not contain more than 3% by mass of any individual listed constituent and not more than 5% by mass in total of all listed constituents.
8	Petrographic Analysis	ASTM C 295	Terms defined in Section M.04.01-2c.

b. Basis of Approval: A Quality Control Plan for Fine Aggregate (QCPFA) provided by the Contractor shall be submitted for review and approval for each new source documenting how conformance to Items 1 through 7 as shown in Table M.04.01-1 is monitored. The QCPFA must be resubmitted any time the process, location or manner of how the fine aggregate (FA) is manufactured changes, or as requested by the Engineer. The QCPFA must include the locations and manufacturing processing methods. The QCPFA for any source may be suspended by the Engineer due to the production of inconsistent mixtures.

The Contractor shall submit all test results to the Engineer for review. The Contractor shall also include a washed sieve analysis in accordance with AASHTO T 27/T 11. Any fine aggregate component or final combined product shall have 100% passing the 3/8 inch sieve and a minimum of 95% passing the # 4. The Gsa, Gsb, and Pw_a shall be determined in accordance with AASHTO T 84.

The Contractor will be notified by the Engineer if any qualified source of supply fails any portion of Table M.04.01-1. One retest will be allowed for the Contractor to make corrections and/or changes to the process. If, upon retest, the material does not meet the requirements of items 1-7, additional testing will be required in accordance with item 8.

c. The Contractor may provide a Petrographic analysis of the material performed by a third party acceptable to the Engineer at its' own expense. The Contractor shall submit the results of the analysis with recommended changes to the manufacturing process to the Engineer. The Contractor shall submit fine aggregate samples for testing by the Engineer after the recommended changes have been made.

The Contractor may request the use of such fine aggregate on select project(s) for certain applications of bituminous concrete pavement. Such material will be monitored for a period no less than 48 months, at no cost to the State. Terms of any evaluation and suitable application will be determined by the Engineer.

3. Mineral Filler:

a. Requirements: Mineral filler shall consist of finely divided mineral matter such as rock dust, including limestone dust, slag dust, hydrated lime, hydraulic cement, or other accepted mineral matter. At the time of use it shall be freely flowing and devoid of agglomerations. Mineral filler shall be introduced and controlled at all times during production in a manner acceptable to the Engineer.

b. Basis of Approval: The request for approval of the source of supply shall include the location, manufacturing process, handling and storage methods for the material. Mineral filler shall conform to the requirements of AASHTO M-17

4. Liquid Bituminous Materials:

a. General:

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

ii. The blending at mixing plants of PG binder from different suppliers is strictly prohibited. Contractors who blend PG binders will be classified as a supplier and will be required to certify the binder in accordance with AASHTO R-26(M). The binder shall meet the requirements of AASHTO M-320(M) and AASHTO R-29(M). 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 materials. 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 (tanker truck) 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 will be free of contamination from any residual material, along with two (2) copies of the bill of lading.

iv. 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) will be allowed to supply PG binders to Department projects.

b. Neat Performance Grade (PG) Binder:

i. PG binder shall be classified by the supplier as a "Neat" binder for each lot and be so labeled on each bill of lading. Neat PG binders shall be free from modification with: fillers, extenders, reinforcing agents, adhesion promoters, thermoplastic polymers, acid modification and other additives, and shall indicate such information on each bill of lading and certified test report.

ii. The asphalt binder shall be Performance Grade PG 64-22.

c. Modified Performance Grade (PG) Binder

Unless otherwise noted, the asphalt binder shall be Performance Grade PG 76-22 asphalt modified 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-320(M) and AASHTO R-29(M).

d. Warm Mix Additive or Technology:

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

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-320(M) and AASHTO R-29(M) 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.

iv. Cut-backs (medium cure type);

i. Requirements: The liquid petroleum materials shall be produced by fluxing an asphalt base with appropriate petroleum distillates to produce the grade specified.

ii. Basis of Approval: The request for approval of the source of supply shall be submitted at least seven days prior to its use listing the location where the materials will be produced, and manufacturing, processing, handling and storage methods. The Contractor shall submit a Certified Test Report in accordance with Section 1.06 and a Material Safety Data Sheet (MSDS) for the grade to be used on the Project. The liquid asphalt shall be MC-250 conforming to AASHTO M-82.

e. Emulsions

i. Requirements: The emulsified asphalt shall be homogeneous and not be used if exposed to freezing temperatures.

ii. Basis of Approval: The request for approval of the source of supply must include the location where the materials will be produced, and manufacturing, processing, handling and storage methods.

1. 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. When ambient temperatures are 80°F and rising, grade SS-1 or SS-lh may be substituted if accepted by the Engineer. Each shipment shall be accompanied with a Certified Test Report listing Saybolt viscosity, residue by evaporation, penetration of residue, and weight per gallon.

2. Cationic emulsified asphalt shall conform to the requirements of AASHTO M-208(M). 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-lh may be substituted if accepted by the Engineer. Each shipment shall be accompanied with a Certified Test Report listing Saybolt viscosity, residue by evaporation, penetration of residue, and weight per gallon.

5. Reclaimed Asphalt Pavement (RAP):

a. Requirements: RAP shall consist of asphalt pavement constructed with asphalt and aggregate reclaimed by cold milling or other removal techniques approved by the Engineer. For bituminous concrete mixtures containing RAP, the Contractor shall submit a JMF in accordance with Article M.04.02 to the Engineer for review.

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 test the material and provide the following information along with a 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 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.
3. A statement that RAP material has been crushed to 100% passing the ½ inch sieve and remains free from contaminants such as joint compound, wood, plastic, and metals.

6. 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	
Sieve Size	Percent Passing
3/8-inch	100
No. 4	35-100
No. 200	0.0-10.0

7. Joint Seal Material:

Requirements: Joint seal material shall be a hot-poured rubber compound intended for use in sealing joints and cracks in bituminous concrete pavements. Joint seal material must meet the requirements of AASHTO M-324 – Type 2.

8. Plant Requirements:

a. Mixing Plant and Machinery:

The mixing plant used in the preparation of the bituminous concrete shall comply with AASHTO M-156(M)/ASTM D 995 for a Batch Plant or a Drum Dryer Mixer Plant, and be approved by the Engineer.

b. Storage Silos:

For all mixes, the Contractor may use silos for short-term storage of Superpave mixtures with prior notification and 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. Prior approval must be obtained for storage times greater than those indicated. When multiple

silos are filled, the Contractor shall discharge one silo at a time. Simultaneous discharge of multiple silos is not permitted.

Type of silo cylinder	Maximum storage time for all classes (hr)	
	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	

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 delivery ticket, as specified herein. Material feed controls shall be automatically or manually adjustable to provide proportions within the tolerances listed below for any batch size.

An asterisk (*) shall be automatically printed next to any individual batch weight(s) exceeding the tolerances in ASTM D 995 section 8.7.3. 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.

There must be provisions so that scales are not 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 truck and batch plant printout when the automatic batching sequence is interrupted or switched to auto-manual or full manual during proportioning. For each day's production, each project shall be provided a clear, legible copy of these recordings on each delivery ticket.

d. Aggregates: The Contractor shall ensure that aggregate stockpiles are managed to provide uniform gradation and particle shape, prevent segregation and cross contamination in a manner acceptable to the Engineer. For drum plants only, the Contractor shall determine the percent moisture content at a minimum, prior to production and half way through production.

e. Mixture: The dry and wet mix times shall be sufficient to provide proper coating (minimum 95% as determined by AASHTO T 195(M)) of all particles with bitumen and produce a uniform mixture.

The Contractor shall make necessary adjustments to ensure all types of bituminous concrete mixtures contain no more than 0.5% moisture throughout when tested in accordance with AASHTO T 329.

f. RAP: The Contractor shall indicate the percent of RAP, the moisture content (as a minimum determined twice daily – prior to production and halfway through production), and the net dry weight of RAP added to the mixture on each truck ticket. For each day of production, the production shall conform to the job mix formula and RAP percentage and no change shall be made without the prior approval of the Engineer.

g. Asphalt Binder: The last day of every month, a binder log shall be submitted when the monthly production for the Department exceeds 5000 tons. Blending of PG binders from different suppliers or grades at the bituminous concrete production facility is strictly prohibited.

h. Warm mix additive: For mechanically foamed WMA, the maximum water injection rate shall not exceed 2.0% water by total weight of binder and the water injection rate shall be constantly monitored during production.

i. Field Laboratory: The Contractor shall furnish the Engineer an acceptable field laboratory at the production facility to test bituminous concrete mixtures during production. The field 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, 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 a high speed internet connection with a minimum upstream of 384 Kbps and a functioning web browser with unrestricted access to https://ctmail.ct.gov. This equipment shall be maintained in clean and good working order at all times and be made available for use by the Engineer.

The laboratory shall be equipped with a suitable 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. Windows shall be installed to provide sufficient light and ventilation. During summer months adequate cooling or ventilation must be provided so the indoor air temperature shall not exceed the ambient outdoor temperature. Light fixtures and outlets shall be installed at convenient locations, and a telephone shall be within audible range of the testing area. The laboratory shall be equipped with an adequate workbench that has a suitable length, width, and sampling tables, and be approved by the Engineer.

The field laboratory testing apparatus, supplies, and safety equipment shall be capable of performing all tests in their entirety that are referenced in AASHTO R 35(M), *Standard Practice for Superpave Volumetric Design for Hot-Mix Asphalt (HMA)* and AASHTO M 323, *Standard Specification for Superpave Volumetric Mix Design*. In addition, the quantity of all equipment and supplies necessary to perform the tests must be sufficient to initiate and complete the number of tests identified in Table M.04.03-2 for the quantity of mixture produced at the facility on a daily basis. The Contractor shall ensure that the

Laboratory is adequately supplied at all times during the course of the project with all necessary testing materials 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 field 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. **Marshall Method - Class 1, 2, 3, 4, 5, 5A, 5B and 12:**
   a. Requirements: When specified, the Marshall method shall be employed to develop a bituminous concrete mix design that includes a JMF consisting of target values for gradation and bitumen content for each class of bituminous concrete designated for the project in accordance with the latest Asphalt Institute's MS-2 manual. Each class of bituminous concrete must meet the requirements as shown in Table M.04.02-1.

   b. Basis of Approval: The Contractor shall submit to the Engineer a request for approval of the JMF annually in accordance with one of the methods described herein. Prior to the start of any paving operations, the JMF and production percentage of bitumen must be accepted by the Engineer, and the Contractor must demonstrate the ability to meet the accepted JMF and production percentage of bitumen for each class of mixture. Additionally, the fraction of material retained between any two consecutive sieves shall not be less than 4%.

   The Engineer will test each class of mixture for compliance with the submitted JMF and Table M.04.02-1. The maximum theoretical density (Gmm) will be determined by AASHTO T 209(M). If the mixture does not meet the requirements, the JMF shall be adjusted within the ranges shown in Table M.04.02-1 until an acceptable mixture is produced. All equipment, tests and computations shall conform to the Marshall method in accordance with AASHTO T 245(M).

   An accepted JMF from the previous operating season may be acceptable to the Engineer provided that there are no changes in the sources of supply for the coarse aggregate, fine aggregate, recycled material (if applicable) and the plant operation had been consistently producing acceptable mixture.

   The Contractor shall not change sources of supply after a JMF has been accepted. Before a new source of supply for materials is used, a new JMF shall be submitted to the Engineer for approval.

c. Marshall Mixture (Virgin): For bituminous concrete mixtures that contain no recycled material, the limits prescribed in Table M.04.02-1 govern. The Contractor shall submit to the Engineer for approval, a JMF with the individual fractions of the aggregate expressed as percentages of the total weight of the mix and the source(s) of all materials. The JMF shall indicate two bitumen contents; the JMF target percentage and a production percentage (actual amount added to mix) of bitumen for each mix class by total weight. For surface course Class 1, a 0.45 power gradation chart shall also be submitted on which is plotted the percentage passing each sieve. The JMF shall also indicate the target temperature of completed mixture as it is dumped from the mixer and tested in accordance with Article M.04.03.

d. Marshall Mixtures with RAP: In addition to subarticles M.04.02 – 1a through c, RAP in bituminous concrete shall comply with requirements stated in Article M.04.01, and as stated herein. Upon approval of the Engineer, a maximum of 15% RAP may be used with no binder grade modification. RAP material shall not be used with any other recycling option.
The Contractor may increase the RAP percentage in 5% increments up to a maximum of 30% provided a new JMF is accepted by the Engineer. The following information shall be included in the JMF submittal:
   - Gradation and asphalt content of the RAP.
   - Percentage of RAP to be used.
   - Virgin aggregate source(s).
   - Total binder content based on total mixture weight.
   - Production pull percentage of added virgin binder based on total mixture weight.
   - Gradation of combined bituminous concrete mixture (including RAP).
   - Grade of virgin added, if greater than 15% of total mix weight.

e. Marshall Mixture with CRCG: In addition to subarticle M.04.02 – 1a through c, for bituminous concrete that contains CRCG, the Contractor shall submit a materials certificate to the Engineer stating that the mixture and its components comply with requirements stated in subarticle M.04.01 - (6). Additionally, 1% 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.

2. Cold Patch Method - Class 5, 5A, 5B:

a. Requirements: This mixture must be capable of being stockpiled and workable at all times. A non-stripping agent accepted by the Engineer shall be used in accordance with manufacturer's recommendations. The Contractor shall take necessary steps to ensure that this mixture uses aggregate containing no more than 1% moisture and is not exposed to any rain, snow, or standing water for a period of 6 hours after being mixed. This mixture shall be mixed and stockpiled at the point of production on a paved surface at a height not greater than 4 feet during the first 48 hours prior to its use.

i. Class 5A mixture shall have 3/8 to ½ inch polypropylene fibers that have been approved by the Engineer added at a rate of 6 pounds per ton of mixture.
ii. Class 5B mixture shall have ¼ inch polyester fibers that have been approved by the Engineer added at the rate of 2 1/2 pounds per ton of mixture.
iii. Class 5 mixture shall not contain fibers.

b. Basis of Approval: The aggregates, fibers and binder (MC-250) shall meet the requirements as specified in sub articles M.04.01-1 through 4 and in Table M.04.02-1. The use of recycled material is not permitted with these classes of bituminous concrete. Mixtures not conforming to the binder content as shown in Table M.04.02-1 shall be subject to rejection. There is a two test minimum per day of production. Mixtures not conforming to the gradation as shown in Table M.04.02-1 shall be subject to payment adjustment as specified in Section 4.06.

TABLE M.04.02 – 1 MASTER RANGES FOR MARSHALL BITUMINOUS-CONCRETE MIXTURES

Notes: (a) 75 blow (Marshall Criteria). (b) 3-6% when used for a roadway wearing surface. (c) For divided highways with 4 or more lanes, a stability of 1500 lbs is required. (d) Contains an accepted non-stripping compound. (e) To help prevent stripping, the mixed material will be stockpiled on a paved surface and at a height not greater than 4 feet during the first 48 hours. (f) As determined by AASHTO T 245(M). (g) The percent passing the #200 sieve shall not exceed the percentage of bituminous asphalt binder determined by AASHTO T 164 or AASHTO T 308(M). (h) Mixture with 5% or more aggregate retained on ¾" sieve. (i) Mixtures finer than condition (h) above. (j) Class 5 mixture shall contain no fibers. Class 5A mixture shall have 3/8 to ½ inch polypropylene fibers that have been previously accepted by the Engineer added at a minimum rate of 6 pounds per ton of mixture. Class 5B mixture shall have ¼ inch polyester fibers that have been previously accepted by the Engineer added at the minimum rate of 2 1/2 pounds per ton of mixture

CLASS	1	2	3	4	12	5 (e)(j)	5A (e)(j)	5B (e)(j)	JMF % Tol. (±)
Grade of PG Binder content %	PG 64-22 5.0 – 6.5	PG 64-22 5.0 – 8.0	PG 64-22 6.5 - 9.0	PG 64-22 4.0 - 6.0	PG 64-22 7.5 - 10.0	MC-250 (d) 6.0 - 7.5	MC-250 (d) 6.0 - 7.5	MC-250 (d) 6.0 - 7.5	0.4
Sieve Size	Percent Passing (%)								
# 200	3.0 – 8.0 (g)	3.0 – 8.0 (g)	3.0 – 8.0 (g)	0.0 – 5.0 (g)	3.0 – 10.0 (g)	0.0 - 2.5	0 .0- 2.5	0.0 - 2.5	2.0
# 50	6 – 26	8 – 26	10 - 30	5 - 18	10 - 40				4
# 30	10 - 32	16 - 36	20 - 40		20 - 60	2 - 15	2 – 15	2 - 15	5
# 8	28 - 50	40 - 64	40 - 70	20 - 40	60 - 95	10 - 45	10 – 45	10 - 45	6
# 4	40 - 65	55 - 80	65 - 87	30 - 55	80 - 95	40 - 100	40 – 100	40 - 100	7
¼"									
3/8 "	60 - 82	90 - 100	95 - 100	42 - 66	98 - 100	100	100	100	8
½ "	70 - 100	100	100		100				8
¾"	90 - 100			60 - 80					8
1"	100								
2"				100					
Additionally, the fraction of material retained between any two consecutive sieves shall not be less than 4%									
Mixture Temperature									
Binder	325°F maximum					140-185° F			
Aggregate	280-350° F					100-175° F			
Mixtures	**265-325° F**				**275-325°F**	**120-175° F**			**25 °F**
Mixture Properties									
VOIDS - %	3.0 – 6.0 (a)	2.0 – 5.0 (b)	0 – 4.0		0 - 5.0 (a)				
Stability (f) lbs. min.	1200 (c)	1000	1000		1000				
FLOW (f) in.	.08 - .15	.08 - .15	.08 - .18		.08 - .15				
VMA % - min.	15(h) :16 (i)								

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

a. Requirements: The Contractor or its representative shall design and submit Superpave mix designs annually for approval. The design laboratory developing the mixes shall be approved by the Engineer. The mix design shall be based on the specified Equivalent Single-Axle Loads (ESAL). Each bituminous concrete mix type must meet the requirements shown in Tables M.04.02-2 thru Table M.04.02-5 and in accordance with AASHTO M 323(M) and AASHTO R 35(M). The mix design shall include the nominal maximum aggregate size and a JMF consisting of target values for gradation and bitumen content for each bituminous concrete mix type designated for the project.

The contractor shall provide test results with supporting documentation from an AASHTO Materials Reference Laboratory (AMRL) with the use of NETTCP Certified Technicians for the following tests;

1. Aggregate consensus properties for each type & level, as specified in Table M.04.02-3. In addition the Gsa, Gsb, Pw_a shall also be provided for each component aggregate.

2. New mixes shall be tested in accordance with AASHTO T 283(M) *Standard Method of Test for Resistance of Compacted Hot-Mix Asphalt (HMA) to Moisture-Induced Damage*, (TSR). The compacted specimens may be fabricated at a bituminous concrete facility and then tested at an AMRL accredited facility.

   The AASHTO T 283(M) test results, specimens, and corresponding JMF sheet (Form MAT-429s) shall be submitted by the Contractor for review.

The Contractor shall supply the Engineer with 1 gallon of the specified PG binder and 1 gallon of the same PG binder with the warm mix additive blended into it. The MSDS for the WMA additive shall be included with every submittal.

In addition, minimum binder content values apply to all types of bituminous concrete mixtures, as stated in Table M.04.02-5. For mixtures containing RAP, the virgin production and the anticipated proportion of binder contributed by the RAP cannot be less than the total permitted binder content value for that type nor the JMF minimum binder content.

i. Superpave Mixture (virgin): For bituminous concrete mixtures that contain no recycled material, the limits prescribed in Tables M.04.02-2 thru Table M.04.02-5 apply. The Contractor shall submit a JMF, on a form provided by the Engineer, with the individual fractions of the aggregate expressed as percentages of the total weight of the mix and the source(s) of all materials to the Engineer for approval. The JMF shall indicate the corrected target binder content and applicable binder correction factor (ignition oven or extractor) for each mix type by total weight of mix. The mineral filler (dust) shall be defined as that portion of blended mix that

passes the #200 sieve by weight when tested in accordance with AASHTO T 30(M). The dust-to-effective asphalt (D/Pbe) ratio shall be between 0.6 and 1.2 by weight. The dry/wet mix times and hot bin proportions (batch plants only) for each type shall be included in the JMF.

The percentage of aggregate passing each sieve shall be plotted on a 0.45 power gradation chart and shall be submitted for all bituminous concrete mixtures. This chart shall delineate the percentage of material passing each test sieve size as defined by the JMF. The percentage of aggregate passing each standard sieve shall fall within the specified control points, but outside the restricted zone limits as shown in Tables M.04.02-2 thru Table M.04.02-5. Mixes with documented performance history which pass through the restricted zone may be permitted for use as long as all other physical and volumetric criteria meets specifications as specified in Tables M.04.02-2 thru Table M.04.02-5 and with prior approval from the Engineer. A change in the JMF requires that a new chart be submitted.

ii. Superpave Mixtures with RAP: Use of approved RAP may be allowed 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 and test results that show the combined binder (recovered binder from the RAP, virgin binder at the mix design proportions and warm mix asphalt additive if used) meets the requirements of the specified binder grade.

Unless approved by the Engineer, RAP material shall not be used with any other recycling option.

b. Basis of Approval: On an annual basis, the Contractor shall submit to the Engineer any bituminous concrete mix design, and JMF anticipated for use on Department projects. Prior to the start of any paving operations, the mix design and JMF must be approved by the Engineer. Bituminous concrete mixture supplied to the project without an approved mix design and JMF will be rejected. The following information must be included in the mix design submittal:

a. Gradation, specific gravities and asphalt content of the RAP,
b. Source of RAP and percentage to be used.
c. Warm mix Technology and manufacturer's recommended additive rate and tolerances, mixing and compaction temperature ranges for the mix with and without the warm-mix technology incorporated.
d. Result of TSR testing, and if applicable Anti-strip manufacturer, and dosage rate.
e. Target Temperature at plant discharge.

Note – Testing to be performed shall be done in accordance with section M.04.03.

The JMF shall be accepted if the Plant mixture and materials meet all criteria as specified in Tables M.04.02-2 thru Table M.04.02-5. If the mixture does not meet the requirements, the contractor shall adjust the JMF within the ranges shown in Tables M.04.02-2 thru Table M.04.02-5 until an acceptable mixture is produced. All equipment, tests, and computations shall conform to the latest AASHTO R-35(M) and AASHTO M-323(M).

Any JMF, once approved, shall only be acceptable for use when it is produced by the designated plant, it utilizes the same component aggregates and binder source, and it continues to meet all criteria as specified herein, and component aggregates are maintained within the tolerances shown in Table M.04.02-2.

The Contractor shall not change any component source of supply including consensus properties after a JMF has been accepted. Before a new source of materials is used, a revised JMF shall be submitted to the Engineer for approval. Any approved JMF applies only to the plant for which it was submitted. 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.

Superpave mixture with CRCG: In addition to subarticles M.04.02 – 3 a through c, for bituminous concrete mixtures that contain CRCG, the Contractor shall submit a materials certificate to the Engineer stating that the CRCG complies with requirements stated in Article M.04.01, as applicable. Additionally, 1% 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.

c. Mix Status: Each facility will have each type of bituminous concrete mixture evaluated based on the previous year of production, for the next construction paving season, as determined by the Engineer. Based on the rating a type of mixture receives it will determine whether the mixture can be produced without the completion of a PPT. Ratings 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.04.03-3: *Superpave Master Range for Bituminous Concrete Mixture Production*, and are as follows:

Criteria A: Based on Air Voids. Percentage of acceptance results with passing air voids.

Criteria B: Based on Air Voids and VMA. The percentage of acceptance results with passing VMA, and the percentage of acceptance results with passing air voids, will be averaged.

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

Ratings are defined as:

"A" – Approved:
A rating of "A" is assigned to each mixture type from a production facility with a current rating of 70% passing or greater.

"PPT" – Pre-Production Trial:
Rating assigned to each mixture type from a production facility when:

1. there are no passing acceptance production results submitted to the Department from the previous year;
2. there is a source change in one or more aggregate components from the JMF on record by more than 10% by weight;
3. there is a change in RAP percentage ,
4. the mixture has a rating of less than 70% from the previous season;
5. a new JMF not previously submitted.

Bituminous concrete mixtures rated with a "PPT" cannot be shipped or used on Department projects. A passing "PPT" test shall be performed with NETTCP certified personnel on that type of mixture by the bituminous concrete producer and meet all specifications (Table M.04.02-2 Table M.04.02-5) before production shipment may be resumed.
Contractors that have mix types rated a "PPT" may use one of the following methods to change the rating to an "A."

Option A: Schedule a day when a Department inspector can be at the facility to witness a passing "PPT" test or,

Option B: When the Contractor or their representative performs a "PPT" test 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 for binder and gradation determination, and 5,000 grams of cooled loose bituminous concrete for Gmm determination for verification testing and approval. Passing verifications will designate the bituminous concrete type to be on an "A" status. Failing verifications will require the contractor to submit additional trials.

Option C: When the Contractor or their representative performs a "PPT" test without being witnessed by a Department inspector, the Engineer may verify the mix in the Contractor's laboratory. Passing verifications will designate the bituminous concrete type to be an "A" status. Failing verifications will require the Contractor to submit additional trials.

When Option (A) is used and the "PPT" test meets all specifications, the "PPT" test is considered a passing test and the rating for that mix is changed to "A". When the "PPT" test is not witnessed, the "PPT" Option (B) or (C) procedure must be followed. If the "PPT" Option (B) procedure is followed, the mixtures along with the test results must be delivered to the Materials Testing Lab. The test results must meet the "C" tolerances established by the Engineer. The tolerance Table is included in the Department's current QA Program for Materials, Acceptance and Assurance Testing Policies and Procedures.

"U" – No Acceptable Mix Design on File:

Rating assigned to a type of mixture that does not have a JMF submitted, or the JMF submitted has not been approved, or is incomplete. A mix design or JMF must be submitted annually seven (7) days prior in order to obtain an "A," or "PPT" status for that mix. A "U" will be used only to designate the mix status until the mix design has been approved, and is accompanied with all supporting data as specified. Bituminous concrete mixtures rated with a "U" cannot be used on Department projects.

TABLE M.04.02– 2: SUPERPAVE MASTER RANGE FOR BITUMINOUS CONCRETE MIXTURE DESIGN CRITERIA

Notes: (1) Minimum Pb as specified in Table M.04.02-5. (2) Voids in Mineral Aggregates shall be computed as specified herein. (3) Control point range is also defined as the master range for that mix. (4) Dust is considered to be the percent of materials passing the #200 sieve. (5) For WMA, lower minimum aggregate temperature will require Engineer's approval. (6) For WMA and PMA, the mix temperature shall meet manufacturer's recommendations.

	S0.25				S0.375				S0.5				S1			
Sieve	CONTROL POINTS (3)		*RESTRICTED ZONE*		CONTROL POINTS(3)		*RESTRICTED ZONE*		CONTROL POINTS(3)		*RESTRICTED ZONE*		CONTROL POINTS(3)		*RESTRICTED ZONE*	
inches	Min (%)	Max (%)	*Max (%)*	*Min (%)*	Min (%)	Max (%)	*Min (%)*	*Max (%)*	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	-	90	-	-	-	90	-	-	-	-	-	-	-	-	*39.5*	*39.5*
#8	32	67	*47.2*	*47.2*	32	67	*47.2*	*47.2*	28	58	*39.1*	*39.1*	19	45	*26.8*	*30.8*
#16	-	-	*31.6*	*37.6*	-	-	*31.6*	*37.6*	-	-	*25.6*	*31.6*	-	-	*18.1*	*24.1*
#30	-	-	*23.5*	*27.5*	-	-	*23.5*	*27.5*	-	-	*19.1*	*23.1*	-	-	*13.6*	*17.6*
#50	-	-	*18.7*	*18.7*	-	-	*18.7*	*18.7*	-	-	*15.5*	*15.5*	-	-	*11.4*	*11.4*
#100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
#200	2.0	10.0	-	-	2.0	10.0	-	-	2.0	10.0	-	-	1.0	7.0	-	-
Pb (1)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
VMA (2) (%)	16.0 ± 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/Pbe(4)	0.6 – 1.2				0.6 – 1.2				0.6 – 1.2				0.6 – 1.2			
Agg. Temp(5)	280 – 350F				280 – 350F				280 – 350F				280 – 350F			
Mix Temp(6)	265 – 325 F				265 – 325 F				265 – 325 F				265 – 325 F			
Design TSR	≥ 80%				≥ 80%				≥ 80%				≥ 80%			
T-283 Stripping	Minimal, as determined by the Engineer															

TABLE M.04.02–3
SUPERPAVE MASTER RANGE FOR CONSENSUS PROPERTIES OF COMBINED AGGREGATE STRUCTURES

Notes: (1) If less than 25 % of a given layer is within 4 inches of the anticipated top surface, the layer may be considered to be below 4 inches for mixture design purposes.

Traffic Level	Design ESALs (80 kN)	Coarse Aggregate Angularity (1) ASTM D 5821	Fine Aggregate Angularity (7) AASHTO T 304	Flat or Elongated Particles ASTM D 4791	Sand Equivalent AASHTO T 176
-----	(million)			>#4	-----
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
	Design ESALs are the anticipated project traffic level expected on the design lane, projected over a 20 year period, regardless of the actual expected design life of the roadway.	Criteria presented as minimum values. 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.	Criteria presented as minimum percent air voids in loosely compacted fine aggregate passing the #8 sieve.	Criteria presented as maximum Percent by mass of flat or elongated particles of materials retained on the #4 sieve, determined at 3:1 ratio.	Criteria presented as minimum values for fine aggregate passing the #8 sieve.

*** NOTE: Level 1 for use by Towns and Municipalities ONLY.**

TABLE M.04.02– 4: SUPERPAVE MASTER RANGE FOR TRAFFIC LEVELS AND DESIGN VOLUMETRIC PROPERTIES.

Traffic Level	Design ESALs	Number of Gyrations by Superpave Gyratory Compactor			Percent Density of Gmm from HMA/WMA specimen			Voids Filled with Asphalt (VFA) Based on Nominal mix size – inch			
	(million)	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	73 – 76	73 - 76	65 - 75	65 - 75

*** NOTE: Level 1 for use by Towns and Municipalities ONLY.**

TABLE M.04.02– 5: SUPERPAVE MINIMUM BINDER CONTENT BY MIX TYPE & LEVEL.

Mix Type	Level	Binder Content Minimum (1)
S0.25	1*	5.6
S0.25	2	5.5
S0.25	3	5.4
S0.375	1*	5.6
S0.375	2	5.5
S0.375	3	5.4
S0.5	1*	5.0
S0.5	2	4.9
S0.5	3	4.8
S1	1*	4.6
S1	2	4.5
S1	3	4.4

*** NOTE: Level 1 for use by Towns and Municipalities ONLY.**

M.04.03— Production Requirements:

1. Quality Control Plan and Processes: The Contractor shall submit a Quality Control Plan (QCP) for bituminous concrete production specifically for the plant producing the bituminous concrete mixture for review and approval of the Engineer on an annual basis.

The QCP 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. 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 upon request.

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. All daily QC sampling, inspection and test reports shall be reviewed by the Quality Control Manager and be submitted to the Engineer upon request.

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 Sampling & Testing Methods: Acceptance samples of mixtures shall be obtained from the hauling vehicles and tested by the Contractor at the facility during each day's production.

The hauling vehicle from which samples are obtained shall be selected using stratified – random sampling based on the total estimated tons of production in accordance with ASTM D 3665, except that the first test shall be randomly taken from the first 151 tons or as directed by the Engineer.

The number of sub lots and tests required per sub lot is based on the total estimated tons of production per day as indicated in Table M.04.03-1. Quantities of the same type/level mix per plant may be combined daily for multiple state projects to determine the number of sub lots.
The payment adjustment for air voids and liquid binder will be calculated per sub lot as described in Section 4.06.

An acceptance test shall not be performed within 150 tons of production from a previous acceptance test unless approved by the Engineer. Quality Control tests are not subject to this restriction. Unless otherwise tested, a minimum of one (1) acceptance test shall be performed for every four days of production at a facility for each type/level mix (days of production may or may not be consecutive days).

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. Verification testing will be performed by the Engineer on the retained specimens 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 at the plant. In addition the Contractor must provide supporting documentation or test results to validate the subject acceptance test result(s). The Engineer may invalidate any positive adjustments for material corresponding to the 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.

Contractor personnel performing acceptance sampling and testing must be present at the facility prior to, and during 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 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 inoperable, production can continue for a maximum of 1 hour. The Contractor shall obtain box sample(s) in accordance with Table M.04.03-1 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.

Table M.04.03 – 1: Acceptance Testing Frequency per Type/Level/Plant

Daily quantity produced in tons (lot)	Number of Sub Lots/Tests
0 to 150	0, Unless requested by the Engineer
151 to 600	1
601 to 1,200	2
1,201 to 1,800	3
1,801 or greater	1 per 600 tons or portions thereof

i. Marshall Mix Acceptance Sampling and Testing Procedures: When the Marshall mix design is specified, the following acceptance procedures and AASHTO test methods shall be used:

Table M.04.03 – 2: Marshall Acceptance Test Procedures

Protocol	Reference	Description
1	**AASHTO T 30(M)**	Mechanical Analysis of Extracted Aggregate
2	**AASHTO T 40(M)**	Sampling Bituminous Materials
3	**AASHTO T 308(M)**	Binder content by Ignition Oven method (adjusted for aggregate correction factor)
4	**AASHTO T 245(M)**	Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
5	**AASHTO T 209(M)**	Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
6	**AASHTO T 269(M)**	Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
7	**AASHTO T 329**	Moisture Content of Hot-Mix Asphalt (HMA) by Oven Method

a. Cessation of Supply: Marshall Mix Production shall cease for the Project from any facility that consistently fails to produce mixture that meets the JMF and volumetric properties. The criteria for ceasing the supply of a class of mixture from any plant are as follows:

i. Off-Test Status: The results of AASHTO T 164 or AASHTO T 308(M) and T 30(M) will be used to determine if the mixture is within the tolerances shown in Table M.04.02-1. The Contractor will be notified that a plant is "off test" for a class of mixture 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 for that class of mixture.

ii. When multiple plants and 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" adjusted payment.

iii. If a test indicates that the bitumen content or gradation are outside the tolerances, the Contractor may make a single JMF change on classes 1, 2, 3, 4 and 12 as allowed by the Engineer prior to any additional testing. A JMF change shall include the date and name of the Engineer that allowed it. Consecutive test results outside the requirements of Table M.04.02-1 JMF tolerances may result in rejection of the mixture.

iv. The Engineer may cease supply of mixture from the plant when the test results from three non-consecutive samples of a class of mixture are not within the JMF tolerances or the test results from two non-consecutive samples not within the master range indicated in Table M.04.02-1 during any one production period, due to inconsistent production.

v. 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.

b. Adjustments for Off Test Mixture under Cessation of Supply: The bituminous concrete plant shall cease supplying to the project:

i. When the test results from three consecutive samples are "off test" and not within the JMF tolerances or,

ii. The test results from two consecutive samples are "off test" and not within the ranges indicated in Table M.04.02 – 1 or,

iii. When the percent of material passing the minus #200 sieve material exceeds the percent of extracted bitumen content for three consecutive samples during any production period of the values stated in Table M.04.02-1:

a. The quantity of mixtures shipped to the project determined to be "off test" and outside the tolerances will be tabulated by the Engineer and will be adjusted in accordance with Section 4.06.

b. Following cessation, a trial production period will be required at the plant for that class of mixture. Use of that class of mixture from that plant will be prohibited on the Project until the plant has demonstrated the ability to consistently produce acceptable mixture.

c. When the Engineer has accepted the mixtures from the trial production period, the use of that mixture on the Project may resume.

ii. Superpave Mix Acceptance Sampling and Testing Procedures: When the Superpave mix design is specified, the following acceptance and AASHTO test procedures shall be used:

Table M.04.03– 3: Superpave Acceptance Testing Procedures

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

The Contractor shall perform moisture susceptibility (TSR) testing annually for all design levels of HMA-, WMA-, and PMA- S0.5 plant-produced mixtures, in accordance with the latest version of AASHTO T 283(M).

If any material source changes from the previous year, or during the production season, a mix design TSR as well as a production TSR is required for the new mixture. The AASHTO T 283(M) test shall be performed at an AASHTO Materials Reference Laboratory (AMRL) by NETTCP Certified Technicians. The test results and specimens shall be submitted to the Engineer for review. This shall be completed within 30 days from the start of production. 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, and MSDS sheet for the anti-strip additive (if applicable) to the Engineer. In addition, compaction of samples shall be accomplished utilizing an accepted Superpave Gyratory Compactor (SGC), supplied by the Contractor. The SGC shall be located at the facility supplying mixture to the project.

a. Determination of Off-Test Status:

i. Off Test Status: Superpave mixes shall be considered *"off test"* when any Control Point Sieve, VA, VMA, and Gmm values are outside of the limits specified in Table M.04.03-3 and the computed binder content (Pb) established by AASHTO T308(M) or as documented on the vehicle delivery ticket is below the minimum binder content stated in sub article M.04.03-5. 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 (and project staff) when the plant is *"off test"* for a type of mixture. When multiple plants and 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.

b. Cessation of Supply for Superpave Mixtures with no Payment Adjustment: Production of bituminous concrete shall cease for the Project from any plant that consistently fails to produce mixture that meets the JMF and volumetric properties. The quantity of Superpave mixtures shipped to the project that is "off-test" will not be adjusted for deficient mixtures.

A Contractor shall cease to supply mixture from a plant when:

1. Bituminous concrete mixture is "off test" on three (3) consecutive tests for VMA or Gmm, regardless of date of production due to inconsistency (i.e., small production requires 1 test per day for multiple days).

2. Bituminous concrete mixture is "off test" on two (2) consecutive tests for the Control Point sieves in one day's production.

Following cessation, the Contractor shall immediately make necessary material or process corrections and run a Pre-Production Trial (PPT) for that type of mixture. Use of that type of mixture from that plant will be prohibited on the Project until the Contractor has demonstrated the ability to produce acceptable mixture from that facility. When the Contractor has a passing test and has received approval from the Engineer, the use of that mixture to the Project may resume.

c. Cessation of Supply for Superpave Mixtures with Payment Adjustment:
Production of bituminous concrete shall cease for the Project from any plant that consistently fails to produce mixture that meets the Superpave minimum binder content by mix type and level listed in Table M.04.02-5. The quantity of Superpave mixtures shipped to the project that is "off-test" will be adjusted for deficient mixtures in accordance with Section 4.06.

A Contractor shall cease to supply mixture from a plant when the binder content (Pb) is below the requirements of Table M.04.03-5 on the ignition oven test result after two (2) consecutive tests, regardless of the date of production.

Following cessation, the Contractor shall immediately make necessary material or process corrections and run a Pre-Production Trial (PPT) for that type of mixture. Use of that type of mixture from that plant will be prohibited on the Project until the Contractor has demonstrated the ability to produce acceptable mixture from that facility. When the Contractor has a passing test and has received approval from the Engineer, the use of that mixture to the Project may resume.

d. JMF Changes for Superpave Mixture Production: It is understood that a JMF change is effective from the time it was submitted forward and is not retroactive to the previous test or tests. JMF changes are permitted to allow for trends in aggregate and mix properties but every effort shall be employed by the Contractor to minimize this to ensure a uniform and dense pavement.

JMF changes to the G_{mm} or mix Absorption Correction Factor (A_{cf}) are only permitted prior to or after a production shift for all bituminous-concrete types of mixtures and only when they:

i. Are requested in writing and pre-approved by the Engineer;
ii. Are based on a minimum of a two test trend;
iii. Are documented with a promptly submitted revised JMF on form provided by the Engineer.
iv. A revised JMF submittal shall include the date and name of the Engineer that allowed it.

TABLE M.04.03– 3: SUPERPAVE MASTER RANGE FOR BITUMINOUS CONCRETE MIXTURE PRODUCTION

Notes: (1) 300°F minimum after October 15. (2) Minimum Pb as specified in Table M.04.03-5 (3) Control point range is also defined as the master range for that mix. (4) JMF tolerances shall be defined as the limits for production compliance. VA & Pb payment is subject to adjustments, as defined in sub-article 4.06.04 - 2. (5) For WMA, lower minimum aggregate temperature will require Engineer's approval. (6) For WMA and/or polymer modified asphalt, the mix temperature shall meet manufacturer's recommendations. In addition, for WMA, the maximum mix temperature shall not exceed 325°F once the WMA technology is incorporated.

	S0.25		**S0.375**		**S0.5**		**S1**		**Tolerances**
Sieve	CONTROL POINTS (4)		CONTROL POINTS (4)		CONTROL POINTS (4)		CONTROL POINTS (4)		**JMF Limits (4)**
inches	Min(%)	Max(%)	Min(%)	Max(%)	Min(%)	Max(%)	Min(%)	Max(%)	±Tol
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	-	90	-	90	-	-	-	-	
#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(2)	-	-	-	-	-	-	-	-	note (2)
VMA (%)	16.0		16.0		15.0		13.0		1.0
VA (%)	4.0		4.0		4.0		4.0		1.0
Gmm	JMF value		JMF value		JMF value		JMF value		0.030
Agg. Temp (5)	280 – 350F		280 – 350F		280 – 350F		280 – 350F		
Mix Temp (6)	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– 4: SUPERPAVE MASTER RANGE FOR TRAFFIC LEVELS AND DESIGN VOLUMETRIC PROPERTIES.

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

*** NOTE: Level 1 for use by Towns and Municipalities ONLY.**

TABLE M.04.03– 5: SUPERPAVE MINIMUM BINDER CONTENT BY MIX TYPE & LEVEL.

Mix Type	Level	Binder Content Minimum (1)
S0.25	1*	5.6
S0.25	2	5.5
S0.25	3	5.4
S0.375	1*	5.6
S0.375	2	5.5
S0.375	3	5.4
S0.5	1*	5.0
S0.5	2	4.9
S0.5	3	4.8
S1	1*	4.6
S1	2	4.5
S1	3	4.4

*** NOTE: Level 1 for use by Towns and Municipalities ONLY.**

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

AASHTO Standard Specification	
Reference	**Modification**
M 320	1. Mass change for PG 64-22 shall be a maximum loss of 0.5% when tested in accordance with AASHTO T 240. 2. The two bottles used for the mass change determination may be re-heated and used for further testing.
AASHTO Standard Methods of Test	
Reference	**Modification**
T 27	Section 7.7 Samples are not washed
T 30	Section 6.2 thru 6.5 Samples are not routinely washed
T 168	Samples are taken at one point in the pile. All types of bituminous concrete except Class 4 are scooped from the sample container instead of remixing and quartering. (Method verified by laboratory study). Samples from a hauling vehicle are taken from only one point instead of three as specified. 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. 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.
T 195	Section 4.3 only one truck load of mixture is sampled. Samples are taken from opposite sides of the load.
T 209	Article 9.5.1 Bowl is suspended 2 minutes prior to reading rather than 10 minutes. This makes no significant difference in results. Section 7.2 The average of two bowls is used proportionally in order to satisfy minimum mass requirements. 8.3 Omit Pycnometer method.
T 245	Article 3.3.2 A compacting temperature of 140 to 146°C (284 to 295°F) is used Article 3.5.2 Seventy-five (75) blows per side are used on Classes 1 and 12, per ConnDOT design requirements Section 3.1 for production testing: one specimen is molded for each extraction test for production over 275 metric tons/day (300 tons/day). Other mixtures: two specimens per extraction test.
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.
T 308	In addition to the standard testing procedure, the Department has adopted a procedure that addresses a correction factor that is calculated using the composite aggregate percentages (**Composite Aggregate Correction Factor Method (CACF)**). The aggregate is burned in compliance with the standard AASHTO procedure Method A exclusively. All modifications are listed for this method only. A2.2 and A2.3 Omit A2.4 Omit. Replace with: Determine an aggregate gradation for each aggregate component "blank" in accordance with T30. A2.5 Omit. Replace with: The individual aggregate samples are to be dried in an oven at a maximum temperature of 148 ± 5°C (300 ± 9° F) to a constant weight. RAP samples are to be oven dried at a maximum temperature of 110 ± 5°C (230 ± 9° F) to a constant weight. RAP samples will be burned for total binder content only and not to arrive at a correction factor for a mixture. A2.6 and A2.7 and A2.8 Omit. A2.8.1 Omit Note 2 A2.9 Omit. Replace with: Perform a gradation analysis on the residual aggregate in accordance with T30 and compare it to the gradation performed prior to burning. A2.9.1 and A2.9.2 Omit The correction factors for each size aggregate are provided by the Contractor to the Engineer prior to the Annual Plant Inspection. The Engineer may verify the correction factors. The Composite Aggregate Correction Factor (CACF) for any mixture may be calculated by summing the result of the correction factor for each individual aggregate multiplied by the percentage of that aggregate in the overall mixture. (Note: All correction factors must be re-calculated every time the percentage of any aggregate changes within the mixture.) If the average corrected Pb content from the ignition oven differs by 0.3% or more from the average bituminous concrete facility production weigh ticket 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, the Engineer may require a new correction factor calculation for all the aggregate components in the mix. In addition to the standard testing procedure, the Department has adopted a procedure that addresses the time involved between sampling the hot-mix asphalt specimen and the beginning of the test. 6.3 Omit. Replace with: The test specimen must be ready to be placed in an approved ignition furnace for testing within ten minutes of being obtained from the hauling vehicle and the test shall start immediately after.

T 331	6.1 Cores are dried to a constant mass prior to testing using a core-dry machine.

AASHTO Standard Recommended Practices

Reference	Modification
R 35	**<u>Volumetric Calculations of VMA and Correction Factor</u>** VMA_a - Voids in Mineral Aggregate from (Va + Vbe) the mix: A. VMA calculated from the mix shall be determined in accordance with *Formula 5.16.1A*. It can be correlated that the VMA calculated from AASHTO R-35 is equivalent to VMA_a when the Pb_a x (100-Pb_t) / 100 is known and substituted for A_{cf}, as shown in *Formula 5.16.1A (ii)*. Test results from VMA_a shall therefore be required to meet all contract specifications. Values of VMA_a that are out of specifications during production may be cause for the contractor to determine assignable reason, take corrective action, and modify the Job Mix Formula (JMF), as needed. Continued VMA_a data that is out of specifications may be cause for the Engineer to order cessation of supply. *Formula 5.16.1A.* Determining the VMA of bituminous concrete by the mix or air voids & effective binder method: $$VMA_a = V_a + \left[\frac{(Gmb_d \times (Pb_t - A_{cf})}{G_b}\right]$$ Where: VMA_a = VMA calculated from plant production mix(V_a + Vb_e) Gmb_d = Bulk specific gravity as determined by AASHTO T 166(M) Pb_t = Total Binder Content (corrected) by AASHTO T 308(M) A_{cf} = Absorption correction factor provided by Contractor (refer to B. i and ii) B. Determining the bituminous concrete mix binder correction factor for each class by use of percent absorption of water by AASHTO T 84/85, AASHTO M 323 and D_f method. This value shall be performed by the Contractor during the mix design only and submitted as a JMF value. Two methods for determining the A_{cf} are shown, although method (i) will be the desired method to be used. Both methods are equivalent when the Gsa, Gsb and Pwa are recent and valid for the mix. *i.* $A_{cf} = Df \times Pwa \times (100 - Pb_t) / 100$ *ii.* $A_{cf} = (Pb_a$ *from annual JMF submittal*$) \times (100 - Pb_t) / 100$ Where: Df = as determined by Formula 5.16.1B. Pwa = as determined by AASHTO T 84/85 Pb_a = as determined by AASHTO M 323 (from annual JMF submittal) D_f (Density Factor): The Contractor shall calculate the bituminous concrete

	mix design D_f (*derived from formula X1.2 APPENDIX X1 of AASHTO R 35)* for each class of material, in accordance with *Formula 5.16.1B.* *Formula 5.16.1B.* Determining the Density Factor *(D_f)* of mix design bituminous concrete: $$D_f = \left(\frac{Gse - Gsb}{Gsa - Gsb}\right)$$ Where: D_f = Density Factor or multiplier determined by AASHTO R-35(M) Gse = Effective Specific Gravity determined by AASHTO M-323 at plant Gsa = Apparent Specific Gravity determined by AASHTO T 84/85 of mix design Gsb = Bulk Specific Gravity determined by AASHTO T 84/85 of mix design
R 26	Quality Control Plans must be formatted in accordance with AASHTO R 26, certifying suppliers of performance-graded asphalt binders, Section 9.0, Suppliers Quality Control Plan, and "NEAUPG Model PGAB QC Plan." 1. The Department requires that 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. 2. Sampling of asphalt binders should be done under the supervision of qualified technician. NECTP "Manual of Practice," Chapter 2 Page 2-4 (Key Issues 1-8). 3. A copy of the Manual of Practice for testing asphalt binders in accordance with the Superpave PG Grading system shall be in the testing laboratory. 4. All laboratories testing binders for the Department are required to be accredited by the AASHTO Materials Reference Laboratory (AMRL). 5. 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. 6. 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. Suppliers shall provide AASHTO M-320 Table 2 testing at a minimum of once per month on one sample of material. Each supplier shall rotate the PG grade each month (including polymer-modified asphalt (PMA)), so that data can be collected for all the grades produced.

SECTION M.13 ROADSIDE DEVELOPMENT

Article M.13.04—Seed Mixtures:

Delete the Seed Mixture Chart and replace with the following:

Article M.13.04—Seed Mixtures: (a) The grass seed mixture shall conform to the following:

Species	Proportion By Weight (Mass) Pounds(kilograms)	Minimum Purity (Percent)	Minimum Germination (Percent)
VELVET BENTGRASS, (AGROSTIS CANINA) CERTIFIED VARIETY: OR EQUAL CERTIFIED VARIETY;	25 (9.1)	96	85
RED FESCUE (FESTUCA RUBRA L. SSP. RUBRA) CERTIFIED VARIETY: OR EQUAL CERTIFIED VARIETY	35 (15.9)	97	80
PARTRIDGE PEA (CHAMAECRISTA FASCICULATA) CERTIFIED VARIETY:	10 (4.5)	95	90
INDIAN GRASS (SORGHASTRUM NUTANS) CERTIFIED VARIETY:	15 (5.45)	95	90
CANADA WILDRYE (ELYMUS CANADENSIS) CERTIFIED VARIETY:	5 (2.3)	95	90
KENTUCKY BLUE GRASS (POA PRATENSIS) CERTIFIED VARIETY:	10 (4.5)	95	90

SECTION 10.00 - GENERAL CLAUSES FOR HIGHWAY ILLUM. AND TRAFFIC SIGNAL PROJECTS

Add the following: Article 10.00.14 – Maintenance of Illumination During Construction

The Contractor shall organize his work so that any portion of the roadway which has existing illumination and is open for use remains lighted. The Contractor shall also provide illumination on all temporary crossovers, ramps and roadways, constructed as part of the stage construction, which are open for use. The lighting may consist of: existing lighting, new lighting, temporary lighting, or any combination of the above. It is the Contractor's responsibility to stage the installation/relocation of service cabinets, poles, lights, and circuitry so that all roadways as described above remain lighted. If it is necessary to install temporary poles, lights, or circuitry, that work shall be submitted to the Engineer for approval prior to installation, and will be paid for at the contract bid unit price for these items.

If the contract documents include temporary illumination plans, these plans shall serve as a framework for providing roadway illumination during construction. Temporary illumination plans may not represent the extent of the temporary illumination work required, or the exact quantity of temporary lights to be installed.

Prior to the start of any work on the lighting system, the Contractor, along with ConnDOT District Electrical Maintenance, shall inspect the system for lighting outages, pole knockdowns, and circuit malfunctions. If found, these deficiencies shall be noted and repaired by ConnDOT prior to the start of work by the Contractor.

Once the Contractor begins work on the roadway lighting system, maintenance of that system becomes the Contractor's responsibility. ConnDOT District Construction personnel will note the start and end date of the Contractor's responsibility for maintenance of the lighting system. The Contractor shall maintain the illumination throughout the duration of the project, until accepted by the State. The Contractor shall supply to the Project Engineer and to the ConnDOT District Electrical Maintenance Supervisor, the names and phone numbers of a primary, and back-up representative, to be contacted should a problem with the lighting system occur.

Initial notification of lighting outages or pole knockdowns within the project limits should immediately be directed to ConnDOT Highway Operations, who would then notify ConnDOT Electrical Maintenance. ConnDOT Highway Operations can be reached at the following telephone numbers: for projects in District 3 call (203)-696-2690, for projects in Districts 1, 2, and 4 call (860) 594-3447. The following procedures will be followed for lighting outages:

1) Once notified of a lighting outage, ConnDOT Electrical Maintenance personnel will assess the situation, and in the case of a pole knockdown, may clear the pole from the roadway and make safe any exposed wires.

2) Upon assessment of the lighting outage, ConnDOT will notify the Project Inspector and the Contractor's designated representative of the outage, thereby transferring responsibility for any further repairs to the Contractor.

3) Upon notification, The Contractor shall be responsible to repair the lighting system before the normal nighttime turn-on of the lights. If this cannot be achieved, the Contractor will be required to have the lighting operational prior to the next normal nighttime turn-on of the lights, up to a maximum of 24 hours from the time the Contractor was notified of the problem. The Contractor shall contact the district construction field office and apprise the Project Inspector of the situation, and brief him on what steps will be taken to bring the lighting back on line along with an anticipated time frame for doing this.

4) For isolated individual luminaire outages (not a continuous circuit), the Contractor shall repair such luminaires within 48 hours of notification.

If the Contractor's response to the lighting outage is deemed unacceptable, repairs to the lighting system may be carried out for safety reasons, by State forces, at the State's discretion. Labor and material costs incurred by the State for this repair work, will be assessed to the Contractor.

The Contractor shall follow standard "lock-out", "tag-out", and "call before you dig" procedures when working on the lighting circuit. Both the Contractor and ConnDOT Electrical Maintenance shall have mutual accessibility to active lighting control cabinets.

The Contractor shall be responsible for repair of damage to the lighting system incurred as the result of his operations. All repairs or replacements due to the Contractor's operations shall be made by the Contractor at the Contractor's expense.

The Contractor shall maintain a log book of any lighting repair work performed, which will include a description of the repairs, and the date the work was performed. The log book shall be made accessible to the project Engineer.

Temporary illumination circuitry shall consist of pre-assembled aerial cable of the type and size as indicated in the special provisions. If aerial cable cannot be installed due to specific construction activities (driving of piles, placing of bridge girders..etc.), the Contractor shall notify the Engineer and suggest alternative methods of installation. Alternative options may include installing cable in duct underground, or installing surface mounted cable in duct or PVC conduit with cable along the backside of a bridge parapet or temporary concrete barrier curbing. Temporary cable in duct/conduit laying directly on the ground will not be allowed. The option of surface mounting duct or conduit to the backside of a parapet or barrier will only be allowed when construction activities make it necessary, and where the surface mounted conduit will not

expose workers to a high voltage hazard. The Engineer's approval will be required prior to the installation of any temporary circuitry not installed overhead.

When temporary circuitry is installed in trench, standard warning tape procedures will be followed as set forth in Article 1.05.15. When temporary circuitry is surface mounted to the backside of a parapet or barrier wall, the Contractor shall install warning placards which read: "Live Electricity". Warning placards shall be installed at the beginning, end, and at intermittent points 100' (30 meters) apart along the exposed length of the duct/conduit. All temporary lighting circuits shall include a continuous No. 8 bare copper grounding conductor connected to all light standards and effectively grounded as per the NEC.

ITEM #0216012A - CONTROLLED LOW STRENGTH MATERIAL

Description: Controlled Low Strength Material (CLSM) is a self consolidating, rigid setting material to be used in backfills, fills, structural fills and elsewhere as indicated on the plans, or as directed by the Engineer. The flow and set time characteristics of CLSM shall be designed to meet the specific job conditions. All CLSM material covered by this specification shall be designed to be hand excavatable at any time after placement. It shall be composed of a mixture of portland cement, aggregate, and water with the option of using fly ash, slag cement, air-entraining agents, and other approved admixtures.

Materials: All materials utilized in the CLSM mix design shall be in accordance with the applicable requirements of Article M.03.01

Composition: The composition of the CLSM shall be in accordance with the requirements set forth in Article M.03.01-General Composition of Concrete Mixes, as well as the applicable sections of ACI 229R. The Contractor shall submit each proposed mix design, with all supporting data, to the Engineer for review and approval at least two weeks prior to its use.

The setting time of CLSM materials shall be designed so as to achieve the strength necessary to comply with the time constraints called for under the Maintenance and Protection of Traffic requirements of the project specifications. The use of chloride accelerators is not permitted.

The minimum compressive strength of the CLSM material shall be 30 pounds per square inch (psi) and the maximum compressive strength of the CLSM shall be 150 pounds per square inch (psi) when tested in accordance with ASTM D4832 after 56 days.

The CLSM mix design shall utilize a nominal maximum size of No. 8 aggregate as specified in M.01.01.

CLSM mixes shall have a minimum of 20% entrained air when tested in accordance with AASHTO T152.

Construction Methods: CLSM shall only be placed when the ambient temperature is at least 32° F and rising. CLSM material shall be deposited within 2 hours of initial mixing.

CLSM may be placed by chutes, conveyors, buckets or pumps depending upon the application and accessibility of the site. Should voids or cavities remain after the placement of the CLSM, the Contractor shall modify the placement method or flow characteristics of the CLSM. Voids or cavities which have not been filled properly shall be corrected as directed by the Engineer and at the Contractor's expense.

Method of Measurement: This work will be measured for payment by the actual number of cubic yards of "Controlled Low Strength Material installed and accepted within the pay limits shown on the contract plans or as directed by the Engineer.

Basis of Payment: This work will be paid at the contract unit price per cubic yard "Controlled Low Strength Material," which price shall include all materials, equipment, tools and labor incidental thereto.

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, materials, equipment, tools, and labor incidental thereto.

ITEM #0401152A - CONCRETE PAVEMENT REPLACEMENT FOR ROADWAY (FULL-DEPTH)

Article 4.01.01 - Description:

Delete the entire article and add the following:

This work shall consist of replacing full-depth concrete pavement at locations as designated by the Engineer.

Article 4.01.02 - Materials:

After the last sentence add the following:

Mix I: The Contractor shall design and submit a portland cement concrete mix to the Engineer for approval. Mix I shall be used only when the ambient air temperature is 65 degrees F or higher, and where there is unlimited cure time.

Mix II: The Contractor shall design and submit a high-early strength portland cement concrete mix to the Engineer for approval. Mix II shall be used only when the ambient air temperature is 65 degrees F or higher, and where there is restricted cure time.

Mix III: The Contractor shall submit a proprietary, rapid-setting concrete mix or Mix IV to the Engineer for approval. These mixes are to be used when the ambient air temperature at the time of placement falls between the range of 30 to 65 degrees F.

Mix IV: The Contractor shall design and submit a high-early, cold weather concrete mix to the Engineer for approval. The aggregate sizes shall be designed by the Contractor so as to function properly given the job conditions. This mix shall be used in conjunction with the requirements as detailed under Section 19, "Cold Weather Concreting," of the Construction Methods detailed herein. Prior to approval, the Contractor shall demonstrate his ability to successfully utilize this mix.

Additional Materials:
Insulating material shall conform to the requirements of ASTM C578.
Expansion joint material shall conform to AASHTO M153, Type 2.

Article 4.01.03 - Construction Methods:

Delete Subarticle F-2 and H-1; add the following:

Construction Methods not specifically covered in this specification shall conform to 4.01.03:

1. COMPOSITION:

The Contractor shall submit a mix design to the Engineer for each of the mixes listed below. The mix design calculations shall include certified test results documenting the strength requirements relative to temperature restrictions for the available cure time.

These designs must be submitted at least 30 days prior to the start of the contract.

Mix I shall be composed of portland cement, fine and coarse aggregate, water, and approved concrete admixtures.

Mix II shall be composed of portland cement, fine and coarse aggregate, water and approved concrete admixtures. Accelerators shall be non-chloride, and shall conform to AASHTO M-194. Accelerators shall be used in strict accordance with the manufacturer's recommendations and procedures. Precautions shall be taken to ensure compatibility of the air-entraining and non-chloride accelerating admixtures. High range water reducing agents (superplasticizers) may be used in the mix design if approved by the Engineer. The maximum allowable slump shall be increased to 7 inches when superplasticizers are used, provided that the water-cement ratio is not exceeded and the mix does not exhibit segregation. The specified air content shall be 6-1/2 ± 1-1/2 percent when superplasticizers are included in the mix. The superplasticizers shall be added on-site to avoid rapid slump loss. Slump measurements shall be taken before and after the addition of the superplasticizer. Additional superplasticizer may be added to the mix with approval of the Engineer.

Mix III shall strictly follow the manufacturer's recommendations with regard to the composition of the concrete mix. The mix shall contain an air-entraining agent, and the percentages of entrained air shall be maintained at 6-1/2 ± 1-1/2 percent. The percentage of required entrained air in the mix may be reduced by the Engineer, providing that the product manufacturer can demonstrate that the durability of the material is satisfactory when the amount of entrained air is reduced. The Contractor shall submit substantive testing documentation, that verifies the above requirement, to the Engineer for approval.

Mix IV shall be of the same composition as Mix II, with the following additional requirements:

1. Only Type III portland cement shall be utilized in the mix, with its minimum content being 850 pounds per cubic yard of concrete.

2. The temperature of the concrete, as delivered, shall be within the range of 70 to 95 degrees F.

Mixes II, III, and IV shall develop a minimum compressive strength of 1,800 psi in a maximum period of 6 hours. This is the minimum strength necessary to open to traffic.

2. INSPECTION OF THE CONCRETE SLABS:

Before any existing concrete is removed, the Engineer shall perform an inspection of the concrete slabs and designate areas where concrete removal is required. The lateral limits of each area to be removed and replaced shall be marked with paint by the Engineer. In no case shall the minimum length of the patch be less than 6 feet, or less than 12 feet in width.

3. SAWING OF THE CONCRETE PAVEMENT:

The existing pavement to be removed shall be sawed full-depth along the transverse and longitudinal boundaries designated by the Engineer.

The equipment shall be capable of sawing neat vertical faces along the patch boundaries. Saw cuts with a toothed wheel saw blade shall **ONLY** be permitted inside the patch boundaries to facilitate the concrete removal operation. In this case, however, a minimum 3-inch clearance must be maintained between the internal cuts and the boundaries of the patch. If the Contractor oversaws with a toothed wheel into the adjacent concrete slabs, then the Contractor shall replace said slabs at no cost to the State.

Oversawing into the adjacent slabs or shoulders to ensure that full-depth cuts have been achieved in the corners shall be minimized. All oversawed areas shall be thoroughly cleaned and filled with approved crack sealant.

The sawing operation may be performed in advance of the concrete-removal operation. However, it shall be limited to a distance not to exceed the amount of patching that can be completed during the next five (5) working days. This distance shall be determined by the Engineer, based on past performance of the Contractor.

4. REMOVAL OF DETERIORATED CONCRETE:

Concrete slab removal shall be limited to the amount of pavement that can be removed and replaced during the allowable working period. All deteriorated concrete shall be removed within the limits marked by paint or where designated by the Engineer.

The concrete slabs shall be lifted out by means of chains, lift-pins, or other approved devices. In-place breaking of concrete shall not be permitted. During the removal operation, utmost care shall be exercised to minimize disturbance and damage to the subbase, adjacent pavement, or bituminous shoulder. Any areas damaged during either the concrete sawing or removal operations shall be repaired by extending the patch boundary. These repairs shall be made under the direction of the Engineer, at no cost to the State.

5. BITUMINOUS CONCRETE REMOVAL:

Where existing bituminous material is to be replaced with concrete, the adjacent concrete pavement shall be cut full-depth and removed. Utmost care shall be exercised to minimize

disturbance and damage to the subbase, adjacent pavement, or bituminous shoulder. Adjacent concrete edges shall be cleaned and exhibit a vertical face. Unacceptable concrete surfaces shall be re-cut as directed by the Engineer.

6. SUBBASE/SUBGRADE PREPARATION:

After the concrete has been removed, all disturbed or loose subbase/subgrade material shall be carefully removed. Protection of the subbase/subgrade following the concrete removal shall be the responsibility of the Contractor and no additional payment will be allowed for repairs of the subbase/subgrade not so protected.

When, in the opinion of the Engineer, the subbase/subgrade is in a saturated condition or not suitable for concrete placement, the Contractor shall be required to excavate an additional depth as designated by the Engineer. Subbase replacement material shall meet the requirements for graded aggregate subbase in accordance with M.02. Construction methods for this material shall be in accordance with 2.12.03. The Engineer may also require that the Contractor install underdrains in accordance with 7.51.

7. HOLE DRILLING REQUIREMENTS:

The face of the existing pavement shall be drilled for insertion of the deformed epoxy coated steel bars at locations shown on the contract drawings. The use of hand held drills shall not be permitted. The holes shall be drilled with a drilling machine meeting the following requirements:

a. The machine shall produce holes such that each individual dowel's longitudinal axis is aligned parallel to the longitudinal axis of the pavement slabs.

b. The forward and reverse travel of the drills shall be controlled by mechanically applied pressure. The drills shall be equipped with tungsten carbide bits. Drill guide bushings will be required to prevent eccentricity of the drilled holes.

c. The drill and the pressure mechanism shall be matched to drill the holes for the dowels in 30 seconds or less.

d. The drills, pressure mechanisms, guide bushings, centralizer collars, and drill feeds shall be gang mounted and shall consist of not less than three (3) independently powered and driven drills. The drill feeds shall be constructed such that all drill bits shall be parallel to one another. Each drill bitshall pass through a centralizer collar which shall be replaced as wear demands. The driven drill bits shall impart a pressure against the face of the concrete not to exceed 40 psi.

The drilling machine should be mounted on a tractor or other suitable piece of equipment so that it can be easily transported and quickly positioned at each repair location. The drilling machine shall be approved by the Engineer prior to actual use.

When in the opinion of the Engineer drill wear is such that the hole diameter exceeds the diameter of the deformed bar by 1/4 of an inch, the Contractor shall replace the drill bits and/or guides. The holes and face of the existing concrete shall be cleaned with compressed air after drilling is complete.

8. DOWEL BAR INSTALLATION:

Dowel bars shall be number 10 deformed epoxy coated steel bars and shall be used in all fixed transverse joints. All dowel bars shall be 18 inches in length, and embedded a distance of 9 inches into the adjacent slabs.

Chemical anchor material shall be used to secure the dowel bars in place as shown on the contract drawings. Chemical anchor material shall be placed by using a flexible long-nose tube that injects the material into the back of the hole in accordance with the manufacturer's recommendations.

Under no circumstances will the practice of dipping the dowel bars in the chemical anchorage material be permitted.

The bar shall be inserted into the hole while being rotated at least one complete revolution so that the material in the bottom of the hole is forced up and around the bar. A retention disk shall be placed on the leading end of the bar before it is inserted into the hole so that as the bar is inserted and rotated, only the excess chemical anchorage material is allowed to escape. The space around the bar shall be completely filled with chemical anchorage material and shall be free of voids.

Retention disks shall be polymeric material or aluminum with a non-reactive flexible gasket material and shall be approved for use by the Engineer. The design and installation of the retention disk shall be such that there will be no metal to metal contact between the retention disk and the deformed bars.

9. FORMS FOR SLAB REPLACEMENTS ADJACENT TO SHOULDER:

Forms shall be utilized on the bituminous shoulder side of the patch. In order to accommodate the side forms, the Contractor shall saw cut full-depth and excavate 6 inches beyond the lateral width of the form into the adjacent shoulder. Forms shall extend longitudinally along the existing shoulder pavement a minimum of 1 foot beyond the transverse limits of the patch. The forms shall be secured to prevent movement during concrete placement. After the removal of the form, the excavated portion of the shoulder shall be replaced with Bituminous Concrete Class 1, or the SUPERPAVE mix designated on the project, in accordance with Section 4.06 and shall be true to the line and grade of the new patch and existing shoulder.

10. POLYETHYLENE SHEET:

A 4 mil thick polyethylene sheet, whose all around dimensions are 3 inches less than those of the repair area, shall be secured to the subbase prior to placement of the concrete.

11. CONCRETE PLACEMENT:

It shall be the responsibility of the Contractor to arrange the construction schedule so that the required operations are performed without causing a delay in work.

Concrete placement operations for Mixes I and II may commence only when the air temperature is in the range of 65 to 95 degrees F and when the anticipated minimum and maximum temperatures for the 48 hours immediately after placement of concrete shall be within the range of 40 to 95 degrees F.

When the air temperature is below 65 degrees F, or when the anticipated temperature is expected to fall below 40 degrees F within 48 hours of the concrete placement, **ONLY** Mixes III or IV shall be used.

Placement of concrete shall not be permitted if the air temperature is, or can be expected to lie outside the range specified for that particular mix design. The anticipated minimum and maximum temperatures shall
be based upon national weather service reports which the Contractor shall obtain on a daily basis. All temperatures shall be measured in the shade.

Concrete shall not be placed when it is raining or when rain is forecast within two hours of placement.

Vibration shall be used to thoroughly consolidate the concrete throughout the entire patch area. Approved spud-type vibrators whose head diameters shall not be less than two (2) inches shall be used to consolidate the concrete. Vibrators shall be capable of transmitting 10,000 to 15,000 vibrations per minute. The vibrators shall be held vertically and vibration shall be done full-depth over the entire area in a uniform pattern. Utmost care shall be exercised to ensure that the concrete around the dowel bars and slab edges has been properly consolidated.

12. JOINTS:

When an existing transverse contraction or expansion joint falls within the limits of a patch, the contraction or expansion joint shall be replaced with a joint of the same type, along the same plane as the adjacent transverse joint, as shown on the contract drawings **Payment for the expansion or contraction joints will be included in the cost of the work.**

Finished joints shall not deviate more than 1/4 inch in the horizontal alignment.

Transverse contraction joints shall consist of planes of weakness created by forming or cutting grooves in the surface of the pavement. Formed grooves shall be made by depressing an approved tool or device into the plastic concrete. The tool or device shall remain in-place until the concrete

has attained its initial set and shall then be removed without disturbing the adjacent concrete, unless the device is designed to remain in the joint.

Sawed contraction joints shall be created by sawing grooves in the surface of the pavements of the dimensions shown on the plans with an approved concrete saw.

Sawing of the joints shall commence as soon as the concrete has hardened sufficiently to permit sawing without excessive raveling, usually 4 to 24 hours. All joints shall be sawed before uncontrolled shrinkage cracking takes place.

The expansion joint material shall conform to AASHTO M153, Type 2.

13. FINISHING:

After the concrete has been placed to a level slightly above the existing concrete pavement surface, a vibrating plate or screed shall be drawn over the surface at a uniform speed, without stopping, in order to strike-off the patch surface even with the adjacent concrete surface. The patch shall then be floated to a smooth finish. The type of screed or plate shall be approved by the Engineer.

The addition of water to facilitate the finishing of the patch surface shall **NOT** be permitted. Finishing operations shall be completed before initial set takes place. Patches less than 10 feet in length shall be screeded parallel to the centerline. Patches greater than 10 feet in length shall be screeded perpendicular to the centerline.

The surface of the patch shall not vary more than 1/4 inch in a distance of 10 feet when a 10-foot-long straightedge is placed on the surface at any angle. Sags or depressions in the surface of the patch area that exceed the 1/4-inch tolerance shall be repaired at the expense of the Contractor. Upward deviations in the hardened patch surface shall be ground down or replaced, at the expense of the Contractor, by approved machinery as directed by the Engineer.

14. CURING:

As soon as initial set of the concrete has occurred in Mixes I and II, curing mediums shall be applied. Initial set is defined as having occurred when no cement paste is lifted from the repair when the surface is lightly rubbed with the fingers of one's hand.

Mix I Curing: Liquid curing compound, conforming to 4.01.03-F7a, shall be used. When the ambient temperature is anticipated to fall below 50 degrees F, insulation curing material, as described below, shall be utilized.

Mix II Curing: Liquid curing compound, conforming to 4.01.03-F7a, shall be used. In addition, a sheet of 4 mil polyethylene shall be placed over the repair area, in conjunction with insulating curing material. This material shall be a minimum of 2 inch thick closed cell extruded polystyrene insulation board that conforms to the requirements of ASTM C578. It shall have a minimum

certified R value of ten (10). The insulating material shall extend at least 12 inches beyond the limits of the repair area, and shall be kept in intimate contact with the pavement surrounding the patch area to prevent wind intrusion beneath. It shall be weighted down with sand bags weighing a minimum of 15 pounds each. The sand bags shall be placed a minimum of two (2) feet on center around the patch area.

Mix III Curing: Curing shall be in accordance with the manufacturer's recommendations.

Mix IV Curing: The curing methods for this mix shall be the same as those requirements for Mix II, with the exception that liquid curing compound shall not be used. Any variations to this prescribed method of curing shall be approved in writing by the Engineer prior to its use.

15. INSPECTION:

Any pavement defects or shrinkage cracks resulting from improper placement or curing methods shall be repaired, or the patch replaced by the Contractor at no cost to the State.

16. TESTING:

The Contractor shall make test cylinders under the supervision of the representative of the Department. The dimensions, type of cylinder mold and number of cylinders shall be specified by the Engineer.

A portable compression testing machine shall be provided by the Contractor and available on site for cylinder testing. All testing and equipment shall conform to ASTM C39. NOTE: This compression machine must be calibrated in accordance with the provisions of Section 5, ASTM C39.

17. TIME SCHEDULE:

Traffic will be allowed on areas of the roadway where the Contractor has placed and finished the full-depth patches (with bituminous cover if required), after the attainment of 1,800 psi compressive strength.

If the concrete has not attained the above compressive strength requirements within 6 hours, the Contractor shall remove and replace the concrete patch, including any additional saw cutting, drilling and bar installation at his own expense during the next working day.

If the Contractor does not complete replacement operations within the given traffic lane closure time period, then he shall provide at his own expense, a full-depth bituminous concrete patch, or a temporary wood/concrete platform, to allow full traffic operations over these areas. Steel plates may be used in lieu of bituminous concrete to span excavations that are 10 feet or less in length and if vehicle speed limits are not to exceed 25 miles per hour. These plates shall be secured to the existing slabs to prevent movement, as directed by the Engineer. Bituminous concrete shall be placed to provide a taper onto and off of the steel plates.

The plate, platform or bituminous patch shall be removed and all work shall be completed on the patch during the next scheduled work period. Installation and removal shall be done as directed by and to the satisfaction of the Engineer.

18. TEMPORARY WOOD/CONCRETE PLATFORMS:

Temporary Wood/Concrete Platforms may be used to allow full traffic operations (as outlined above), or to enhance the production schedule.

19. COLD WEATHER CONCRETING:

When Mix IV is utilized for cold weather concreting as described herein, the following additional requirements shall apply:

a. The polyethylene sheeting referred to under Section 10 shall be eliminated.

b. During cold weather, only those chemical anchoring materials whose cure time is not affected by cold temperatures shall be used.

c. Just prior to the placement of the Mix IV concrete, the subbase and surrounding patch interfaces shall be thoroughly wetted with hot water having a minimum temperature of 175 degrees F. This wetting shall be continued until these interfaces are substantially heated, but in no case shall the residual ponding of water be allowed to occur within the patch area. The method of wetting the patch area shall be approved by the Engineer prior to its use.

Immediately after the wetting operation is concluded, the Mix IV concrete shall be placed into the patch area. Due to the fact that rapid wetting, material placement, consolidation and finishing are paramount to the success of this operation, the failure of the Contractor to follow the prescribed, approved methods shall be grounds for the rejection of those materials in place.

Article 4.01.04 - Method of Measurement:

Delete the entire article and substitute the following:

This work shall be measured for payment by the actual number of cubic yards of concrete placed in acceptable patches.

Expansion and contraction joints shall not be measured for payment.

Removal of unsuitable subbase material shall be measured on the basis of cubic yards of material excavated, as directed by the Engineer.

Replacement of unsuitable subbase material shall be measured on the basis of cubic yards of subbase material placed and accepted by the Engineer.

Subgrade drains shall be measured on the basis of lineal feet of underdrain installed as directed by the Engineer.

Patching of the shoulder pavement that was removed to install the side forms shall be measured on the basis of the number of tons of Bituminous Concrete Class 1 material placed, or the SUPERPAVE mix designated on the project, compacted and accepted by the Engineer.

If the existing roadway is composite pavement (bituminous over concrete), replacement of the bituminous directly above the new concrete patch shall be measured on the basis of the number of tons of Bituminous Concrete Class 1 material placed, or the SUPERPAVE mix designated on the project, compacted and accepted by the Engineer. Material for Tack Coat shall be measured as outlined in 4.06.04-7.

Article 4.01.05 - Basis of Payment:

Delete the entire article and substitute the following:

This work shall be paid for at the contract unit price per cubic yard of "Concrete Pavement Replacement for Roadway (Full-Depth)," complete in place. This price shall include removal and disposal of all materials including but not limited to deteriorated concrete, bituminous pavement, steel reinforcement, and transverse joints. The price shall also include any required sawing of concrete and bituminous pavement, preparation of the patch area, furnishing, placement, finishing and curing of the concrete, subbase preparation, all drilling, furnishing and installation of the dowel bars, retention disks, steel reinforcement, Transverse Expansion Joints, Transverse Contraction Joints, insulating material, 4 mil polyethylene sheets, chemical anchoring material, and all tools and materials incidental thereto. The cost of furnishing, installing, and removal of the Temporary Wood/Concrete Platforms shall also be included.

No direct payment will be made for the concrete testing equipment, the instruction in its use, in-situ testing, the concrete in or curing of the required cylinders as specified hereinbefore, but the cost of this work shall be considered included in the general cost of the work.

Removal of unsuitable subbase material shall be paid for at the contract unit price per cubic yard for "Earth Excavation."

Replacement of unsuitable subbase material shall be paid for at the contract unit price per cubic yard for "Subbase."

Installation of subgrade drains shall be paid for at the contract unit price per lineal foot for "Underdrain."

Patching of the shoulder to facilitate placement of the side forms shall be paid for at the contract unit price per ton for "Bituminous Concrete Class 1" or "SUPERPAVE."

If the existing roadway is composite pavement (bituminous over concrete), replacement of the bituminous directly above the new concrete patch shall be paid for at the contract unit price per ton for "Bituminous Concrete Class 1" or "SUPERPAVE." Material for tack coat shall be paid for at the contract unit price per gallon for "Material for Tack Coat."

ITEM # 0404100A - BITUMINOUS CONCRETE PATCHING – FULL DEPTH

1. Description: This work shall consist of repairing areas of structurally failed flexible pavement by:

a) removal of the entire thickness of the bound and granular layers of the pavement structure to a distance at least one foot beyond the deteriorated area,
b) Application of tack coat to the bound-layer vertical edges of the patch, and
c) Placement of Hot-Mix Asphalt (HMA) to match surrounding pavement thickness as closely as possible except that the minimum HMA thickness shall be two (2) inches. Since the pay item is by area, the estimated composition of the patch is to be included as a detail in the plans or contract documents.

1.1 Definitions: The following definitions of terms shall apply to this Special Provision.

Structurally failed pavement: Structurally failed pavement exhibits deterioration that extends through the entire depth at least the bound layers of the pavement structure. Typical distress forms visible at the surface include potholes, temporary or deteriorated patches, severe depressions or heaves, or areas of alligator cracking. Raveling, delamination, or surface potholes are not indicators of structural failure and are not subject to the repair procedure described in this Provision.

Bound layers: Total thickness of pavement structure composed of material bound together by a bituminous binder.

Granular layers: Total thickness of the pavement structure composed of unbound but selected and/or engineered materials, typically crushed or bank-run aggregate and fines, or crushed stone or crushed or bank-run gravel.

Subgrade: The native fill or unimproved soil underlying the pavement structure.

Flexible pavement: For the purposes of this provision, flexible pavement shall be a pavement structure composed of bound layers and granular layers only, with no Portland-cement concrete (PCC) layers or cementitiously treated layers present in the pavement structure.

2. Materials: Materials for this work shall consist of the following:

a) Processed Aggregate Base conforming to the requirements of Sections 3.04 and M.05.01 of the Standard Specifications.
b) Hot-mix Asphalt conforming to the requirements of Sections 4.06 and M.04 of the Standard Specifications.
c) Tacking agent conforming to the material requirements for tack coat in Sections 4.06 and M.04 of the Standard Specifications.
d) If geotextile is included in the patch, it shall be a High Survivability Separation geotextile from the latest version of the Department of Transportation's Qualified Products List, available at http://www.ct.gov/dot/LIB/dot/documents/dresearch/conndot_qpl.pdf.

3. Equipment: Equipment for this work shall include all pavement cutting, removal, material handling, and compaction equipment to perform all patching operations. Compaction equipment shall include, but not be limited to, a steel-wheeled roller and vibratory plate compactor both capable of compacting both granular and HMA materials to specification requirements.

4. Construction Methods:

a) Demarcation of Areas to be Patched**:**
Mark the areas to receive this treatment. All areas to be full-depth patched shall completely encompass the entire deteriorated area and extend one (1) foot beyond into the surrounding pavement, and shall be approved by the Engineer prior to execution of the work.

b) Patch Preparation**:**
i. Saw cut the edges of the areas demarcated for full-depth patching.
ii. Excavate and remove all layers (bound, granular, and subgrade) in demarcated areas as approved by the Engineer to accommodate the pavement structure for full-depth patching indicated in the Plans. No surrounding pavement, either its bound layers or its granular layers, shall be damaged during removal; if surrounding pavement is damaged, the area of removal shall be extended to encompass the newly damaged pavement. The volume of pavement damaged and repaired beyond the demarcated areas shall be repaired at the Contractor's expense and not be measured for payment.
iii. Place the granular layer in the patch pavement structure to the depth shown on the Plans, compact to the requirements of the Standard Specifications, and bring to line and grade prior to placement of hot-mix asphalt.
iv. In cases where the subgrade is not sufficiently stable to support compaction of the granular layers, a geotextile material may be used on top of the subgrade; if use of a geotextile is selected, the minimum thickness of the granular layer shall be 18 inches.

c) Patch construction**:**
i. Apply tack coat to the bound-layer edges of the patch prior to placement of HMA.
ii. Place HMA in lifts as indicated in the plans or contract documents to match the existing thickness of the surrounding pavement as closely as possible but with a minimum HMA thickness of two (2) inches. The surface elevation of the finished HMA patch shall be even with the surrounding existing pavement within ¼ inch as measured with a 10-foot straightedge.

d) Disposal of waste: Remove all waste materials the same day they are excavated.

5. Method of measurement: This work shall be measured by the total area, in square yards, of "Bituminous Concrete Patching – Full Depth." If geotextile is used, it shall be measured by the total area, in square yards, of "Geotextile (Separation – High Survivability" placed.

6. Basis of Payment: This work will be paid for at the contract unit price per square yard of "Bituminous Concrete Patching-Full Depth." The price shall include all tools, materials, labor,

and equipment used for this activity, including, but not limited to: sawcutting, pavement and granular base excavation and removal, HMA and Processed Aggregate Base used in the construction of the patch, compaction and/or formation of granular base, and tacking agent. Geotextile shall be paid for separately at the contract unit per square yard of "Geotextile (Separation – High Survivability)" placed and shall include all tools, materials, labor, and equipment used for placement of this item. No payment will be issued to the contractor prior to document submissions required.

Pay Item	Pay Unit
Bituminous Concrete Patching – Full Depth	S.Y.

ITEM # 0404101A - BITUMINOUS CONCRETE PATCHING - PARTIAL DEPTH

1. **Description**: This work shall consist of sawcutting and removing deteriorated bituminous concrete pavement, regrading and recompacting the existing granular base, placing tack coat on the vertical faces of the sawcut, and filling the excavated area with HMA S0.5 in compacted lifts of 2 to 3 inches.

2. **Materials:** Materials for this work shall consist of the following:

   2.1 Hot-mix Asphalt (specifically HMA S0.5) conforming to the requirements of Sections 4.06 and M.04 of the Standard Specifications. An equivalent PMA may be used meeting the requirements of Sections 4.06 and M.04 of the Standard Specifications.

   2.2 Tack coat conforming to the material requirements for tack coat in Sections 4.06 and M.04 of the Standard Specifications.

3. **Equipment:** Equipment for this work shall include, but is not limited to, the following:

   3.1 Pavement saw – A pavement saw capable of cutting the full depth of pavement in one pass. It shall be capable of cutting the existing pavement to a minimum width of 24 inches in any direction. This makes the minimum achievable patch size - 24 inches by 24 inches, or 0.45 square yards.

   3.2 Excavation equipment– Equipment capable of removing existing pavement from the roadway. This may include, but not limited to jackhammers, back hoes, mini excavators, loader tractors, and skid-steers.

   3.3 Paving and compaction equipment – Equipment needed to recompact the existing granular base shall include vibratory plate compactors and jumping jack compactors. All equipment used to place and compact the hot mix asphalt required for this work shall meet the requirements of Section 4.06 of the Standard Specifications. Due to the nature of this work, it is expected that much of the placement of hot mix asphalt will require hand work or a mixture of equipment and hand work methods and tools to achieve the required results. The same consideration is to be given to compaction of the hot mix asphalt. Smaller type compaction equipment, including vibratory plate compactors, shall be allowed to achieve the required results. At all times the Contractor is required to meet the density and compaction and all other requirements specified in Sections 4.06 and M.04 of the Standard Specifications.

4. **Construction Methods:**

   4.1 Demarcation of Areas to be Patched:

4.1.1 Areas to be patched under this item shall consist of pavements that demonstrate significant distress throughout all, or nearly all, of the existing bound bituminous pavement layers. Excessive full depth cracking, exceptionally wide full depth cracks, failed bituminous patches or utility trenches, raveling and potholes not limited to just the surface of the pavement, and frost damaged pavements (cracked and/or heaved) are examples of, but not limited to, such distresses. As a general rule, if the pavement distress observed is severe enough that it would not likely support traffic, or remain sound and intact, for at least an additional 2 years, it should be marked out by the Engineer for removal and patching. Lastly, it should be determined that a poor or inadequate granular base is not significantly contributing to the observed distress in the asphalt layers. Inadequate or poor granular base foundations that do not support the overlying bound pavement layers should be removed and replaced under separate item(s) of work.

4.1.2 The Engineer will mark out all areas for removal. The minimum dimension of any given partial-depth patched area shall be 24 inches. Any area to be patched shall completely encompass the entire distressed pavement area and extend at least 6 inches beyond into the surrounding pavement.

4.2 Patch Preparation and Construction:

4.2.1 Sawcut the limits of the demarcated areas through the full depth of the pavement.

4.2.2 Remove the existing pavement from within the boundaries of the sawcut so as not to disrupt, or uplift, the surrounding pavement and to minimize the dislodgement of the existing granular base.

4.2.3 Once the existing pavement is removed, regrade the existing granular base and recompact it utilizing jumping jack and/or vibratory plate compactors. A minimum of 4 passes, or coverages, must be made by any one compaction device. If the Engineer elects to test the density of the granular base, the base shall be compacted to at least 95% of the dry density for that material when tested in accordance with AASHTO T-180, Method D. If necessary, optimum moisture shall be added to the existing base material in order to achieve compaction to the satisfaction of the Engineer. If a significant amount (1 inch or greater) of existing granular base material is lost during the excavation of the deteriorated pavement, the Contractor shall add material meeting the requirements of Section 3.04, "Processed Aggregate Base," of the Standard Specification in order to regrade and compact the granular base to its original elevation. There shall be no additional compensation for replacing granular base material lost during the excavation of the deteriorated pavement. It shall be replaced as described above and included in the cost of the work.

4.2.4 The cut sides/walls of the excavated area shall be wiped or broomed clean of any residual slurry generated from the sawcutting process and then receive an application of tack coat as specified in Section 4.06 of the Standard Specifications.

4.2.5 After the tack coat has had sufficient time to cure or break, HMA S0.5, in lifts of 2 to 3 inches, shall be placed and compacted to the requirements above and in Section 4.06 of the Standard Specifications. The final lift shall be compacted to match the elevation of the surrounding pavement surface. The Contractor may elect to substitute HMA S0.375 (in compacted lifts of 1.5 to 2.5 inches) for HMA S0.5. The Contractor must notify the Engineer within 5 days of making this substitution for approval of the substitution. Approved HMA S0.375 material shall meet the requirements of Sections 4.06 and M.04 of the Standard Specifications.

5. **Method of measurement:** This work shall be measured by the total area, in square yards, of "Bituminous Concrete Patching - Partial Depth."

6. **Basis of Payment:** This work will be paid for at the contract unit price per square yard of "Bituminous Concrete Patching - Partial Depth." The price shall include sawcutting the existing pavement, pavement excavation and removal, leveling and compaction of the existing granular base, tack coat application to the cut sides/walls of the patch area, and placement and compaction of HMA S0.5. All other miscellaneous tools, materials, and equipment needed to complete the work shall also be included in the cost of the work.

Pay Item	Pay Unit
Bituminous Concrete Patching – Partial Depth	S.Y.

ITEM # 0406125A - BITUMINOUS CONCRETE SURFACE PATCH

1. **Description**: This work shall consist of milling and patching an existing deteriorated bituminous concrete pavement surface. A milling machine shall be used to remove existing bituminous pavement to a specified depth. On the Baldwin Bridge, the depth of milling shall be 1.625 inches where possible, but shall not come closer than 0.5 inches to the membrane. Refer to the Baldwin Bridge Paving and Cores diagram to see where milling will have to be reduced to avoid coming within 0.5 inches of the membrane. If this item is used in areas other than the Baldwin Bridge, mill to a depth of 1.5 to 2.5 inches. The milled surface shall be swept and then be blown clean with compressed air. Tack coat is to be applied to the milled surface and any vertical or semi-vertical walls formed by the milling. The milled out area shall then be filled and compacted with PMA S0.25 on the Baldwin Bridge and PMA S0.375 elsewhere.

2. **Materials:** Materials for this work shall consist of the following:

   2.1 Bituminous Asphalt conforming to the requirements of Sections 4.06 and M.04 of the Standard Specifications.

   2.2 Tack coat conforming to the material requirements for tack coat in Sections 4.06 and M.04 of the Standard Specifications.

3. **Equipment:** Equipment for this work shall include, but is not limited to, the following:

   3.1 Milling machine – A milling machine designed and built for milling flexible 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 HMA pavement. It shall be approved by the Engineer.

   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 rotary drum of the machine shall utilize carbide tip tools spaced not more than 5/8 inches apart. The forward speed of the milling machine shall be limited to no more than 25 feet/minute on the Baldwin Bridge and 45 feet/minute elsewhere. The tools on the revolving cutting drum must be continually maintained and shall be replaced as warranted to provide a uniform pavement texture.

   In areas other than the Baldwin Bridge, the Contractor may request to perform a test strip to demonstrate that the same surface tolerance can be attained at an increased forward speed. The test strip shall be a maximum length of 500 feet and

shall have the same criteria for surface tolerance as noted in this specification. The final decision for implementing the increased forward speed will be at the discretion of the Engineer.

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.

In addition to meeting those requirements, the milling machine shall be capable of removing the existing pavement to a minimum width of 24 inches when used on the Baldwin Bridge and 20 inches elsewhere in any direction. This makes the minimum achievable patch size – 24 inches by 24 inches on the Baldwin Bridge and 20 inches by 20 inches, or 0.30 square yards elsewhere.

3.2 Sweeper – The sweeper shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. Other sweeping equipment may be provided in lieu of the sweeper where acceptable by the Engineer.

3.3 Air compressor – The unit shall consist of an air compressor capable of producing 100 psi, oil free, compressed air for blowing the milled pavement surface clean.

3.4 Hot air lance – The unit shall be designed for cleaning and drying the pavement surface. It shall consist of an air compressor capable of delivering 100 psi, oil free heated air. The compressed air emitted from the tip of the lance shall be flame free and be capable of achieving a temperature of at least 1500°F.

3.5 Paving and compaction equipment – All equipment used to place and compact the hot mix asphalt required for this work shall meet the requirements of Section 4.06 of the Standard Specifications. Due to the nature of this work, it is expected that much of the placement of hot mix asphalt will require hand work or a mixture of equipment and hand work methods and tools to achieve the required results. The same consideration is to be given to compaction of the hot mix asphalt. Smaller type compaction equipment, including vibratory plate compactors, shall be allowed to achieve the required results. At all times the Contractor is required to meet the density and compaction and all other requirements specified in Sections 4.06 and M.04 of the Standard Specifications.

4. Construction Methods:

4.1 Demarcation of Areas to be Patched:

4.1.1 Areas to be patched under this item shall consist of areas specified by the Contract (near Ballwin Bridge NB northern header) or pavement surfaces in which the existing surface lift of pavement is raveling, disintegrating, or delaminated from the lift of pavement directly beneath it. Under this specification a "lift" of pavement is defined as an individual layer of bituminous concrete that was placed and compacted previously with one placement pass of a paver or other asphalt

pavement placement device or method. "Surface lift" is defined as the last individual layer of bituminous concrete placed and compacted that currently serves as the driving surface of the roadway. This could include a milled surface. These definitions apply to previously placed "surface lifts" of pavement that were between 1 inch and 2.5 inches thick.

4.1.2 All areas in which the surface lift of pavement displays raveling, disintegration, or delamination from the underlying lift of pavement, of such a severity, that it will not likely support traffic loadings, or remain sound and in-tact, for an additional 2 years, shall be marked out by the Engineer for removal. The minimum width of any given area shall be 24 inches on the Baldwin Bridge and 20 inches elsewhere. All areas to be patched shall completely encompass the entire raveled, disintegrated, or delaminated area and extend at least 6 inches beyond into the surrounding pavement.

4.2 Patch Preparation and Construction:

4.2.1 Utilizing the specified milling machine, mill the demarcated areas to a depth that completely removes the surface lift of pavement. The minimum depth shall be as specified above.

4.2.2 As specified in the requirements for milling, the milled surface shall be swept clean (by hand if necessary.) Once all millings are practicably removed by sweeping, the milled areas shall be allowed to dry if necessary. Any moisture in or on the milled areas must be allowed to evaporate or be removed with the assistance of a hot air lance as specified above. Once the milled area is deemed dry by the Engineer it shall be blown with compressed or hot lance air, as specified above, so that no debris or dust is present on or within the milled area.

4.2.3 Once deemed clean by the Engineer, the milled area, including the sides/walls of the milled area, shall receive an application of tack coat as specified above and in Section 4.06 of the Standard Specifications.

4.2.4 After the tack coat has had sufficient time to cure or break, bituminous asphalt shall be placed and compacted to the requirements above and in Section 4.06 of the Standard Specification. It shall be compacted to match the elevation of the surrounding pavement surface.

4.2.5 On the Baldwin Bridge, the Contractor shall keep in mind that the patch near the bridge header is to be overlaid with the ultrathin and sequence operations accordingly.

5. **Method of measurement:** This work shall be measured by the total area, in square yards, of "Bituminous Concrete Surface Patch."

6. **Basis of Payment:** This work will be paid for at the contract unit price per square yard of "Bituminous Concrete Surface Patch." The price shall include milling, pavement excavation and removal, cleaning of the milled area, tack coat application to the milled surface area, and placement and compaction of bituminous asphalt. All other

miscellaneous tools, materials, and equipment needed to complete the work shall also be included in the cost of the work.

Pay Item	Pay Unit
Bituminous Concrete Surface Patch	S.Y.

ITEM #0406178A – ULTRA-THIN BONDED HMA PAVEMENT (TYPE B)

ITEM #0406192A – POLYMER MODIFIED ASPHALT EMULSION (TYPE 1)

Description: The work shall consist of the production and placement of an ultra-thin hot-mix asphalt (HMA) mixture consisting of a warm polymer-modified asphalt emulsion tack coat followed immediately by an ultra-thin (0.625 inch) lift of HMA. Gradation "Type B" shall be used. "Polymer Modified Asphalt Emulsion (Type 1)" herein can be referred to as "polymer modified emulsion." "Ultra-Thin Bonded HMA Pavement (Type B)" herein can be referred to as "ultra-thin HMA" or "ultra-thin HMA, material/mixture." These items shall be constructed in accordance with these specifications and in close conformity with the lines, grades, thickness, and typical cross section shown on the plans or established by the Engineer.

Materials:

A. **Polymer Modified Emulsion:** The polymer modified asphalt emulsion shall conform to CRS-1P requirements as shown in Table 1, be tested by the supplier, and be submitted to the Engineer with a Certificate of Analysis. The polymer modifier shall be milled or blended into the asphalt emulsion base or the emulsifying agent prior to the emulsification process.

Table 1 – Polymer Modified Asphalt Emulsion Material Properties

Emulsion Properties	Method	Minimum	Maximum
Polymer Content % by weight of total residue	AASHTO T-59	3.0	--
Viscosity, Saybolt Furol, 77°F (25°C), second	AASTHO T-59	20	100
Sieve Test, (%)	AASTHO T-59	--	0.10
Demulsibility (%)	AASHTO T-59	40	--
Storage Stability Test, 1 Day (Difference in % Residue)	AASTHO T-59	--	1
Classification Test	AASHTO T-59	Passes	--
Particle Charge Test	AASHTO T-59	Positive(1)	--
Residue by Distillation, (%)(2)	AASHTO T-59	60	--
Oil Distillate, Volume of Total Emulsion, (%)	AASHTO T-59	--	3

Residue from Distillation Properties			
Penetration, 77°F (25°C), 100 g, 5 second	AASHTO T-49	100	250
Ductility, 77°F (25°C), 5 cm/minute (2 in./min), cm	AASHTO T-51	40	--
Solubility in organic solvent, (%)[3]	AASHTO T-44	97.0	--
Elastic Recovery at 50°F (10°C), (%)[4]	ASTM D 6084	50	--

Notes:

1. If the Particle Charge Test result is inconclusive, material having a minimum PH value of 6.7 will be acceptable.
2. Perform according to AASHTO T-59 except as follows, when the lower temperature reaches approximately 275 °F (135 °C) move the ring burner approximately level with the bottom of the still. Increase the temperature to a maximum 350 °F±11°F (177 °C ± 5.5 °C), maintaining this temperature for 15 minutes.
3. Any organic solvent used shall be demonstrated and proven to work under the above said testing protocols. The type and brand of solvent used shall be recorded and submitted as part of the required testing information.
4. Use ASTMD 6084 Testing Procedure "A." Samples will be tested at 50°F (10 °C).

B. Ultra-Thin HMA: The materials for the ultra-thin HMA mixture, sources of supply, job mix formula, mix tolerances, approval of job mix formula, and the control of the mixture shall conform to the provision requirements and Section M.04. The job mix formula must meet the requirements in Table 2 - Ultra-Thin HMA Mixture Requirements, Type B and must be submitted to the Engineer for approval at least 30 days before production.

Table 2 – Ultra-Thin HMA Mixture Requirements, Type B		
Sieve Sizes	**Type B**	
	Design Limits % Passing (Note a)	**Production Tolerance % (Note a)**
¾"		
½"	100	
⅜"	85-100	+/-5
¼"	30-50	+/-4
#4	24-40	+/-3
#8	21-32	+/-3
#16	16-26	+/-3
#30	12-20	+/-2
#50	8-16	+/-2
#100	5-10	+/-1
#200	4.0-7.0	+/-1.0
% PGB	4.8 – 5.4	
Moisture Sensitivity, AASHTO T283 **(Note b)**	85% minimum	
Film Thickness **(Note c)**	0.35 mils (9.0 μm (microns)) minimum	

Note a: All aggregate percentages are based on total mass of aggregate.
Note b: Specimens for T 283 testing are to be compacted using the Superpave gyratory compactor. The mixtures shall be compacted using 100 gyrations to achieve specimens approximately 3.7 inches in height. Use mixture and compaction temperatures recommended by the binder supplier.
Note c: Film thickness to be obtained using effective binder content; surface area to be calculated according to Asphalt Institute MS-2 methodology.

1. **Asphalt Binder.** Unless otherwise specified, a PG 64-22 binder will be utilized.

2. **Coarse Aggregate.** Coarse aggregates that are from more than one source or of more than one type of material shall have all constituents proportioned and blended to provide a uniform mixture. Crushed stone from an approved source meeting the following requirements of (a) or (b); and Table 3 shall be used.

(a) Sandstone, granite, chert, traprock, or other similar non-carbonate material.

(b) Gravel, or a natural or manufactured blend of the following types of material: limestone, dolomite, gravel, sandstone, granite, chert, traprock or other similar materials meeting the following requirements:

- 0.5 inch Nominal Maximum Size Aggregate Mixes – A minimum of 20% of plus 0.375 inch particles must be non-carbonate.

- 0.375 inch Nominal Maximum Size Aggregate Mixes – A minimum of 20% of plus 0.1875 inch particles must be non-carbonate.

Note- Non-carbonate particles are defined as having a minimum acid insoluble residue content of 80%.

Table 3 – Coarse Aggregate Properties

Property	Method	Requirement
LA Abrasion Coefficient, maximum % loss	AASHTO T 96	25
Maximum percent passing #200 sieve, %	AASHTO T 11, T 27	2
Soundness, maximum % loss	AASHTO T 104	10
Fractured particles	AASHTO T 335	100%

Note: Anti-stripping agents may be required to provide resistance to stripping.

The recommended coarse aggregate proportions are noted in Table 4.

Table 4 –Coarse Aggregate Gradation

Screen Size	Type B (% Passing)
3/4 inch	100
1/2 inch	100
3/8 inch	85-100
1/4 inch	0-15
#4	0-3
#8	0

3. Fine Aggregate. 100% crushed stone having a minimum sand equivalent of 60%, as determined by AASHTO T176, "Plastic fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test" shall be used. The recommended fine aggregate proportions are noted in Table 5.

Table 5 – Fine Aggregate Gradation	
Sieve Size	**Percent Passing**
#4	100
#8	90-100
#16	60-80
#30	45-60
#50	30-40
#100	20-30
#200	15-25

4. Mineral Filler. Mineral Filler shall conform to the requirements of M.04.01.

C. Equipment:

1. Paver- The self-priming spray paver must be capable of spraying the polymer modified asphalt emulsion, applying the hot asphalt overlay and smoothing the surface of the mat in one pass at a rate of at least 30 ft/min. The self-priming spray paver must be equipped with a receiving hopper, feed conveyor, emulsion storage tank, metered high-pressure emulsion spray bar(s) and a variable width, heated, extendable ironing-type screed. The spray bar system must be capable of applying the polymer modified emulsion across the entire width of the screed, including the full width of the variable width screed extensions. The paver shall be equipped with a microprocessor and controls to control the flow of the polymer modified asphalt emulsion and to vary the application rate of the emulsion to insure a uniform application rate of the polymer modified asphalt emulsion at the desired application rate, plus or minus 0.02 gallons/square yard based on speed and paving width. The paver must be able to apply the specified polymer modified emulsion rate at all speeds, including all stops and starts of the paver, uniformly across the full width of the mat being placed. The screed must have the ability to be crowned at the center both positively and negatively and be vertically adjustable and have horizontal extensions to accommodate the desired pavement profile.

2. Rollers- All rollers shall be self-propelled and designed for compaction of HMA. The Contractor shall furnish a minimum of two ten (10) ton double drum rollers for each paving machine to properly seat the ultra-thin HMA. The rollers shall only operate in the static mode and additional rollers may be required to meet production needs.

Construction Methods:

A. **Surface Preparation:** The Contractor shall perform all surface preparation prior to application of the emulsion which shall include thoroughly cleaning the entire area to be overlaid. Rotary power sweeping and vacuuming may be required.

The pavement surface shall be dry.

The Contractor shall protect all manhole covers, water boxes, catch basins and other utility structures with plastic or building felt, which shall be removed upon completion of the paving operation.

B. **Application:** The minimum pavement surface temperature for application of the polymer modified emulsion and placement of the ultra-thin HMA is 50° F. Artificial heating of the pavement surface is not allowed. The finished in-place ultra-thin HMA shall a minimum thickness of 0.625 inches and a maximum thickness of 0.875 inches. If the ultra-thin HMA is placed creating a "drop-off" or vertical deviation exposed to traffic between one pavement surface and another, exceeding 0.750 inches, it shall be unquestionably corrected to be in conformance with this specification immediately by the Contractor at his expense.

The Contractor shall apply the polymer modified asphalt emulsion at a temperature of 140°F – 175°F and provide a uniform application across the entire width to be overlaid, at a rate of 0.15 to 0.25 gal/yd^2. The rate of application shall be project specific and the Contractor shall submit in writing the rate of application to the Engineer for approval prior to commencement of the work under this item. The submittal shall include an explanation of why the polymer modified emulsion rate was chosen. The Contractor shall continuously monitor the spray rate. The ultra-thin HMA material shall be placed on the polymer modified asphalt emulsion as soon as practicably possible to insure that the ultra-thin HMA is placed on the polymer modified emulsion before it breaks or migrates (runs) along the pavement surface. Prolonged stops of the paver are not allowed. If a prolonged stop results in improper application or breaking of the polymer modified emulsion, or the inability to meet the compaction requirements stated herein, the Engineer shall stop the operation until the Contractor can demonstrate that all emulsion application and mix compaction requirements can, and are, being met.

Note: The emulsion target application rate will depend on the macro texture of the surface on which the emulsion will be placed. Projects where the emulsion will be placed on milled or high (open) texture existing pavements will require emulsion application rates toward the high end of the 0.15 to 0.25 gal/yd^2 specification range, while applications over pavements with a particularly tight texture (small-aggregate leveling courses and/or polished, flushed, or bled pavement surfaces) will require application rates at the lower end of the specification range.

No equipment shall come in contact with the polymer modified asphalt emulsion before the ultra-thin HMA wearing course is applied.

After applying the polymer modified asphalt emulsion, apply the ultra-thin HMA wearing course across the full width of the emulsion at a temperature of 300° F – 350° F. The vibratory screed of the paver shall be on at all times during application of mixture. The polymer modified emulsion and ultra-thin HMA shall be combined to conform to the requirements as described within this provision.

C. **Testing of Materials:** Sampling and testing of the HMA mixture for acceptance will be conducted at the HMA facility by the Engineer in accordance with M.04 for gradation and binder content. The Engineer may allow the Contractor to conduct acceptance testing, in which case the Contractor shall follow sampling and testing procedures outlined in this section (C.) and collect a split sample for the disposition of the Engineer for each sample tested. The split sample shall be stored in an appropriate contained, sealed, and labeled with the project number, HMA plant name, date, time obtained, sequential truckload number, sublot, and name of the person obtaining the sample. The sample shall be stored and disposed of at the discretion of the Engineer following the completion of the project.

Passing Test: Ultra-thin HMA material meeting all tolerances shown in Table 2 for Ultra-Thin HMA, Type B as determined by sampling and testing in accordance with M.04 for gradation and binder content is hereby defined as a Passing Test.

Failing Test: A Failing Test is hereby defined as ultra-thin HMA material exceeding one or more of the tolerances shown in Table 2 for Ultra-Thin HMA, Type B as determined by sampling and testing in accordance with M.04 for gradation and binder content.

Lot: For HMA mixture sampling and testing purposes, a lot is defined as comprising one planned production run or 24-hour period, whichever is shorter. An additional lot will be created every 24 hours of a multiple-day production run.

Each lot shall be subdivided into equal sublots based on planned quantity of HMA mixture for the production run as outlined in Table 6 so that each lot is represented by a minimum of two or three sublots.

Table 6 – Minimum Sampling and Testing Schedule at HMA facility

Planned Production Run Quantity (tons)	Number of Sublots
1-220	2
221 and above	3

The planned production quantity for a lot shall be provided by the Contractor to the Engineer at least four (4) hours prior to commencement of production of HMA mixture. The planned quantity of production for each sublot shall be converted to a sequential, ordinal number of truckloads (i.e. 1,2,3 etc). On the first sublot of production for each lot, the Engineer will sample one of the first five (5) truckloads using random-selection procedures to select the actual truckload to be sampled. A random-selection procedure will be used to sample the truckload of material representing each remaining sublot.

If there are no subsequent lots of production for the project, the lot with one sublot tested shall be combined with the previous lot of production.

At any time, the Contractor may obtain additional samples for Quality Control (QC)

purposes. A QC sample must be designated for that purpose by the Contractor prior to sampling. No QC samples will be included in the acceptance of the produced material.

D. Compaction. The process used to compact the ultra-thin HMA is meant to seat the HMA mixture into the sprayed polymer modified emulsion rather than to obtain density. Compaction should start immediately after application of the wearing course and be completed before the mix reaches 195° F. Compaction shall be obtained by use of the paver vibratory screed and by the use of two double drum rollers in static mode. A minimum of two (2) static passes from each roller shall be required to adequately seat the material. Therefore, a minimum of four (4) roller passes must be made over any given area prior to the ultra-thin HMA material cooling below 195° F.

The ultra-thin HMA mixture shall be placed and rolled to provide a continuous and smooth surface with uniform texture. The roller(s) shall not be allowed to stop on the freshly placed wearing course. The wearing course shall be protected from traffic until the rolling operation is complete and the material has cooled sufficiently to resist damage.

A 10 foot straightedge shall be made available to the Engineer during all paving operations, inspection, and testing. If milling is specified as part of the work, or in any other areas where the ultra-thin HMA is required to be placed flush with adjacent pavement surfaces, structures, or other surrounding appurtenances, the pavement surface shall be tested with the straightedge to insure that the pavement surface deviates no more than a ¼ inch in any direction. When matching irregular surfaces or structures, the Engineer shall use discretion when enforcing this rule.

E. Corrective Work Procedures: Any portion of the completed pavement determined by the Engineer to not have received the specified, approved, and tested ultra-thin HMA material, the specified thickness of the ultra-thin HMA material, the specified polymer modified asphalt emulsion, the specified polymer modified emulsion application, the specified proper compactive effort, or is determined to be defective or non-homogeneous in surface texture, shall be corrected at the expense of the Contractor.

With regard to the proper supply and placement of the polymer modified asphalt emulsion; If at any time the Engineer determines that the polymer modified emulsion supplied does not meet any of the criteria specified herein, the application of the polymer modified emulsion shall be stopped along with the entire paving operation until the Contractor demonstrates "re-conformance" with the specifications. The same applies to placement of the polymer modified emulsion. If the specified rate of the polymer modified emulsion application is determined by the Engineer to fall outside the allowable tolerances the Engineer shall stop the paving operation until such time the Contactor can demonstrate compliance with the specification requirements. In all cases, if the Contractor continues to place material unacceptable to the Engineer, the Engineer reserves the right to not pay for, or call for the removal and replacement of, all material placed in non-conformance with this specification. With regard to the proper manufacturing of the ultra-thin HMA material; When tested, if any of the individual specified production tolerances are not met more than once in four tests, the

production of the ultra-thin HMA material shall be stopped until the Contractor runs a trial test demonstrating compliance within the production tolerances listed herein. In such a case, the Engineer reserves the right to not pay for, or call for the removal and replacement of, all ultra-thin HMA material placed between the rendering of the first out of tolerance test and ceasing mix production operations due to the second out of tolerance test. With regard to the proper placement of the ultra-thin HMA material; Any ultra-thin HMA material placed at less than 0.625 inches thick, or greater than 0.875 inches thick, shall be subject to removal as determined by the Engineer. In no case shall the edge or limit of the ultra-thin HMA placed be allowed to form a "drop-off" greater than 0.750 inches. Any edge or "drop-off" formed showing a thickness of greater than 0.750 inches shall be removed immediately by the Contractor. Any flushing of the polymer modified emulsion to the surface of the ultra-thin HMA material shall be considered and treated as a deviation in texture and shall be analyzed and treated according to the texture requirements herein. With regard to the texture of the ultra-thin HMA surface, any given full width travel lane area or full width shoulder area that is at least 100 feet long shall meet the following requirements: If the Engineer observes any change or deviation in texture occurring in 1.5% (or greater) of the surface, that area shall be replaced at the Contractor's expense.

Unless otherwise determined by the Engineer, all corrective work shall be done with the ultra-thin HMA material. Any corrective ultra-thin HMA placed shall be placed by the spray paver as specified herein and shall be placed at a minimum width equal to the width of the main screed of the paver for no less than 100 feet in length. Corrective work performed exclusively by hand with the ultra-thin HMA material is not allowed. Small isolated areas or defects, with the permission of the Engineer, may be repaired with material other than the ultra-thin HMA material required to be placed with the spray paver specified herein.

Note: "Small isolated areas or defects" are defined as: One area of 25 square feet or less per full width lane or full width shoulder for any given continuous 200 foot lane or shoulder section that was placed by the spray paver.

If pavement placed by the Contractor is deemed unacceptable, 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:
    1) Limits of pavement to be replaced or corrected, indicating stationing or other landmarks that is readily distinguishable.
    2) Schedule.
    3) Construction method and sequence of operations.
    4) Methods of maintenance and protection of traffic.
    5) Material sources
    6) Names and telephone numbers of supervising personnel.

b. Perform all corrective work in accordance with the Contract and the approved corrective procedure.

F. Material Documentation. All vendors producing ultra-thin HMA must have their truck-weighing scales, storage scales, and mixing plant automated to provide a detailed ticket. Delivery tickets must include the following information:

1. State of Connecticut printed on ticket.
2. Name of producer, identification of plant, and specific storage bin (silo) if used.
3. Date and time of day.
4. Class of material with RAP (must include RAP dry weight, percentage and daily moisture content, if used).
5. Net weight of material loaded into truck.
6. Gross weight or tare weight of truck.
7. Project number, purchase order number, name of contractor (if contractor other than producer)
8. Sequential Truck number for specific identification of truck. Sequential number shall use natural numbers and be ordered beginning with the first truck for a production lot on the basis of time truck is loaded (i.e. 1,2,3, etc.)
9. Individual aggregate, RAP, and asphalt high/target/low weights shall be printed on batch plant tickets. (For drum plants and silo loadings, the plant printouts shall be maintained by the vendor for a period of three years after the completion of the project).

The Contractor must notify the Engineer immediately if, during the production day, there is a malfunction of the recording system in the automated plant or truck-weighing scales. Manually written tickets containing all required information will be allowed for one hour, but for no longer, provided that each load is weighed on State-approved scales. At the Engineer's sole discretion, trucks may be approved to leave the plant if a State inspector is present to monitor weighing. If such a malfunction is not fixed within forty-eight hours, material will not be approved to leave the plant until the system is fixed to the Engineer's satisfaction. No damages will be considered should the State be unable to provide an inspector at the plant.

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

G. Cessation of Supply: The production plant providing ultra-thin HMA shall cease supplying materials to this project under any of the following conditions:

1. If the supplied ultra-thin HMA material exceeds one or more of the tolerances shown in Table 2 for Ultra-Thin HMA, Type B on two (2) samples out of the latest consecutive three (3) samples tested for gradation or binder content, delivery of material to the jobsite may not resume until a passing test is performed. This passing test shall be the first test result to be considered in subsequent Cessation of Supply considerations (i.e. Cessation of Supply could only be triggered again beginning on the third test after supply has been reestablished.)
2. If the supplied polymer modified emulsion fails to meet any of the requirements above. Supply of material to the site may resume once the Contractor demonstrates, in writing to the Engineer, that the requirements herein are met.

3. If the resulting surface texture fails to meet any of the requirements above. Supply of material to the site may not resume until the Contractor determines the cause of the deficient or non-homogeneous surface texture, proposes corrective planned measures to be employed, and then submits such a plan to the Engineer for acceptance or approval.
4. If the final compacted thickness requirements/tolerances stated herein are not met. Supply of the material may not resume until the Contractor determines why the final compacted thickness placed specified herein was not met, proposes/demonstrates a change in the placement operations, and then institutes said change to assure conformance with this specification.
5. If the compaction requirements stated herein are not met. Supply may not resume until the Contract determines, in writing to the Engineer, the cause of the inability to meet the compaction requirements within this specification. In addition, the Contractor shall propose, in writing to the Engineer, a change that addresses the identified cause of the problem and a revised compaction plan that will meet this specification.

Cessation of Supply shall occur as many times as necessary until the Contractor completes the work properly according to all the requirements within this specification. Cessation of Supply is also to be triggered when no further material is to be produced and the condition of two failing tests out of the last three consecutive tests is met (i.e. on the last lot of production for the project).

All ultra-thin HMA material in non-conformance with this specification, as described above, that is not subject to non-payment or removal and replacement by the Engineer, shall be considered deficient material (DM).

Method of Measurement:

1. Polymer Modified Asphalt Emulsion (Type 1): The quantity of Polymer Modified Asphalt Emulsion (Type 1) will be measured for payment by the number of gallons furnished and applied on the Project and accepted by the Engineer.

2. Ultra-Thin Bonded HMA Pavement (Type B): The quantity of Ultra-Thin Bonded HMA Pavement (Type B) measured for payment will be determined by the documented area covered and measured in square yards (yd^2) at the thickness shown on the plans and will be subject to the following:

a. Material Deficiency Adjustment (MDA): Ten percent of the total quantity of material determined by the Engineer that exceeds one or more of the tolerances shown in Table 2 for Ultra-Thin HMA, Type B will be used for purposes of determining MDA.
For deficient material due to failing tests of the HMA mixture at the plant, the entire quantity of produced HMA in each of the two failing sublots leading to each instance of Cessation of Supply and delivered to the jobsite will be included in the DW term of the MDA calculation in (b.) below, except that on the last lot for the project, should Cessation of Supply not be invoked because it contains two sublots

as per Section (C.), the entire quantity of material in the sublot(s) with a failing test shall be included in the DW term of the MDA calculation in (b.) below

b. The square yards will be calculated as follows: MDA square yards (yd^2) = DM x .10

Where: DM = square yards (yd^2) of deficient Ultra-Thin HMA, Type B material, calculated as follows:

DM = TA x [DW / TW]

Where TA = Total documented area covered and measured in square yards (yd^2),
DW = Total weight of deficient Ultra-Thin HMA, Type B material exceeding one or more of the tolerances shown in Table 2 for Ultra-Thin HMA, Type B, as determined by the Engineer from a) the delivery tickets required in the Construction Methods, (F) Material Documentation, to have been delivered to the project.
TW = Total weight of Ultra-Thin HMA, Type B material determined by the Engineer from the delivery tickets required in the Construction Methods, (F) Material Documentation, to have been delivered to the project.

Basis of Payment:

1. Polymer Modified Asphalt Emulsion (Type 1): Material for asphalt emulsion will be paid for at the Contract unit price per gallon for "Polymer Modified Asphalt Emulsion (Type 1)."

2. Ultra-Thin Bonded HMA Pavement (Type B): The furnishing and placing of the HMA mixture will be paid for at the Contract unit price per square yard for "Ultra-Thin Bonded HMA Pavement (Type B)."

The cost for all equipment, tools, and work required to place and compact the polymer modified emulsion and the ultra-thin HMA shall be included in the measurement and payment of Item Nos. 0406192A and 0406178A specified herein. These costs shall include, but are not limited to, cleaning the existing pavement surface prior to placement of the ultra-thin HMA material with rotary power sweeping and vacuuming equipment if required and the cost for providing lighting for the purpose of illuminating the work area and equipment during placement operations.

3. Adjustments: A contract item will be incorporated by construction order for material deficiency adjustments.

a. Material Deficiency Adjustment (MDA): The quantity of MDA square yards (yd^2) measured for adjustment will be used to determine the adjustment value and will be calculated as follows:

MDA square yards (yd^2) X Contract price per square yard (yd^2) = MDA Adjustment. This dollar amount shall be deducted, via a construction order, from the total contract amount.

No separate or additional payment will be made for any work related to the replacement or correction of defective pavement as determined by the Engineer. Related work includes, but is not limited to, items such as the removal and replacement of ultra-thin HMA, maintenance and protection of traffic, pavement repairs, replacement of bridge joints, pavement markings and any other work that is deemed necessary by the Engineer to provide and produce acceptable corrective or replacement work to the pavement.

Payment will be for the items completed and accepted by the Engineer, the price of which shall include all labor, materials and equipment incidentals thereto.

Pay Items	Pay Unit
0406192A- Polymer Modified Asphalt Emulsion (Type 1)	gallons
0406178A- Ultra-Thin Bonded HMA Pavement (Type B)	yd^2

ITEM #0406180 - HOT-MIX ASPHALT SMOOTHNESS ADJUSTMENT

Description

The Engineer shall evaluate the final pavement surface for smoothness (rideability) as stated herein. This is a bonus/penalty item which shall be applied to the surface lift only. This item shall apply to projects requiring a minimum of two (2) lifts of bituminous concrete (Hot-Mix Asphalt (HMA), Polymer-Modified Asphalt (PMA), or Warm-Mix Asphalt (WMA)) in which the combined total compacted depth of bituminous concrete placed is 3 inches or greater and the surface lift is at least 1.5 inches thick. All provisions and requirements of Section 4.06 Bituminous Concrete apply, unless specifically stated otherwise within this item.

Definitions:

Lift: A single bituminous-concrete mixture placed at a defined thickness in a single paver pass.

Surface Lift: The uppermost lift of bituminous-concrete paving.

Roadway segment: A segment of highway designated to receive pavement rehabilitation that includes paving at least two lifts, the combined thickness of which is 3 inches or greater. A roadway segment contains one or two directions of travel, through lanes in each direction, and any additional shoulder area, paved median area, ramp(s), and/or auxiliary lanes designated to receive paving.

Lane: An area of pavement designated to carry traffic in a given direction.

Measured Lane: A lane subject to a hot-mix asphalt pavement smoothness adjustment as indicated in this item. Ramps, shoulders, and certain other features are excluded from the adjustment as described below.

Tenth Mile Segment: The subset of a measured lane which will be evaluated for smoothness and used as the basis for payments. Each measured lane shall be divided into tenth (0.1) mile segments. Some tenth mile segments may be less than a full tenth (0.1) mile because they are terminated by a boundary such as the end of the lane or a bridge without an asphaltic plug joint. Bonuses/penalties shall be based on the smoothness and tonnage of the surface lift of each tenth mile segment.

Lift Pay Thickness (inches)**:** The thickness that the plans specify for the surface lift of the measured lane.

Tenth Mile Segment Pay Area (square yards): The area of the travelway of a tenth mile segment as determined from the plans. If striping exists, it would be the area bounded by the lane striping and beginning and ending termini of the tenth mile segment. Where a segment's travelway width varies (for example, where a low speed lane narrows as it begins or terminates), the Pay Area shall reflect the actual travelway area.

ARAN: Automatic Road Analyzer. A vehicle operated by the State that collects and analyzes road data. It provides IRI data every 5 meters for both the right and left wheelpaths.

IRI (inches/mile)**:** International Roughness Index, developed by the World Bank to quantify roughness.

ProVAL: Free FHWA sponsored software that is used to analyze road roughness.

Average IRI (AIRI or MRI) (inches/mile): The average of the right and left wheelpath IRIs for a tenth mile (528 foot) segment as computed by analyzing ARAN data with ProVAL software, selecting Ride Quality Analysis, selecting MRI as the Ride Quality Index, and selecting to apply a 250 mm filter. The MRI shall be rounded to the nearest whole tenth of an inch per mile. Fractional parts of 0.05 and up shall be rounded up, less than 0.05 shall be rounded down. For example, 50.05 is rounded to 50.1; 80.049 is rounded to 80.0.

Hot-Mix Asphalt: Whenever reference is made to Hot-Mix Asphalt (HMA), the reference shall apply to HMA, PMA, and WMA.

This item shall be applied separately to each roadway segment which is included in this Contract and designated to be measured for a Hot-Mix Asphalt smoothness adjustment as indicated in this item. The calculations for smoothness (as represented by ProVAL MRI) and cost adjustments shall be done separately for each tenth mile segment in each measured lane.

Evaluation Methods

Trial Evaluation - Prior to the placement of the surface lift of pavement, the Engineer shall furnish the Contractor with IRI values for tenth mile (0.1mile) segments for the right and left wheelpaths that result from the Engineer's evaluation of the material placed to date. The actual time of the "trial" evaluation shall be coordinated between the Engineer and the Contractor. The "trial" evaluation shall be limited to one (1) test lane in each direction of travel. Final evaluations for payment shall measure all lanes of interest (as described below) in each direction of travel. The trial IRI values will serve as a guide to the Contractor in evaluating the level of conformance with the smoothness specification.

Data Collection and IRI Computation – All final pavement surfaces in lanes that extend for more than 0.4 miles (2,112 feet) shall be evaluated, including climbing lanes and acceleration lanes. The final pavement surface shall be evaluated for smoothness using the State's ARAN vehicle. ARAN vehicles contain sensors that measure vertical accelerations and roughness and software that simulates the traversing of a so-called "quarter car" over the adjusted profile. The software calculates an IRI value as defined by the World Bank for each lane of travel over the project. The ARAN is a Class II device as defined by the World Bank. The IRI represents the vertical (upward and downward) displacement that a passenger would experience traveling at 48 MPH in a standard vehicle over the profile established by the device. A zero IRI value would indicate a perfectly smooth pavement surface, while increasing IRI values would correspond to an increasingly rough pavement surface. The ARAN has the capability to measure the longitudinal profile in each (right and left) wheelpath simultaneously. If the ARAN vehicles are unavailable, the Engineer may substitute another suitable method of obtaining IRI values with a World Bank Class II profiler that allows calculation of smoothness adjustments as indicated in this item.

ProVAL shall be used to calculate an MRI value for each tenth mile segment. The ProVAL MRI is the average of the right and left wheelpath IRIs.

The evaluation shall be subject to the following:

1. Only mainline travel lanes shall be evaluated. This shall include climbing lanes, operational lanes, and turning roadways that are 0.4 miles (2,112 feet) or greater in length.

2. Data collection shall start approximately 100 feet prior to, and end approximately 100 feet after the transverse construction joints at the project limits. The pay area shall be limited to the limits of the paving as defined by the transverse construction joints at the start and end of the project.

3. Construction joints inside the project shall not be excluded from the area measured for smoothness.

4. Smoothness data and payment adjustments shall <u>not</u> be computed for the following project sections:

- Ramps
- Climbing lanes, operational lanes, acceleration lanes, deceleration lanes, and turning roadways less than 0.4 miles (2,112 feet) in length
- Shoulders and gore areas
- Pavement on horizontal curves which have a 900 foot or less centerline radius of curvature, and pavement within the super-elevation transition of these curves

5. Bridge decks shall be included if they are paved as part of the project, have two lifts totaling 3 inches of HMA, and have an asphaltic plug or similar product for bridge joints. Structures with exposed concrete, elastomeric concrete or steel joint systems shall be excluded.

6. Transition sections of varying thickness of pavement (created by milling or paving) leading into or away from pavement changes such as bridge decks or underpasses shall be excluded if the deck or underpass is excluded. A length of 50 feet on either end of a transition shall be excluded from measurement of IRI, but not from payment of an adjustment. The 50 foot length shall have the same adjustment percentage as the immediately adjacent tenth mile section.

7. If a deck or underpass is excluded and there is no transition section adjoining it, then a length of 50 feet before and after the deck or underpass shall be excluded for measurement, but included for payment similar to 6. above.

8. Tonnages for payment shall be calculated based on the theoretical volume of HMA as determined by the typical sections and distances measured by the ARAN van and assuming a density of 0.0575 tons per SY per inch of HMA thickness. For example, if the typical section calls for 2 inches HMA in the top course and a lane width of 12 feet, the tonnage for a tenth mile section would be calculated: Tons = 12ft x 528ft /9 x 2inch x 0.0575 = 81.0 tons

9. Data shall be collected within 30 days of the completion of the entire surface lift of pavement, or within 30 days of the completion of any corrective work on the pavement. The Contractor, at its own expense, will be allowed to correct any areas prior to the collection of data. The Contractor shall notify the Engineer in writing of its intent to do so along with a proposed schedule for corrective work that includes an anticipated date that data collection can be performed. The completion of the entire final lift of pavement and/or any corrective work includes, but is not limited to, all associated work such as pavement markings, sawing and sealing of joints, and installation of bridge asphaltic plug joints.

   To minimize the number of times the ARAN van is needed, all final surface lift paving in both directions of travel must be completed before calling on the ARAN van to measure the smoothness. However, if final surface lift paving extends beyond a single paving season, then the ARAN van shall be used to measure the final surface lifts completed each paving season.

10. No testing shall be conducted during rain or under other conditions deemed unacceptable by the Engineer. During testing, the roadway must be free of moisture and other deleterious materials which might affect the evaluation. Any work associated with preparing the roadway for the evaluation (for example, sweeping), shall <u>not</u> be measured for payment.

11. The option to apply the 250 mm filter, which represents the footprint length of a typical tire, shall be selected.

12. Measurements and locations are understood to have an accuracy limited to what can be attained by reviewing data and photos collected by the ARAN van. The state shall not be required to conduct surveys in addition to the ARAN van measurements. Since various factors affect the accuracy the van can attain, including but not limited to:

    - The van records certain data only once every 5 meters.
    - The distance measured by the van can vary because of vehicle wander within the lane and temperature changes affecting tire pressure.
    - The exact location of transitions and joints may be difficult to ascertain from the ARAN photos.

    It is to be understood by all parties that measurements are approximate.

Method of Measurement:
Rideability Adjustments (RA) for pavement smoothness shall be applied to all HMA in the surface lift of all measured lanes in both directions. It shall be computed and paid (or penalty assessed) for each tenth mile segment.

Bituminous Concrete Class ( ) or HMA S* Quantity -- The quantity of bituminous concrete measured for the RA for each tenth mile segment shall be determined by using the equation below:

Segment Tons = Lift Pay Thickness x **Tenth Mile Segment Pay Area** x **0.0575**
(tons) (inches) (SY)

Rideablity Adjustment (RA) Percent (%)
The RA bonus/penalty percentage for each tenth mile segment shall be determined based on its AIRI. Each tenth mile segment AIRI shall be classified into one of the five AIRI ranges shown in Table 1 and the applicable pay factor value for the segment derived.

Table 1 Rideability Pay Factor Schedule

AIRI (ProVAL MRI) (inches per mile)	Pay Factor (%)	
Less than 50	+10	Bonus
50 to 60	+(60 – AIRI)	Bonus
60 to 80	0	0
80 to 120	1.25 x (80 – AIRI)	Penalty
over 120	- 50	Penalty

Basis of Payment

Bonuses/Penalties shall be computed for each tenth mile segment. For each segment, the HMA Pay Factor and tonnage of the surface lift shall be determined as described above. The Pay Factor shall be rounded to the nearest tenth of a percent. For example, a Pay Factor of 7.72% rounds to 7.7%; -12.49% rounds to -12.5%). The adjustment to the cost shall be determined by the formula:

Smoothness Adjustment = Segment Tons x Pay Factor / 100 x HMA Unit Cost

For example, suppose a 1.06 mile measured lane with a surface lift thickness of 2 inches has eleven segments with their lengths, average travelway widths, and AIRI values as shown in Table 2 below. Assuming a unit cost for HMA of $85 per ton, the smoothness adjustments for each segment would be as shown in Table 2.

Table 2 HMA Smoothness Adjustment Example Calculations

Segment	Length (miles)	Average Width (ft)	Area (SY)	Lift Pay Thick-ness (inch)	HMA Tons (Area x thickness x 0.0575)	AIRI (MRI) (in/ mile)	Pay Factor (%)	Adjust ($) (Tons x Pay Factor /100 x Unit cost)
1	0.1	4	235	2	26.99	72	0	0
2	0.1	9	528	2	60.72	50	10	516
3	0.1	12	704	2	80.96	40	10	688
4	0.1	12	704	2	80.96	90	-12.5	-860
5	0.1	12	704	2	80.96	100	-25	-1720
6	0.1	12	704	2	80.96	50	10	688
7	0.1	12	704	2	80.96	77	0	0
8	0.1	12	704	2	80.96	55	5	344
9	0.1	12	704	2	80.96	55	5	344
10	0.1	8	469	2	53.97	51	9	413
11	0.06	4	141	2	16.19	62	0	0
							Total:	413

For the surface lift in this measured lane, there would be a $413 bonus.

Adjustments for smoothness shall not be made for those areas that the Engineer determines to be defective and require the removal and replacement of the HMA.

The sum of money shown on the estimate, and in the itemized proposal as "Estimated Cost", for this item will be considered the bid price although payment will be made as described above. The estimated cost figure is not to be altered in any manner by the bidder. If the bidder should alter the amount shown, the altered figure will be disregarded and the original cost figure will be used to determine the amount of the bid for the Contract.

ITEM # 0406285A – FINE MILLING OF HOT MIX ASPHALT (HMA) (0 TO 4 INCHES)

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

Materials: The existing HMA surface shall be disposed of offsite by the Contractor at an approved disposal facility unless otherwise stated in the contract documents.

Construction Methods: The Contractor shall remove the HMA 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 directed by the Engineer.

The equipment for milling the pavement surface shall be designed and built for milling flexible 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 HMA 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 utilize carbide tip tools spaced not more than $^{5}/_{16}$ inches 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 Contractor may request to perform a test strip to demonstrate that the same surface tolerance can be attained at an increased forward speed. The test strip shall be a maximum length of 500 feet and shall have the same criteria for surface tolerance as noted in this specification. The final decision for implementing the increased forward speed will be at the discretion of the Engineer.

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 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 a measurement 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 HMA layers or a surface delamination of HMA 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 a +/- ½ inch to eliminate the condition.

When removing a HMA pavement entirely from an underlying Portland cement concrete pavement, all of the HMA 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 it meets the requirements below. 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 will 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 1 inch exposed to traffic as a result of milling. All structures within the roadway that are exposed to traffic and greater than 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 taper.
3. All rectangular structures shall receive a transition of bituminous concrete formed at a minimum 24 to 1 taper.

*Bituminous concrete tapers at a minimum 24 to 1 taper may be substituted for the protection rings if approved by the Engineer.

For roadways with a posted speed limit of greater than 35 mph:

1. All structures shall receive a transition of bituminous concrete meeting the temporary transition requirements in Special Provision Section 4.06- Bituminous Concrete, "Transitions for Roadway Surface".

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. The sweeper shall be equipped with a water tank and be capable of removing the millings and loose debris from the surface. Other sweeping equipment may be provided in lieu of the sweeper 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 HMA (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 transition; removal and disposal of millings; furnishing a sweeper and sweeping after milling. The costs for these items shall be included in the contract unit price.

Pay Item	Pay Unit
Fine Milling of Hot Mix Asphalt (HMA) (0 to 4 inches)	S.Y.

ITEM #0406287A RUMBLE STRIPS - AUTOMATED

ITEM #0406288A RUMBLE STRIPS - MANUAL

Description:
Work under this item shall consist of installing rumble strips on asphalt highway shoulders where shown on the plans or where directed by the Engineer, and in conformance with these specifications.

Construction Methods:
The Contractor shall pre-mark the location of the edge of the cut, and the beginning and ending points of the sections, prior to the installation of the rumble strips. The Engineer shall review and approve the locations.

The Contractor shall arrange for a technical representative, from the company which produces the milling machine to be used on the project, who will be required to be on-site from the beginning of the operation in order to ensure results that meet the requirements of the plans and specifications until such time the Engineer is satisfied.

Rumble strips should not be installed on bridge decks, in acceleration and deceleration lanes, at drainage structures, at loop detector sawcut locations, or in other areas identified by the Engineer.

Automated (Wide Shoulders):
The equipment shall be able to install the rumble strips in sections where the shoulder width from the edge line to an obstruction is greater than or equal to 4 feet. Where there are no obstructions, the equipment shall be used in sections where the shoulder width from the edge line is a minimum of 3 feet. The equipment shall consist of a rotary type cutting head with a maximum outside diameter of 24" and shall be a minimum of 16" long. The cutting head(s) shall have the cutting tips arranged in such a pattern as to provide a relatively smooth cut (approximately 1/16 of an inch between peaks and valleys) in one pass. The cutting head shall be on its own independent suspension from that of the power unit to allow the tool to self align with the slope of the shoulder or any irregularities in the shoulder surface. The equipment shall include suitable provisions for the application of water to prevent dusting. The Contractor shall use a machine capable of creating the finished pattern at a minimum output of 60 rumble strips per minute.

Manual (Narrow Shoulders):
The equipment shall be able to install the rumble strips in sections where the shoulder width from the edge line to an obstruction is between 3 feet and 4 feet. The cutting head(s) shall have the cutting tips arranged in such a pattern as to provide a relatively smooth cut (approximately 1/16 of an inch between peaks and valleys) in one pass. The equipment shall include suitable provisions for the application of water to prevent dusting.

Finished Cut (Automated or Manual)
The rumble strips shall have finished dimensions of 7" (+/- 1/2") wide in the direction of travel and shall be a 16" (+/- 1/2") long measured perpendicular to the direction of travel. The depressions shall have a concave circular shape with a minimum 1/2" depth at center (maximum allowable depth is 5/8" measured to a valley). The rumble strips shall be placed in relation to the roadway according to the patterns shown in the plans or on the Rumble Strip Details. Alignment of the edge of the cut shall be checked and verified by the Engineer.

The cutting tool shall be equipped with guides to provide consistent alignment of each cut in relation to the roadway.

The Contractor shall pick up any waste material resulting from the operation in a manner acceptable to the Engineer. This waste material shall be disposed of in accordance with Subarticle 2.02.03-10(a).

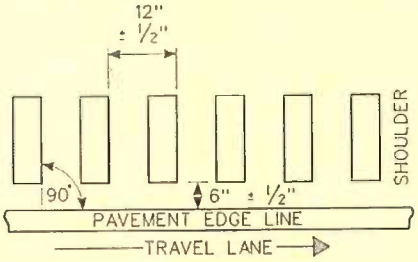
The work area shall be returned to a debris-free state prior to re-opening to traffic.

The Contractor shall provide all traffic control according to the Maintenance and Protection of Traffic Specification included elsewhere in the contract.

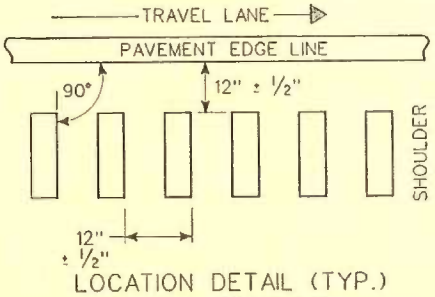
Method of Measurement:
This work will be measured for payment by the actual number of feet of shoulder where the rumble strips are placed and accepted. This distance shall be measured longitudinally along the edge of pavement with deductions for bridge decks, acceleration and deceleration lanes, drainage structures, loop detector sawcut locations, and other sections where the rumble strips were not installed.

Basis of Payment:
This work will be paid for at the Contract unit price per foot for "Rumble Strips - Automated" or "Rumble Strips - Manual." The price shall include furnishing all equipment, tools, labor, a technical representative and work incidental thereto and also disposal of any waste material resulting from the operation. The Contractor will not be paid under the item "Rumble Strips - Manual" if the field conditions allow for the use of the "Rumble Strips - Automated" item, even if the manual method was used.

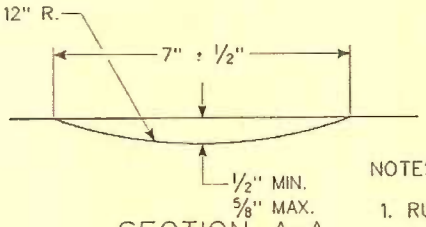
DETAILS AND SECTIONS OF RUMBLE STRIPS



LOCATION DETAIL (TYP.)
LEFT SHOULDER



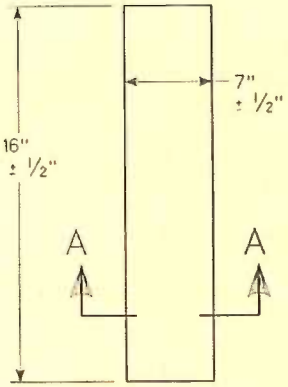
LOCATION DETAIL (TYP.)
RIGHT SHOULDER



SECTION A-A
NO SCALE

NOTES:

1. RUMBLE STRIP ALIGNMENT SHALL GENERALLY BE STRAIGHT AND OFFSET APPROXIMATELY 6" IN THE LEFT SHOULDER AND 12" IN THE RIGHT SHOULDER FROM THE OUTER EDGE OF THE EDGE LINE AND SHALL BE AT LEAST 12" FROM THE LONGITUDINAL JOINT IN COMPOSITE PAVEMENTS. THIS OFFSET MAY BE ADJUSTED TO ACCOMMODATE VARIATIONS IN THE EDGE LINE AND THE SHOULDER WIDTH.



PLAN DETAIL

FILE: RUMBLE.MDS

CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUR. OF ENGINEERING & HWY. OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

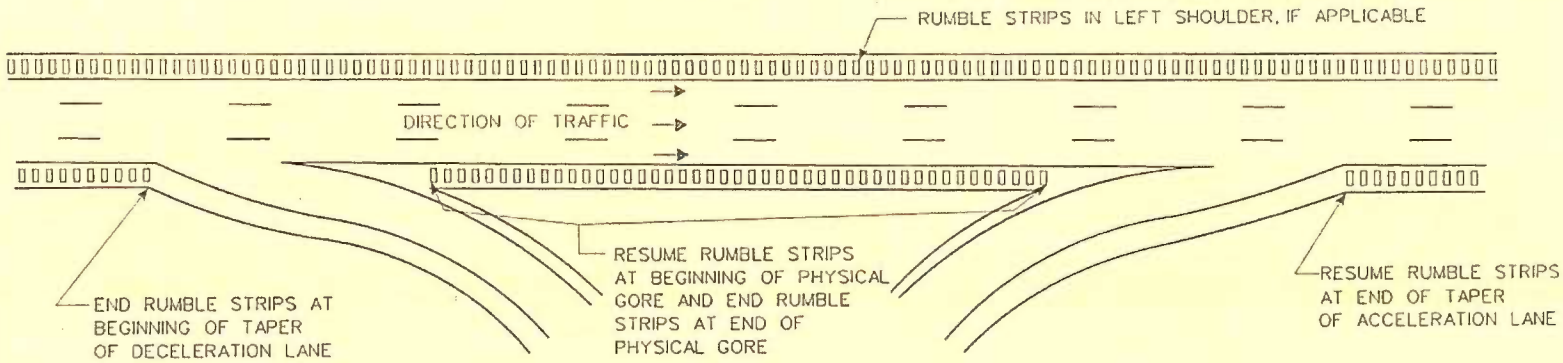
RUMBLE STRIP DETAILS

ENGINEER Erika B. Smith DATE 10-18-99
SUBMITTED Stephen J. Masiatka DATE 10-20-99
TRAFFIC SUPERVISING ENGR.
APPROVED [signature] DATE 10-20-99
PRINCIPAL ENGINEER

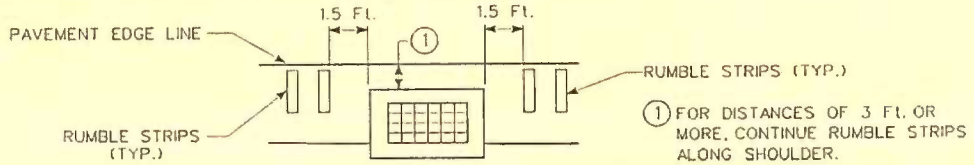
SCALE - NONE

ITEM # 0406287A
ITEM # 0406288A

TYPICAL TREATMENTS FOR INSTALLING RUMBLE STRIPS

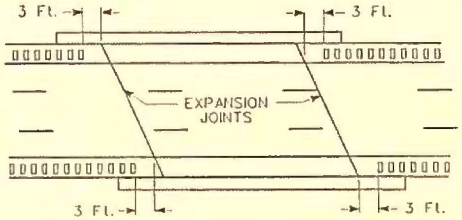


TYPICAL TREATMENT FOR RAMPS



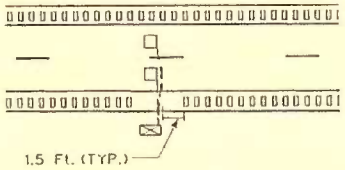
TYPICAL TREATMENT FOR OBSTRUCTIONS
(I.E. CATCH BASINS OR MANHOLES)

FILE: RUMBLE.MDS



TYPICAL TREATMENT FOR BRIDGES

NOTE: NARROW SHOULDERS APPROACHING BRIDGES MAY RESULT IN ENDING THE RUMBLE STRIPS AT THE GUIDE RAIL APPROACH



TYPICAL TREATMENT FOR
LOOP DETECTOR SAWCUT LOCATIONS

SCALE - NONE

CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUR. OF ENGINEERING & HWY. OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

TYPICAL TREATMENTS FOR INSTALLATION OF RUMBLE STRIPS

ENGINEER Erika B. Smith DATE 10-18-99

SUBMITTED Stephen J. Rosetti DATE 10-20-99
TRAFFIC SUPERVISING ENGR.

APPROVED _____ DATE 10-20-99
PRINCIPAL ENGINEER

ITEM # 0406287A
ITEM # 0406288A

ITEM #0406314A – 80 MIL PAVEMENT MARKING GROOVE 5" WIDE

ITEM #0406315A – 80 MIL PAVEMENT MARKING GROOVE 7" WIDE

ITEM #0406316A – 80 MIL PAVEMENT MARKING GROOVE 9" WIDE

ITEM #0406317A – 80 MIL PAVEMENT MARKING GROOVE 13" WIDE

Description:
Work under this item shall consist of grooving the pavement surface in a continuous or regularly spaced fashion for the placement of recessed pavement markings. Unless otherwise noted, the groove shall be 1 inch wider than the anticipated pavement marking. The groove for double-yellow centerline markings shall be 13 inches wide.

Groove Width: 5 inches wide for 4-inch markings
7 inches wide for 6-inch markings
9 inches wide for 8-inch markings
13 inches wide for 12-inch markings and double yellow centerline

Groove Depth: 80 Mils (0.080 inches) ± 10 Mils (0.010 inches)

The groove shall not be installed continuously for intermittent pavement markings, but only where markings are to be applied.

The groove shall not be installed on bare concrete bridge decks, on metal bridge decks, on bridge joints, at drainage structures, at loop detector sawcut locations, or in other areas identified by the Engineer.

Equipment:
The grooving equipment shall be equipped with a free-floating, depth-controlled head which provides a consistent groove depth over irregular pavement surfaces. The grooving head shall only be equipped with diamond saw blades. Any ridges in the bottom of the groove shall have a maximum height of 15 Mils (0.015 inches).

The grooving equipment shall be capable of installing a groove 6 inches away from any vertical or horizontal obstruction.

Construction Methods:
The pavement marking groove shall be installed in accordance with the current ConnDOT pavement marking standard drawings.

The Contractor shall establish control points for measuring offsets and pre-marks along the entire distance of pavement being grooved. Prior to installation of the groove, the Contractor shall verify the equipment is capable of installing the correct width and spacing of the groove. The control points, pre-marks, and equipment will be reviewed by the Engineer prior to commencement of the work.

The groove will be considered defective if any edge of the groove varies more than 0.25 inch in a 10-foot length, or if the alignment of the groove visibly deviates from the normal alignment of the road.

Final Cleaning: The Contractor shall immediately collect all debris and dust resulting from the grooving operation by vacuuming the pavement groove and adjacent pavement surface. Collected debris and any waste material shall be properly disposed of by the Contractor.

The work area shall be returned to a debris-free state prior to re-opening to traffic.

Repair of Unacceptable Groove:
The Contractor shall repair any defective groove(s) to the satisfaction of the Engineer. All work in conjunction with this repair shall be performed at no additional cost to the State.

Pavement Marking Requirements:
The Contractor is required to install permanent epoxy resin pavement markings in the grooves before the lane or roadway is opened to live traffic. If the permanent pavement markings cannot be installed before the lane or roadway is opened to live traffic, temporary 5-Mil (0.005-inch) hot-applied waterborne pavement markings without glass beads shall be installed before the lane or roadway is opened to live traffic at no additional cost to the State. Within 10 calendar days, permanent epoxy resin pavement markings shall be applied in the groove over the 5-Mil (0.005-inch) hot-applied waterborne pavement markings.

Groove Depth Gauge:
The Contractor shall supply the Engineer with two accurate, easily readable gauges with which to verify groove depth for the duration of the project. The gauges shall be delivered no less than one week prior to the anticipated beginning of grooving operations. Gauges shall be accompanied by manufacturer's instructions for their use. The gauges will be returned to the Contractor at the conclusion of the project.

Method of Measurement:
This work will be measured for payment by the number of linear feet of groove installed in the pavement as ordered and accepted by the Engineer.

Basis of Payment:

104- 164

ITEM #0406314A
ITEM #0406315A
ITEM #0406316A
ITEM #0406317A

This work will be paid for at the contract unit price per linear foot of "Pavement Marking Groove" installed in the pavement and accepted. This price shall include cleaning of the pavement, all materials, equipment, tools, depth gauges, and labor incidental thereto, and disposal of any waste material resulting from the operation.

Pay Item	**Pay Unit**
80 Mil Pavement Marking Groove 5" Wide	L.F.
80 Mil Pavement Marking Groove 7" Wide	L.F.
80 Mil Pavement Marking Groove 9" Wide	L.F.
80 Mil Pavement Marking Groove 13" Wide	L.F.

ITEM # 0406999A - ASPHALT ADJUSTMENT COST

The Asphalt Price is available on the Department of Transportation web site at:

http://www.ct.gov/dot/asphaltadjustment

The asphalt adjustment cost will be based on the variance in price for the performance-graded binder component of hot mix asphalt (HMA), Polymer Modified Asphalt (PMA), and Ultra-Thin Bonded Hot-Mix Asphalt mixtures completed and accepted in the contract.

An asphalt adjustment cost will be applied only if all of the following conditions are met:

I. For HMA and PMA mixtures:

a. The HMA or PMA mixture in which the adjustment is being applied is listed as a contract item with a pay unit of tons or metric tons.

b. The total quantity for all HMA and PMA mixtures in a contract or individual purchase order (Department of Administrative Service contract awards) exceeds 1000 tons or more.

c. The difference between the posted *Asphalt Base Price* and *Asphalt Period Price* varies by more than $5.00.

II. For Ultra-Thin Bonded HMA mixtures:

a. The Ultra-Thin Bonded HMA mixture in which the adjustment is being applied is listed as a contract item.

b. The total quantity for Ultra-Thin Bonded HMA mixture in a contract exceeds:

i. 800 tons (727 metric tons) if Ultra-Thin Bonded HMA is listed as a contract item with a pay unit of tons or metric tons.

ii. 30,000 square yards (25,080 square meters) if Ultra-Thin Bonded HMA is listed as a contract item with a pay unit of square yards or square meters.

Note: The quantity of Ultra-Thin Bonded HMA measured in tons shall be determined from the material documentation requirements set forth in the Ultra-Thin Bonded HMA Special Provision.

c. The difference between the posted *Asphalt Base Price* and *Asphalt Period Price* varies by more than $5.00.

d. No Asphalt Adjustment Cost shall be applied to the liquid emulsion that is specified as part of the Ultra-Thin Bonded HMA mixture system.

III. Regardless of the binder used in all HMA and/or PMA mixtures, the Asphalt Adjustment Cost will be based on PG 64-22.

The Connecticut Department of Transportation (ConnDOT) shall post on its website, the average per ton selling price (asphalt price) of the performance-graded binder. The average is based on the high and low selling price published in the most recent available issue of the **Asphalt Weekly Monitor®** furnished by Poten & Partners, Inc. under the "East Coast Market – New England, New Haven, Connecticut area", F.O.B. manufacturer's terminal.

The selling price furnished from the Asphalt Weekly Monitor ® is based on a standard ton (US$/ST). The metric ton price is determined by applying a factor of 1.1023 (US$/ST x 1.1023 = US$/mton). Example: $150.00/ton x 1.1023 = $165.34/mton

Formula: $\text{HMA} \times \frac{\text{PG\%}}{100} \times [(\textit{Period Price} - \textit{Base Price}] = \$ \_\_\_\_$, where

- **HMA:**
  1. For HMA, PMA, and Ultra-Thin Bonded HMA mixtures with pay units of mass: The quantity (tons or metric tons) of accepted HMA, PMA, or Ultra-Thin Bonded HMA mixture measured and accepted for payment.
  2. For Ultra-Thin Bonded HMA mixtures with pay units of area: The quantity of Ultra-Thin Bonded HMA mixture delivered, placed, and accepted for payment, calculated in tons or metric tons as documented according to the Material Documentation provision (section E) of the Ultra-Thin Bonded HMA Special Provision.

- ***Asphalt Base Price***: The asphalt price that is posted on the ConnDOT website 28 days before the actual bid opening posted.

- ***Asphalt Period Price***: The asphalt price that is posted on the ConnDOT website for the period in which the HMA, PMA mixture is placed.

- Performance-Graded Binder percentage (**PG%**)

  1. For HMA or PMA mixes:
     PG% = 4.5
     - For Superpave 37.5mm (1.5 inch), Superpave 25.0mm (1.0 inch), PMA S1, HMA S1, and Class 4

       PG % = 5.0
     - For Superpave 12.5mm (0.50 inch), HMA S0.5 and Class 1.

       PG % = 6.0
     - For Superpave 0.375 inch (9.5mm), HMA S0.375, Superpave 6.25mm (0.25 inch), HMA S0.25, Superpave 4.75mm (#4) and Class 2.

2. For Ultra-Thin Bonded HMA mixes:
   PG% = Design % PGB (Performance Graded Binder) in the approved job mix formula, expressed as a percentage to one decimal point (e.g. 5.1%)

The adjustment shall not be considered as a changed condition in the contract because of this provision and because the Contractors are being notified before submission of bids.

Basis of Payment: The "Asphalt Adjustment Cost" will be calculated using the formula indicated above. A payment will be made for an increase in costs. A deduction from monies due the Contractor will be made for a decrease in costs.

The sum of money shown on the estimate, and in the itemized proposal as "Estimated Cost", for this item will be considered the bid price although payment will be made as described above. The estimated cost figure is not to be altered in any manner by the bidder. If the bidder should alter the amount shown, the altered figure will be disregarded and the original cost figure will be used to determine the amount of the bid for the Contract.

ITEM # 0507495A – MODIFY EXISTING CATCH BASIN

Description: Work shall consist of modifying existing catch basin to accommodate a new catch basin top which shall include excavating around the catch basin, removal and salvage, if necessary, of the existing catch basin top, removal of leveling blocks or bricks, the removal or repair of the first riser section of the catch basin, the connecting of a new pipe to the existing catch basin as required, the installation of a new riser section of the catch basin, the installation of new leveling blocks or bricks to the correct elevations, and the installation of the catch basin top. The work shall also include grouting of any gaps or cracks and grouting between courses of any new risers, blocks or bricks.

Work under this item shall also include plugging any holes, cracks or gaps in the catch basin with grout, replacing and/or repositioning any blocks or bricks that are loose or out of alignment, and sealing any gaps between blocks or bricks with grout.

Connecting New Pipes to Existing Catch Basins: When connections are to be made to existing catch basins with no available hole or knockout, work shall consist of connecting the pipes by core drilling, line drilling or wall sawing an opening in the catch basins to accommodate the size of the pipe to be inserted. Where line drilling is the method used, the method of drilling holes shall prevent over breakage. All openings shall provide a minimum of 1" and a maximum of 2" clearance around the outside diameter of the pipe. After pipes have been installed in their final position, the surface area around the opening in the catch basin and the surface of the pipe shall be cleaned of all dirt, dust or any other debris and then roughened and wet with water. The opening between the pipe and the catch basin shall be grouted to obtain a watertight seal.

Materials: The material for this work shall conform to Form 816 and shall include, but not be limited to, any tools necessary, grout, bricks, concrete or masonry block, mortar and water.

Construction Methods: This work shall be in accordance with Form 816 or as directed by the Engineer.

Care should be taken so that any debris that falls into the catch basin from this work should be kept to a minimum. The Contractor is responsible for cleaning out any debris that falls into the catch basin as a result of this work.

Refer to Section 5.07 in Form 816.

Method of Measurement: This work will be measured for payment by the number of each modify catch basin, in place, and acceptable to the Engineer.

Work under this item shall not include resetting catch basins or new catch basin tops.

Connecting new pipes to existing catch basins will not be measured separately for payment, but shall be included in the cost of rebuilding and/or repairing the catch basin.

Basis of Payment: This work will be paid for at the contract unit price per each "Modify Existing Catch Basin" completed in place, which price shall include all materials, equipment, and sealing of existing catch basins, tools and labor incidental thereto.

Resetting catch basins and new catch basin tops will be paid for separately under the appropriate item.

Connecting new pipes to existing catch basins will not be measured separately for payment, but shall be included in the cost for modify existing catch basin.

Pay Item	Pay Unit
Modify Existing Catch Basin	Each

ITEM #0520036A - ASPHALTIC PLUG EXPANSION JOINT SYSTEM

Description: Work under this item shall consist of furnishing and installing an asphaltic plug expansion joint system (APJ) in conformance with ASTM D6297, as shown on the plans, and as specified herein.

Work under this item shall also consist of the removal and disposal of bituminous concrete, membrane waterproofing, existing joint components and sealing elements, cleaning and sealing median barrier joints, parapet joints, and sidewalk joints.

Work under this item excludes the removal of Portland cement concrete headers.

Materials: The APJ component materials shall conform to ASTM D6297 and the following:

Aggregate: The aggregate shall meet the following requirements:

a) Loss on abrasion: The material shall show a loss on abrasion of not more than 25% using AASHTO Method T96.

b) Soundness: The material shall not have a loss of more than 10% at the end of five cycles when tested with a magnesium sulfate solution for soundness using AASHTO Method T 104.

c) Gradation: The aggregate shall meet the requirements of Table A below:

d) Dust: aggregate shall not exceed 0.5% of dust passing the #200 sieve when tested in accordance with AASHTO T-11.

Table A

Square Mesh Sieves	**1" (25.0 mm)**	**¾" (19.0 mm)**	**½" (12.5 mm)**	**⅜" (9.5 mm)**	**No. 4 (4.75 mm)**
% passing	**100**	**90 - 100**	**20 - 55**	**0 - 15**	**0 - 5**

A sample of the aggregate shall be submitted to the Department with a Certified Test Report in accordance with Article 1.06.07 for each 20 tons of loose material or its equivalent number of bags delivered to the job site. The Certified Test report must include a gradation analysis resulting from a physical test performed on the actual material that accompanies the report.

Anti-Tacking Material: This material shall be a fine graded granular material with 100% passing the $^{3}/_{16}$" sieve and no more than 5% passing the #200 when tested in accordance with AASHTO T-27.

Backer Rod: All backer rods shall satisfy the requirements of ASTM D5249, Type 1.

Bridging Plate: The bridging plates shall be steel conforming to the requirements of ASTM A36 and be a minimum ¼" thick and 8" wide. For joint openings in excess of 3" the minimum plate dimensions shall be ⅜" thick by 12" wide. Individual sections of plate shall not exceed 4' in length. Steel locating pins for securing the plates shall be size 16d minimum, hot-dip galvanized, and spaced no more than 12" apart.

Concrete Leveling Material: Shall be a cementitious-based material that conforms to ASTM C928 Standard Specification for Packaged, Dry, Rapid-Hardening Cementitious Materials for Concrete Repair, for R3 performance requirements in Table 1 and achieve the following:

a. Final set in 45 Minutes
b. 2500 psi compressive strength in 24 hours
c. 5000 psi compressive strength in 7 days

Parapet Sealant: The sealant used in parapet joint openings shall be a single component non-sag silicone sealant that conforms to the requirements of ASTM D5893.

Sidewalk Sealant: The sealant used in sidewalk joint openings shall be a rapid cure, self-leveling, cold applied, two-component silicone sealant. The silicone sealant shall conform to the requirements listed in Table B:

Table B

Properties - As Supplied	**Test Method**	**Requirement**
Extrusion Rate	ASTM C1183	200-600 grams/min
Leveling	ASTM C639	Self-Leveling
Specific Gravity	ASTM D792	1.20 to 1.40
Properties - Mixed	**Test Method**	**Requirement**
Tack Free Time	ASTM C679	60 min. max.
Joint Elongation – Adhesion to concrete	ASTM D5329 [1,2,3]	600% min
Joint Modulus @ 100% elongation	ASTM D5329 [1,2,3]	15 psi max
Cure Evaluation	ASTM D5893	Pass @ 5 hours

1. Specimens cured at 77 ± 3^0F and 50 ± 5% relative humidity for 7 days
2. Specimens size: ½"wide by ½"thick by 2" long
3. Tensile Adhesion test only

The date of manufacture shall be provided with each lot. No sealant shall be used beyond its maximum shelf-life date.

The two–part silicone sealants shown in Table C are known to have met the specified requirements:

Table C

Product	Supplier
Dow Corning 902RCS	Dow Corning Corporation 2200 W Salzburg Road Auburn, Michigan 48611
Wabo SiliconeSeal	BASF/Watson Bowman Acme Corporation 95 Pineview Drive Amherst, New York 14228

Other two-component silicone joint sealants expressly manufactured for use with concrete that conform to the aforementioned ASTM requirements will be considered for use provided they are submitted in advance for approval to the Engineer. Other joint sealants will be considered for use only if a complete product description is submitted, as well as documentation describing at least five installations of the product. These documented installations must demonstrate that the product has performed successfully for at least three years on similar bridge expansion joint applications.

A Materials Certificate and Certified Test Report for the asphaltic binder shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07 certifying that the asphaltic binder satisfies the requirements of the most current version of ASTM D6297.

A Materials Certificate for all other components of the APJ, leveling material, backer rod and sealant used in sealing parapet and sidewalk joint openings, shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07

Construction Methods: The APJ shall be installed at the locations shown on the plans and in stages in accordance with the traffic requirements in the special provisions "Maintenance and Protection of Traffic" and "Prosecution and Progress".

At least 30 days prior to start of the work, the Contractor shall submit to the Engineer for approval a detailed Quality Control Plan for the installation of the APJ. The submittal shall include:

a) A list of all manufactured materials and their properties to be incorporated in the joint system, including, but not limited to the asphaltic binder, anti-tack material, backer rod, sealant, leveling material, as well as the aggregate's source.
b) A detailed step by step installation procedure and a list of the specific equipment to be used for the installation. The Quality Control Plan must fully comply with the specifications and address all anticipated field conditions, including periods of inclement weather.

The APJ shall not be installed when bituminous concrete overlay or joint cutout is wet. The APJ shall only be installed when the bridge superstructure surface temperature is within the limits specified in Table D and when the ambient air temperature is within the range of 45^0F to 95^0F. The bridge superstructure surface temperature range is determined using the thermal movement range provided on the contract plans for the proposed APJ deck installation location and the selected APJ product.

Table D

Installation Restrictions	
Designed Deck Joint Thermal Movement Range[2]	**Bridge Superstructure Surface Temperature[1]**
0" to 1"	45° F to 95° F
1-1/8"	45° F to 90° F
1-1/4"	45° F to 80° F
1-3/8"	45° F to 70° F
1-1/2"	45° F to 65° F

1. *The superstructure surface temperature shall be determined from the average of three or more surface temperature readings taken at different locations on the interior girder surfaces by the Contractor as directed by the Engineer. Temperature measurements of the superstructure shall be taken by the contractor with a calibrated hand held digital infrared laser-sighted thermometer on the surfaces of an interior steel girder, or interior concrete girder protected from direct sunlight. The infrared thermometer to be supplied by the Contractor for this purpose shall meet certification requirements of EN61326-1, EN61010-1, and EN60825-1 maintained by the European Committee for Electrotechnical Standardization (CENELEC). The thermometer shall have a minimum distance-to-spot ratio of 50:1 and shall have adjustable emissivity control. The thermometer shall have a minimum accuracy value of ±1% of reading or ±2°F, whichever is greater. The thermometer shall be used in strict accordance with the manufacturer's written directions. An additional infrared thermometer satisfying the same standards to be used in this application shall also be provided to the Engineer for quality assurance purposes.*
2. *Linear interpolation may be used to determine an allowable surface temperature range for thermal movement ranges in between values shown in the table, as approved by the Engineer.*

Prior to installing the APJ, the Contractor shall determine the exact location of the deck joint beneath the bituminous concrete overly.
The APJ shall be installed symmetrically about the deck joint opening to the dimensions shown on the plans or as directed by the Engineer; not to exceed 24 inches measured perpendicular to the deck joint. The proposed saw cut lines shall be marked on the bituminous concrete overlay by the Contractor and approved by the Engineer, prior to saw-cutting. The saw-cuts delineating the edges of the APJ shall extend full depth of the bituminous concrete overlay.

The existing bituminous concrete overlay, waterproofing membrane and/or existing expansion joint material, within the saw cut limits shall be removed and disposed of by the Contractor to create the joint cutout.

Concrete surfaces that will support the bridging plates shall be smooth and form a plane along and across the deck joint. Rough or damaged concrete surfaces shall be repaired with a leveling compound meeting the requirements of this specification. Deteriorated concrete areas within the joint limits shall be repaired as directed by the Engineer: such repairs, when deemed necessary by the Engineer, shall be compensated for under the applicable concrete deck repair items in the Contract. The existing and repaired concrete surfaces shall provide continuous uniform support for the bridging plate and prevent the plate from rocking and deflecting.

Prior to the installation of the backer rod, all horizontal and vertical surfaces of the joint cutout shall be abrasive blast cleaned using an oil-free, compressed air supply. The entire cutout shall then be cleared of all loose blast media, dust, debris and moisture using an oil-free, hot air lance capable of producing an air stream at 3,000°F with a velocity of 3,000 feet per second.

A single backer rod, with a diameter at least 25% greater than the existing joint opening at the time of installation, shall be installed at an inch below the bridging plate in the existing deck joint opening between the concrete edges.

Asphaltic binder shall be heated to a temperature within the manufacturer's recommended application temperature range which shall be provided in the Quality Control Plan. During application, the temperature of the binder shall be maintained within this range. In no case shall the temperature of the binder go below 350° F nor exceed the manufacturer's recommended maximum heating temperature.

Asphaltic binder shall then be poured into the joint opening until it completely fills the gap above the backer rod. A thin layer of binder shall next be applied to the all horizontal and vertical surfaces of the joint cutout.

Bridging plates shall be abrasive blast-cleaned on-site prior to installation and then placed over the deck joint opening in the joint cutout. The plates shall be centered over the joint opening and secured with locating pins along its centerline. The plates shall be placed end to end, without overlap, such that the gap between plates does not exceed ¼". The plates shall extend to the gutter line and be cut to match the joint's skew angle, where concrete support exists on both sides of the joint. Within APJ installation limits, where concrete support does not exist at both

sides of the joint opening (such as where a bridge deck end abuts a bituminous concrete roadway shoulder), bridging plates shall not be installed. Installed bridging plates shall not rock or deflect in any way. After installation of bridging plates, a thin layer of asphaltic binder shall be applied to all exposed surfaces of the plates.

The remainder of the joint cutout shall then be filled with a mixture of hot asphaltic binder and aggregate prepared in accordance with the submitted Quality Control Plan and the following requirements:

- The aggregate shall be heated in a vented, rotating drum mixer by the use of a hot-compressed air lance to a temperature of between 370° F. to 380° F. This drum mixer shall be dedicated solely for the heating and, if necessary, supplemental cleaning of the aggregate. Venting of the gas and loose dust particles shall be accomplished through ¼" drilled holes spaced no more than 3" on center in any direction along the entire outside surface of the drum
- Once the aggregate has been heated, it shall then be transferred to a secondary drum mixer where it shall be fully coated with asphaltic binder. A minimum of two gallons of binder per 100lbs of stone is required.
- The temperature of the aggregate and binder shall be monitored by the contractor with a calibrated digital infrared thermometer.
- The coated aggregate shall be loosely placed in the joint cutout in lifts not to exceed 2 inches.
- Each lift shall be leveled, compacted and then flooded with hot asphaltic binder to the level of the aggregate to fill all voids in the coated aggregate layer. The surface of each lift shall be flooded until only the tips of the aggregate protrude out of the surface.
- The final lift shall be placed such that no stones shall project above the level of the adjacent overlay surface following compaction of the coated aggregate.
- Following installation of the final lift, sufficient time and material shall be provided to allow all voids in the mixture to fill. This step may be repeated as needed.
- The joint shall then be top-dressed by heating the entire area with a hot-compressed air lance and applying binder. The final joint surface must be smooth with no protruding stones and be absent of voids.
- Once top-dressed, the joint shall have an anti-tack material spread evenly over the entire surface to prevent tracking.

The Contractor shall be responsible for removing all binder material that leaks through the joint and is deposited on any bridge component, including underside of decks, headers, beams, diaphragms, bearings, abutments and piers.

Traffic shall not be permitted over the joint until it has cooled to 130° F when measured with a digital infrared thermometer. Use of water to cool the completed joint is permitted.

<u>Sidewalk, parapet, and/or curb joint openings</u>

Before placement of any sealing materials in parapets, curbs, or sidewalks, the joints shall be thoroughly cleaned of all scale, loose concrete, dirt, dust, or other foreign matter by abrasive blast cleaning. Residual dust and moisture shall then be removed by blasting with oil free compressed air using a hot air lance. Projections of concrete into the joint space shall also be removed. The backer rod shall be installed in the joint as shown on the plans. The joint shall be clean and dry before the joint sealant is applied. Under no circumstances is the binder material to be used as a substitute for the joint sealant.

Whenever abrasive blast cleaning is performed under this specification, the Contractor shall take adequate measures to ensure that the abrasive blast cleaning will not cause damage to adjacent traffic or other facilities.

The joint sealant shall be prepared and placed in accordance with the manufacturer's instructions and with the equipment prescribed by the manufacturer. Extreme care shall be taken to ensure that the sealant is placed in accordance with the manufacturer's recommended thickness requirements.

The joint sealant shall be tooled, if required, in accordance with the manufacturer's instructions.

Primer, if required, shall be supplied by the sealant manufacturer and applied in accordance with the manufacturer's instructions.

When the sealing operations are completed, the joints shall be effectively sealed against infiltration of water. Any sealant which does not effectively seal against water shall be removed and replaced at the Contractor's expense.

Any installed joint that exhibits evidence of failure, as determined by the Engineer, such as debonding, cracking, rutting, or shoving of the APJ mixture shall be removed and replaced full-width and full–depth to a length determined by the Engineer at no additional cost to the State.

Method of Measurement: This work will be measured for payment by the number of cubic feet of "Asphaltic Plug Expansion Joint System" installed and accepted within approved horizontal limits. No additional measurement will be made for furnishing and installing backer rod and joint sealant in the parapets, concrete medians, curbs and/or sidewalks.

Basis of Payment: This work will be paid for at the contract unit price per cubic foot for "Asphaltic Plug Expansion Joint System," complete in place, which price shall include the saw-cutting, removal and disposal of bituminous concrete, membrane waterproofing, existing joint components and sealing elements, the furnishing and placement of the leveling compound, cleaning of the joint surfaces, furnishing and installing bridging plates, the furnishing and installing of the asphaltic plug joint mixture, the cost of furnishing and installing joint sealant in the parapets, concrete medians, curbs and sidewalks, and all other materials, equipment including, but not limited to, portable lighting, tools, and labor incidental thereto. No additional payment shall be made for the 12" wide bridging plates that are required for deck joint openings with widths in excess of 3".

If directed by the Engineer, additional deck repairs will be addressed and paid for under the applicable concrete deck repair items in the Contract.

ITEM #0601091A - SIMULATED STONE MASONRY

Description:

This item shall consist of furnishing and installing textured and colored formed concrete surfaces using simulated stone molds (form liners) and a color staining system designed to duplicate closely the appearance of natural stone that exists on the bridge including accessories and hardware and in accordance with these specifications. The size, shape, and color should match the existing stones. The architectural form liner simulated stone masonry shall be monolithically formed with the concrete substructure.

Materials:

1. Quality of Work: The process of form lining, texturing and color staining of the hardened concrete shall be performed in strict accordance with the manufacturer's written recommendations and as approved by the Engineer.

2. The design and pattern of form lined concrete surfaces shall follow the layout shown on the contract plans and the manufacturer's standard drawing. The completed concrete surface shall match the color and texture of the Referee Panel. The Referee Panel is available for inspection at the office of the Engineer. Final coloration of cast stone concrete surfaces shall accurately simulate the appearance of the real stone on the existing structure. It shall also demonstrate the colors that may be apparent from aging, such as staining from oxidation, rusting and/or organic staining from soil and/or vegetation.

3. Quality Assurance:

    a. Manufacturer of Simulated Stone Molds and Custom Coloring Systems shall have five years of experience making custom simulated stone molds and color stains to create formed concrete surfaces to match natural stone shapes, surface textures and colors.

    b. Contractor/Subcontractor (installer) shall have five years experience pouring vertically formed architectural concrete. The installer shall be trained in the manufacturer's special techniques in order to achieve realistic surfaces.

    c. Color Stain System Application shall be performed by the manufacturer or manufacturer's authorized representative. The stain shall be applied by an applicator that has experience with similar projects.

    d. A Pre-installation Meeting shall be scheduled with the manufacturer's representative, installer, designer, and Department inspection personnel to assure understanding of simulated stone masonry use, color-staining application, requirements for construction of mockup, and to coordinate the work.

4. Protection: The contractor is solely responsible for construction methods, means, techniques, and for construction site safety precautions. The contractor shall conduct all construction operations in conformance with all applicable local, state and federal safety laws, rules, regulations and codes. All Material Safety Data Sheets (MSDS) shall be available for inspection.

5. Manufacturer: Subject to compliance with the design, referee panel and specification requirements, the contractor shall provide simulated stone masonry and color staining system as manufactured by Custom Rock International, Inc., St. Paul, Minnesota, or approved equivalent.

6. Materials:

   a. Simulated Stone Molds (form liners) shall be made of reusable elastomeric form liners, made of high-strength urethane and cutable form liners, made of lower grade urethane, easily attachable to forms. Form-liners shall leave crisp, sharp definition of the architectural surface. Recurring textural configurations exhibited by repeating recognizable shadow patterns shall be prevented by proper casting of form-liner patterns. Form liners shall not compress more than ¼ inch when concrete is poured at a rate of ten vertical feet per hour. Form liners shall be removable without causing deterioration of surface or underlying concrete. No substitutions will be permitted.

   b. The form liner shall match the stone on the existing structure, and including texture and color staining system shall be as manufactured by Custom Rock International, St. Paul, Minnesota, as distributed by Connecticut Bomanite Systems, Inc., Bethel, Connecticut, or approved equivalent.

   c. The form liner shall be designed to permit 180-degree rotation and interconnection with itself or another pattern liner of differing horizontal dimension. Maximum relief of pattern and the average relief shall be as shown on the contract plans. The simulated stone pattern shall vary in a random manner in the coursing parameters to prevent noticeable multiple duplicate pattern repetition and avoid stacked joints.

   d. In addition to orthogonal surfaces, the form liner shall be capable of forming curved and/or battered surfaces, if shown on the plans, while maintaining the dimensioned coursing and plumb vertical joints without distortion.

7. Release Agent: The release agent shall be compatible with simulated stone masonry and with color staining system to be applied to surface, as recommended by the manufacturer.

8. Form Ties: Form ties shall be designed to separate at least one inch back from finished surface, leaving only a neat hole that can be plugged with compatible patching material.

9. Color Stain: The color stain shall be a penetrating stain mix as provided by the manufacturer, shall achieve color variations present in the natural stone on the existing structure, as approved by the Engineer and in accordance Items 1 and 2 above. The stain shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, acid, alkali, fungi, sunlight or weathering. The stain mix shall be a water borne, low V.O.C. material, less than 180 grams/liter, and shall meet requirements for weathering resistance of 2000 hours accelerated exposure measured by weather-o-meter in accordance with ASTM G23 with 3-bulb. Scrub test 1000 revolutions. Abrasive resistance (Tabor-CF-10) 500 cycles. Adhesion ASTM D3359 1.OOMM cross cuts on glass pass 3 or higher on a scale of 1 to 5. The contractor shall supply information pertaining to chemical resistance in accordance with ASTM D1308.

Construction Methods:

1. Shop Drawings and Submittals: Before fabricating any materials, the contractor shall submit shop drawings, product data sheets, samples and mock-ups to the Engineer for approval in accordance with Article 1.05.02 for the materials listed in Item 3 below. These drawings and submittals shall include, but not be limited to, the following information: manufacturer's name, listing of product compliance with referenced specification standards, complete details of the assemblies, material designations, and nominal hardness of appropriate materials, design loads, quantities and locations. The Engineer's drawings shall not be reproduced, traced or used for shop drawings or erection purposes.

2. Field Measurements: Prior to ordering or fabricating any materials, the contractor shall take complete and accurate field measurements.

3. Submittals:

    a. Catalog cuts, manufacturer's literature, and technical data for the materials specified herein, including but not limited to simulated stone mold pattern, form liner, release agent, concrete patching material and color charts for staining of hardened concrete.

    b. Photographs: Color photographs of three (3) similar past projects of the manufacturer. Include project names, locations and a telephone number of the previous projects Owner's representatives.

    c. Samples: Form ties, sample and description, showing method of separation when forms are removed.

    d. Plan, elevation and details to show overall pattern, joint locations, form tie locations, and end, edge and other special conditions.

    f. Form Lined and Color Stained Concrete Mockup: The mock-up shall be build on site at least four weeks before cast-in-place concrete work to be textured and colored

starts, using same materials, methods and work force that will be used for the Project. Location on site for construction of mockup shall be as approved by Engineer. Concrete shall be placed in the mockup, texture constructed and construction procedure adjusted until a final texture and color is produced that complies with the color and texture of the Referee Panel.

1. Size: 50 ft^2 or larger if needed to adequately illustrate the pattern and texture selected.

2. Include an area to demonstrate simulated stone masonry butt joint, corner and, if appropriate continuation of pattern through expansion joint.

3. If design includes stone texture across top of wall, include in mockup.

4. After concrete has cured sufficiently, the contractor shall prepare the surface for color staining. After the Engineer has approved the prepared surface of the cast simulated stone masonry for color staining, the work of form lined cast-in-place concrete may proceed, except that color staining is not yet authorized.

5. After concrete work on mockup is completed and cured, and after surface is determined by the Engineer to be acceptable for forming and pouring, the contractor shall proceed with mockup as quality standard.

6. After a 30-day cure of the mockup and the date of last pour of architectural concrete the sample is to be stained. After coloring is determined to be acceptable by the Engineer, construction of the remaining work under this specification section may proceed, using mockup as quality standard.

7. The contractor shall remove mockup as directed by the Engineer.

4. Scheduling: The contractor shall schedule color-staining application after adjacent earthwork is completed, to avoid contaminating or damaging the surface. Place topsoil and establish turf after staining application is completed. The contractor shall coordinate the work to prevent interference with other trades.

5. Installation:

1. Install liners and apply release agent.
2. Install concrete as specified elsewhere in the Specifications.
3. Remove form liners and cure concrete.
4. Patching, grinding and bush hammering of form liner seams as required.
5. Provide scaffolding and heat as required and clean water for power washing of the hardened concrete prior to the staining process.
6. Power washing and patching of form liners.

7. Power wash wall in preparation for staining.
8. Apply the color staining process.

6. Liner to Form Attachment System: The form liners shall be securely attached to forms with wood or sheet metal screws; threaded inserts added to the back of the form liner for bolts to fasten the form liner through the forms, or; bolted through the face of the form liner with flat head bolts inserted in a pattern joint and through the form liner and forming system. Construction adhesives may be used, but not on reusable forms. Place adjacent form liners with less than 6-mm separation between form liners.

7. Release of Form Liners From Hardened Concrete: Only manufacturer recommended form release agents (Lark V or Orna Con) shall be utilized and shall be applied to the form liners before the concrete is poured. Release agents shall be applied in strict accordance with release agent manufacturer recommendations. Hand-charged sprayers will only be allowed if a thin uniform coating of release agent is obtained on the form liner.

8. The form liner shall be removed from the wall within 24 hours of pouring the concrete. The form liners may be detached from the forms and then removed from the concrete, or they may remain attached to the forms and the entire forming system removed from the concrete. Remove the form liners from the top, down. Curing of concrete may be accomplished with form liners and forms placed back against the wall after the initial detachment. Curing shall be performed in accordance with Article 6.01.03-19. Curing compounds shall not be used.

9. Care and Cleaning of Form Liner: Form liners shall be cleaned the same day they are removed from the wall with a power wash and mild detergent. Synthetic brushes with stiff bristles may be used on stubborn areas. Mild acid washes may also be used. Solvents shall not be used. If necessary, patching of holes shall be performed with 100% clear silicone caulk. Form liners shall be stored inside or under a protective, non-transparent cover, in a vertical, upside-down position.

10. Wall Patching and Preparation: After form liners are removed from the hardened concrete, the textured uncolored surface shall be prepared for color staining. All holes larger then 20 mm in greatest principal dimension shall be filled with concrete patching material such as Tamms Speed-crete or equal mixed with latex or acrylic bonder, as approved by the manufacturer and Engineer. All honeycombed areas shall be filled and textured to match surrounding areas. Seam lines and other unnatural protrusions shall be ground down to match adjacent areas with a hand-held power grinder using discs made for concrete. Grinding of seams shall be performed immediately after removal of the form liners. Perform final bush hammering to blend defects and ground areas into the final rock texture. In particular, the process of wall patching and preparation shall be subject to approval of the manufacturer and Engineer.

11. Color Staining: The hardened concrete shall be a minimum of 30 days old before color staining is applied. Power-wash the wall to free it from laitance, dirt, oil and other objectionable materials. After the wall has dried, the color staining process is applied using

colors approved by the Engineer. Color staining shall be applied in such a way that the stones shall have individual colorations from one to the other. Water-based stains shall be used in air temperatures between 10 °C and 38 °C. Solvent-based stains shall be used in air temperatures of 10 °C and below, but in no case when the temperature of the hardened concrete is below 4 °C and falling. During color staining operations the contractor shall protect property, pedestrians, vehicular and other traffic upon, underneath or in the vicinity of the bridge and also portions of the bridge superstructure and substructure against damage or disfigurement from errant stain materials. The contractor shall comply with all environmental regulations regarding surface cleaning, stain application, ground and watercourse protection and disposal protection of waste materials. For additional information, refer to Section 1.10.

12. Simulated Stone Mold Preparation: The contractor shall clean and make free of buildup the form liners prior to each pour. He shall inspect for blemishes and tears and repair them if needed following manufacturer's recommendations.

Method of Measurement:

This work shall be measured for payment by the actual number of square meters of the face area of accepted Simulated Stone Masonry completed within the neat lines as shown on the plans, or as ordered by the Engineer.

Basis of Payment:

This Work will be paid for at the contract unit price per square yard for "Simulated Stone Masonry", complete in place, which price shall include all equipment, form-work molds, tools and labor incidental thereto.

This work shall also include the cost of furnishing and applying the color staining system to the simulated stone masonry surface.

Pay Item	**Pay Unit**
SIMULATED STONE MASONRY	S.Y.

ITEM # 0601192A - SURFACE PATCH

Description:
The work under this item shall consist of patching of any pavement surfaces such as potholes or open longitudinal joints or surfaces which have become rutted, broken, damaged, delaminated, or otherwise unserviceable, and at such other locations as the Engineer may designate, in order to provide a suitable surface for placement of a layer of bituminous concrete or other surfacing material. In areas where milling is proposed, this item is to be used only after any milling, fine milling, or micromilling has been completed.

For road sections that must be milled and paved in the same night, the work for this item must be completed after milling and before paving. Otherwise, if used following milling, this work shall be done within one working day following the milling and shall be completed before traffic is permitted to resume on the exposed roadway.

Materials: The patching materials shall satisfy the requirements of Subarticle 4.06.02 for Bituminous Concrete Class 2, HMA S0.25, HMA S0.375, PMA S0.25, or PMA S0.375, as directed by the Engineer..

Construction Methods:

The sections of concrete pavement to be repaired in the milled area shall be marked by the Engineer and referenced prior to placement of any bituminous material.

The concrete surface to receive patching material shall be cleaned of loose concrete, dirt, dust, loose particles and foreign matter and be dry prior to patching.

A thin uniform tack coat, meeting the requirements of Section 4.06, shall be applied just prior to patching.

Patching material shall be placed by means acceptable to the Engineer and shall be compacted to the satisfaction of the Engineer.

Method of Measurement: This work will be measured for payment by the actual number of square feet of roadway patched.

Basis of Payment: This work will be paid for at the contract unit price per square foot for "Surface Patch," complete in place, which price shall include the surface preparation of patch areas, all materials, equipment, tools and labor incidental thereto.

ITEM #0601270A – FULL DEPTH PATCH (HIGH EARLY STRENGTH CONCRETE)

Description: This item shall consist of the saw cutting concrete, removal of all deteriorated concrete for the full depth of the deck slab, furnishing and installing deformed steel bars, and reconstructing the slab with new concrete, where directed by the Engineer and as hereinafter specified. Work under this item shall also include providing of a safe access to the structure for the delineation of the repair locations and review of the performed repair work. The Contractor shall not perform any repair work without prior approval of the Engineer for location, limits and types of repairs.

Materials: The material shall conform to the following requirements:

1. High Early Strength Concrete – The high early strength concrete (HESC) shall conform to one of the following:

   A. Unless otherwise approved by the Engineer, the HESC shall be one of the following materials:

   Rapid Set DOT Cement
   CTS Cement Manufacturing
   1023 Dogwood Lane
   West Chester, PA 19382
   215-429-4956

   Dayton Superior Corporation
   PO Box 355
   Oregon, IL 61061
   800-745-3707

   Speed Crete Green Line
   Tamms Industries
   730 Casey Ave.
   Wilkes-Barre, PA 18702
   800-218-2667

   B. In lieu of the above HESC mixes, the Contractor may propose the use of another proprietary type mix. This mix shall meet the physical requirements as stated below. The high early strength concrete shall be of a high strength, have rapid strength gain characteristics in normal weather (above 10°C ambient temperature), bond to the existing concrete, and be durable. The concrete material shall be able to accept coarse aggregate to extend the yield and result in a workable mixture. The high early strength concrete, as delivered without additional coarse aggregate, and mixed in accordance with the manufacturer's instructions, shall have the following properties:

   - A minimum one hour compressive strength of 2,500 psi, a 24 hour strength of 3,500 psi and a 28 day strength of 5,000 psi (ASTM C109)

- A minimum bond strength of 220 psi after 24 hours. (ASTM C882)
- A minimum initial setting time of 5 minutes at 24° ± 1°C. (ASTM C266)
- The ability to withstand 50 cycles of freeze-thaw (10% NaCl solution) with a maximum loss of 6%. (ASTM C666)
- Expansion of no more than 0.40% and contraction of no more than 0.05%. (ASTM C157)
- A workable mixture when extended with a minimum 60% No. 8 aggregate by weight of dry concrete component.

A mix design for this material shall be submitted at least two weeks prior to its use. The mix design shall state the percentage of each component to be utilized along with substantive data that demonstrates the ability of the material to meet the specification requirements.

2. Deformed Steel Bars: Section 6.02.

Construction Methods: Construction methods shall conform to the following requirements:

1. Inspection of the Structural Slab: Before any existing concrete is removed from the structural slab, the Contractor will provide the Engineer clear access to the bridge deck. During this time, the Engineer will perform an inspection of the structural slab and designate areas where concrete removal will be required. Due to the nature of the operations, the inspection can be performed only after some existing materials, notably overlays and waterproofing system, have first been removed from the structural slab. It shall be the responsibility of the Contractor to arrange the construction schedule so that the required operations may be performed without causing delay to the work.

   No operations will be performed by the Engineer until after the following construction work has been completed:

   a) The existing bituminous overlay or concrete wearing course, if present, has been removed.

   b) The existing waterproofing system, if present, has been removed.

   The removal of these materials will be paid for under other applicable items.

   c) Installation of protective shielding for the prevention of materials onto the areas below the bridge.

   d) Installation of sedimentation controls for the prevention of materials entering the bridge drainage system.

   It shall be the responsibility of the Contractor to inform the Engineer, in writing, of the date that a structure will be available for inspection operations. Notification shall be given to the

Engineer at least seven (7) days prior to the date that the area in question will be in condition acceptable to the Engineer.

The Contractor is hereby informed that the following time period will be necessary to perform the required inspection operations:
One working day with suitable weather conditions per each six thousand square feet, or portion thereof, of structural slab area.

The Contractor will not be allowed to do any further work to the structural slab, until all necessary inspection operations have been performed, unless given permission by the Engineer. The Contractor will include any costs related to the allowance for this inspection in the general cost of the work.

2. Removal of Deteriorated Concrete: All deteriorated concrete shall be removed within the limits shown on the plans and where ordered by the Engineer. The lateral limits of each area to be repaired will be delineated by the Engineer and suitably marked. Where several areas to be repaired are very close together, the Engineer may combine these individual patches into a large area. The outlines of each such area shall first be cut to a depth of one-half (1/2) inch with an approved power-saw capable of making straight cuts. In the event that reinforcing steel is encountered within the upper ½ inch depth during sawing operations, the depth of saw-cut shall immediately be adjusted to a shallower depth so as not to damage the steel bars. If so directed by the Engineer, saw cutting shall again be carried down to the ½ inch depth at other locations of repair providing reinforcing steel is not again encountered. Where over-breakage occurs resulting in a featheredge, the featheredge shall be squared up to a vertical edge in an approved manner. Where sawing is impractical, the areas shall be outlined by chisel or other approved means.

   The removal of concrete shall be by pneumatic hammer methods and shall be governed by the requirements set forth in the special provision Item "Partial Depth Patch" and as directed by the Engineer.

   The Contractor shall take adequate measures to prevent concrete debris from falling to any area below the structure and onto adjacent roadway lanes. All debris shall be promptly cleaned up and removed from the site. All material removed shall be satisfactorily disposed of by the Contractor.

   The Contractor shall design, furnish and install protective shielding on the underside of each bay undergoing full depth patch repairs to prevent an unexpected fall of deteriorated concrete to areas below the bridge. The protective shielding shall be designed, furnished and installed by the Contractor. Working drawings and design calculations for the temporary shielding shall be submitted in accordance with the requirements of Article 1.05.02(a). The working drawings and design calculations shall be prepared, sealed and signed by a Professional Engineer, licensed in the State of Connecticut. The furnishing of such plans shall not serve to relieve the contractor of any part of his responsibility for the safety of the work or for the successful completion of the project.

The Contractor shall also furnish and install sedimentation controls at bridge scuppers to prevent concrete debris from entering the bridge drainage system. The methods proposed by the Contractor will be approved by the Engineer.

Where existing reinforcing steel is damaged or has insufficient cover as determined by the Engineer, it shall be cut out and replaced with new reinforcing steel of the same size, with a minimum length for lap splice as indicated on the plans or as directed by the Engineer.

3. Surface Preparation: Sound reinforcing steel which is in the proper position in the slab shall be left in place and cleaned of all concrete. The smaller fragments shall be removed with hand tools.

   The newly exposed reinforcing steel and concrete faces shall be cleaned of loose or powder-like rust, oil solvent, grease, dirt, dust, bitumen, loose particles, and foreign matter just prior to patching.

   Existing concrete surfaces against which the new patch will be placed shall be dampened. All free water shall be removed from the surface.

   Forms shall conform to the pertinent requirements of Subarticle 6.01.03-3.

   The cleaned concrete surface area to receive patching material shall be wetted for a one hour period immediately prior to placement of the concrete patch. Any standing water shall be blown out with compressed air prior to application of binding grout and patch material.

   After wetting of the deck patch area to receive patching, and removal of the standing water, cement binding grout shall be scrubbed into the concrete patch bonding surface with stiff bristled brushes. All bonding surfaces in the patch area shall receive a coating of bonding grout within a time period not to exceed five (5) minutes prior to placement of the concrete patch material.

4. Mixing, Placing and Finishing: Mixing and placing concrete shall be done in accordance with the applicable portions of Article 6.01.03. Mixing and placing shall not be executed unless the ambient temperature is above 40 degree F and rising.

   The concrete mix shall be properly placed to ensure complete contact around all reinforcing steel and against existing concrete at patch edges and compacted to a level slightly above the surrounding deck surface. Vibrators of the appropriate size shall be used for all consolidation of the concrete, regardless of the size of the patch area, with no hand tamping or rodding allowed. Concrete may be moved horizontally with the aid of hand tools, but not with the use of vibrators (excess vibration shall be avoided).

   Vibrating plates or vibrating screed shall be used on the surface of all patches for strike off and consolidation. After the concrete has been spread evenly and compacted to a level

slightly above the adjacent concrete surface, the vibrating plate or screed shall be drawn over the surface at a uniform speed without stopping, in order to finish the surface smooth and even with adjacent concrete. The surface shall be float finished. Finishing operations shall be completed before initial set takes place.

5. Curing: Immediately after finishing of the patch area, a sheet of 4 mil polyethylene shall be placed over the repair area, in conjunction with insulating curing material. This material shall be a minimum of 2-inch thick closed cell extruded polystyrene insulation board that conforms with the requirements of ASTM C578. It shall have a minimum certified R-value of ten (10). The insulating material shall extend a minimum of 12 inches beyond the limits of the patch area, and shall be kept in intimate contact with the surrounding pavement surface to prevent lifting of the material. It shall be weighed down with sandbags that weigh at least 15 pounds each. The sandbags shall be placed a minimum of two (2) feet on center around the patch area.

   Cured patches, having a hollow sound when chain dragged or tapped (indicating delamination), shall be replaced by the Contractor at his expense until a patch acceptable to the Engineer is in place.

6. Tolerances in Finished Patch Surfaces: The surface profile of the patched area shall not vary more than one-eighth inch in a distance of 10 feet, when a 10 foot long straightedge is placed on the surface at any angle relative to the centerline of the bridge. Humps in the patch that exceed the one-eight inch tolerance shall be ground down by approved machinery. Sags or depressions in the surface of the patch area that exceed one-eight inch tolerance as determined by the Engineer shall be repaired by removal of the concrete in the depression to a depth of one inch and repaired in the previously described manner.

7. Testing: The Contractor shall form, cure and test all concrete test cylinders under supervision of a representative of the Department. The dimensions, type of cylinder mold, number of cylinders, and method of curing shall be as directed by the Engineer.

   The Contractor shall provide a portable compressive testing machine, on site, for the purpose of testing all compressive strength cylinders. All testing shall be in accordance with the requirements of ASTM C39. NOTE: This compressive testing machine must be calibrated in accordance with the provisions of Section 5, ASTM C39. The Contractor shall provide the testing calibration certificate to the Engineer.

8. Time Schedule: Traffic will not be allowed on any areas where the Contractor has placed and finished concrete until the material has properly cured as specified, and has developed the strength of 2,500 psi as determined by the compressive strength test, or until the Engineer authorizes its opening to traffic.

   All work shall proceed as required by the "Maintenance and Protection of Traffic" and "Prosecution and Progress" specifications contained elsewhere within the contract documents.

Method of Measurement: This work will be measured for payment by the actual volume in cubic yards of replacement concrete, complete and accepted. No deduction will be made for the volume of reinforcing steel. Removal of concrete will not be measured for payment. Furnishing and installing deformed steel bars and providing of a safe access for delineation and inspection of the performed repairs will not be measured for payment.

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for "Full Depth Patch (High Early Strength Concrete)" complete in place, which price shall include saw cutting and removal of concrete, surface preparation of patch areas, furnishing and installing deformed steel bars, concrete replacement, designing, furnishing and installing protective shielding, providing inspection access for delineation and inspection of performed repairs, all equipment, tools, labor and work incidental thereto.

ITEM # 0601318A - PARTIAL DEPTH PATCH

Description: Work under this item shall consist of the removal of spalled, delaminated or otherwise deteriorated concrete from existing bridge decks and/or approach slabs, and replacement with fast setting patching material as shown on the plans, as directed by the Engineer, and hereinafter specified. Where ordered by the Engineer, work under this item shall also include repairing pop-outs on the underside of the deck caused by the removal of deteriorated concrete. Work under this item shall also include the furnishing and installation of deformed steel bars, reinforcing wire ties and vertical supports on inadequately supported and/or defective reinforcing steel within deck patch areas and providing of a safe access to the structure for the delineation of the repair locations and review of the performed repair work.

Materials: The material shall conform to the following requirements:

1. High Early Strength Concrete – The high early strength concrete (HESC) shall conform to one of the following:

A. Unless otherwise approved by the Engineer, the HESC shall be one of the following materials:

Rapid Set DOT Cement
CTS Cement Manufacturing
1023 Dogwood Lane
West Chester, PA 19382
215-429-4956

HD-50
Dayton Superior Corporation
PO Box 355
Oregon, IL 61061
800-745-3707

Speed Crete Green Line
Tamms Industries
730 Casey Ave.
Wilkes-Barre, PA 18702
800-218-2667

B. In lieu of the above HESC mixes, the Contractor may propose the use of another proprietary type mix. This mix shall meet the physical requirements as stated below. The high early strength concrete shall be of a high strength, have rapid strength gain characteristics in normal weather (above 10°C ambient temperature), bond to the existing concrete, and be durable. The concrete material shall be able to accept coarse aggregate to extend the yield and result in a workable mixture. The high early strength concrete, as delivered without additional coarse aggregate, and mixed in accordance with the manufacturer's instructions, shall have the following properties:

- A minimum one hour compressive strength of 2,500 psi, a 24 hour strength of 3,500 psi and a 28 day strength of 5,000 psi (ASTM C109)
- A minimum bond strength of 220 psi after 24 hours. (ASTM C882)
- A minimum initial setting time of 5 minutes at 24°±1°C. (ASTM C266)

- The ability to withstand 50 cycles of freeze-thaw (10% NaCl solution) with a maximum loss of 6%. (ASTM C666)
- Expansion of no more than 0.40% and contraction of no more than 0.05%. (ASTM C157)
- A workable mixture when extended with a minimum 60% No. 8 aggregate by weight of dry concrete component.

A mix design for this material shall be submitted at least two weeks prior to its use. The mix design shall state the percentage of each component to be utilized along with substantive data that demonstrates the ability of the material to meet the specification requirements.

2. Deformed Steel Bars: Section 6.02.

Construction Methods:

1) Inspection of the Structural Slab: Before any existing concrete is removed from the structural slab, the Contractor will provide the Engineer clear access to the bridge deck. During this time, the Engineer will perform an inspection of the structural slab and designate areas where concrete removal will be required. Due to the nature of the operations, the inspection can be performed only after some existing materials, notably overlays and waterproofing system, have first been removed from the structural slab. It shall be the responsibility of the Contractor to arrange the construction schedule so that the required operations may be performed without causing delay to the work.

No operations will be performed by the Engineer until after the following construction work has been completed:

a) The existing bituminous overlay or concrete wearing course, if present, has been removed.
b) The existing waterproofing system, if present, has been removed.
   Note: The removal of this material will be paid for under other applicable items.
c) Installation of sedimentation controls for the prevention of materials entering the bridge drainage system.
   The Contractor shall furnish and install sedimentation controls at bridge scuppers to prevent concrete debris from entering the bridge drainage system. The methods proposed by the Contractor will be approved by the Engineer.

It shall be the responsibility of the Contractor to inform the Engineer, in writing, of the date that a structure will be available for inspection operations. Notification shall be given to the Engineer at least seven (7) days prior to the date that the area in question will be in a condition acceptable to the Engineer.

The Contractor is hereby informed that the following time period will be necessary to perform the required inspection operations:

One working day with suitable weather conditions per each six thousand square feet, or portion thereof, of structural slab area.

The Contractor will not be allowed to do any further work to the structural slab, until all necessary inspection operations have been performed, unless given permission by the Engineer.

The Contractor will include any costs related to the allowance for this inspection in the general cost of the work.

2) Removal of Deteriorated Concrete: All deteriorated concrete designated for removal under this construction item shall be removed within the limits shown on the plans and where ordered by the Engineer. The lateral limits of each area to be repaired will be delineated by the Engineer and suitably marked. Where several areas to be repaired are very close together, the Engineer may combine these individual patches into a large area. The outlines of each such area shall first be cut to a depth of one-half (1/2) inch with an approved power saw capable of making straight cuts. In the event that reinforcing steel is encountered within the upper 1/2 inch depth during sawing operations, the depth of saw-cut shall immediately be adjusted to a shallower depth so as not to damage the steel bars. If so directed by the Engineer, saw cutting shall again be carried down to the 1/2 inch depth at other locations of repair provided reinforcing steel is not again encountered. Where over-breakage occurs resulting in a featheredge, the featheredge shall be squared up to a vertical edge in an approved manner. Where sawing is impractical, the area shall be outlined by chisel or other approved means.

All deteriorated concrete shall be removed by pneumatic hammers, hydro-demolition will not be permitted.

The weight of pneumatic hammers when used shall not exceed 30 pounds for concrete removal above the top reinforcing steel nor 15 pounds for concrete removal below the top reinforcing steel.

The depth of concrete removal shall be as shown on the plans but shall be such as to include all spalled, delaminated, or otherwise deteriorated concrete. The Engineer will be sole determiner of what constitutes deteriorated concrete, using sounding methods or other evaluation measures at his discretion.

For deterioration on the deck underside, the Contractor shall design, furnish and install protective shielding on the underside to prevent an unexpected fall of deteriorated concrete to areas below the bridge. The protective shielding shall be designed, furnished and installed by the Contractor. Working drawings and design calculations for the temporary shielding shall be submitted in accordance with the requirements of Article 1.05.02(a). The working drawings and design calculations shall be prepared, sealed and signed by a Professional Engineer, licensed in the State of Connecticut. The furnishing of such plans shall not serve to relieve the contractor of any part of his responsibility for the safety of the work or for the successful completion of the project.

Where the existing reinforcing steel is damaged or corroded, it shall be cut out and replaced with new reinforcing steel of the same size. Any sound reinforcing steel damaged during the concrete removal operations, shall be repaired or replaced by the Contractor at his expense as directed by the Engineer. New steel shall be attached beneath or beside existing steel with a minimum splice

length as indicated on the plans, or as directed by the Engineer. The concrete shall be removed to a minimum depth of 1 inch below the new steel.

3) Surface Preparation: Sound reinforcing steel which is in the proper position in the slab shall be left in place and cleaned of all concrete, the smaller fragments to be removed with hand tools in patch areas where pneumatic hammers were used.

Reinforcing bar wire ties and vertical supports shall be installed on inadequately supported and/or vibrating reinforcing steel, as directed by the Engineer.
The concrete surface and reinforcing steel to receive patching material shall be sandblasted, followed by air blasting in order to remove all loose particles and dust. All blasting operations shall be performed using techniques approved by the Engineer, taking care to protect all pedestrians, traffic, and adjacent property. All compressed air sources shall have properly sized and designed oil separators, attached and functional, to allow delivered air at the nozzle to be oil-free. The patch area shall be cleaned of all additional loose or powder-like rust, oil, solvent, grease, dirt, dust, bitumen, loose particles, and foreign matter just prior to patching.

The entire concrete surface to be patched shall be dampened. All free water shall be removed from the patch area.

4) Mixing, Placing, and Finishing: Mixing and placing concrete should not be done unless the ambient temperature is above 35°F. All mixing shall be accomplished by means of a standard drum-type portable mixer. A continuous type mobile mixer may be used if permitted by the Engineer. The Contractor shall calibrate the mobile mixer under supervision of the Engineer. Calibration shall be in accordance with the applicable sections of ASTM method C685. The total mix shall be limited to the quantity that can be mixed and placed in 15 minutes. The concrete mix shall be spread evenly and compacted to a level slightly above the pavement surface. Vibration, spading or rodding shall be used to thoroughly compact concrete and fill the entire patch area. Where practical, internal vibration shall be used in cases where concrete has been removed below the reinforcing steel. Hand tamping shall be used to consolidate concrete in smaller patches, including popouts.

Vibrating plates or vibrating screeds shall be used on the surface of all patches for strike off and consolidation. After the concrete has been spread evenly and compacted to a level slightly above the pavement surface, the vibrating plate or screed shall be drawn over the surface at a uniform speed without stopping, in order to finish the surface smooth and even with adjacent concrete.

The surface shall be float finished.

Finishing operations shall be completed before initial set takes place.

Cured patches, having a hollow sound when chain dragged or tapped (indicating delamination), shall be replaced by the Contractor at his expense until a patch acceptable to the Engineer is in place.

5) Tolerances in Finished Patched Surfaces: The surface profile of the patched area shall not vary more than one-eighth inch in a distance of 10 feet, when a 10 foot long straightedge is placed on the surface at any angle relative to the centerline of the bridge. Humps in the patch that exceed the one-eighth inch tolerance shall be ground down by approved machinery. Sags or depressions in the surface of the patch area that exceed one-eighth inch tolerance shall be repaired by removal of the concrete in the depression over an area determined by the Engineer to a depth of one inch and repaired in the previously described manner.

6) Underside of Bridge Deck Treatment: The Engineer shall examine the underside of the bridge deck for pop-outs caused by the removal of deteriorated concrete. The surface area of pop-outs shall be coated with epoxy resin where ordered by the Engineer. The concrete surface and exposed reinforcing steel, if any, which is to receive the coating material shall be cleaned of all loose or powder-like rust, oil, dust, dirt, loose particles, and other bond inhibiting matter just prior to coating.

The epoxy resin shall be mixed in accordance with the manufacturer's instructions. Also in accordance with the manufacturer's instructions, two coats of the mixed material shall be applied in uniform coats of approximately 2 to 3 mil dry film thickness each.

If the pop-outs extend beyond the bottom layer of reinforcing steel, the pop-outs shall be repaired as ordered by the Engineer.

6) Test Cylinders: The Contractor shall make and perform compressive strength tests on representative cylinders under the supervision of the Engineer. The dimensions, type of cylinder mold and number of cylinders shall be specified by the Engineer. Traffic shall not be permitted on patched surfaces until the patch material attains a strength of 2500 psi, as determined by breaks of the test cylinders.

A portable compression testing machine shall be provided by the Contractor and available on site for cylinder testing. All testing and equipment shall conform to ASTM C39.

Note: This compression machine must be calibrated in accordance with the provisions of Section 5, ASTM C39.

7) Time Schedule: Work under this item begun on any specific bridge during a construction season shall be completed, at least, to include this item and placing of first course of wearing surface as soon as possible and specifically before the beginning of the construction season's winter shutdown.

All work shall proceed as required by the "Maintenance and Protection of Traffic" and "Prosecution and Progress" specifications contained elsewhere within the contract documents. Traffic will not be allowed on any areas where the Contractor has removed deteriorated concrete until a minimum of 1.5 hours after the placing and finishing operations on the areas are complete as required by this specification.

Method of Measurement: This work will be measured for payment by the actual volume in cubic feet of replacement concrete, complete and accepted. No deduction will be made for the volume of reinforcing steel. Removal of concrete, furnishing and installation of reinforcing steel and providing of a safe access for delineation and inspection of the performed repairs will not be measured for payment.

Basis of Payment: This work will be paid for at the contract unit price per cubic foot of deck concrete repaired for "Partial Depth Patch", complete in place and accepted, which price shall include removal of deteriorated concrete, surface preparation of patch areas, epoxy resin coating of the underside of deck pop-out surfaces, concrete replacement, the furnishing and installation of deformed steel bars, reinforcing bar wire ties and vertical supports for inadequately supported and/or deteriorated existing reinforcing steel, furnishing and installing protective shielding, providing inspection access for delineation and inspection of performed repairs, all materials, equipment, including the portable compression testing machine required for the testing of the repair material, tools, labor and work incidental thereto.

Pay Item	Pay Unit
Partial Depth Patch	c.f.

ITEM #0602936A -DRILLING AND GROUTING REINFORCING BARS

Description: Work under this shall consist of drilling holes in the existing concrete and grouting reinforcing bars. All work shall be as shown on the plans or as directed by the Engineer.

Materials: The adhesive bonding material shall be a resin compound specially formulated to anchor steel bars in holes drilled into concrete for the purpose of resisting tension pull-out. The adhesive bonding materials shall be selected for the Connecticut Department of Transportation Approved Product List.

Certification: A Materials Certificate shall be required for the adhesive bonding material in accordance with Article 1.06.07, certifying the conformance of this material to the requirements stated herein.

Construction Methods: The Contractor shall drill holes into the concrete to the depth and at the locations shown on the plans.

The Contractor shall submit the following to the Engineer for approval: type of drill, diameter of bit, method of cleaning holes and method of placement of the adhesive bonding material. Specifications and recommendations for the aforementioned may be obtained from the manufacturer of the adhesive bonding material.

The reinforcing bars shall be able to develop a pull-out resistance of 125 percent of their nominal yield strength when bonded at the embedment depths provided.

The Contractor shall provide the minimum cover for the bars as shown on the plans.

If the existing reinforcing steel is encountered during drill, the holes may be relocated only if approved by the Engineer.

Drilling methods shall not cause spalling, cracking, or other damage to the concrete. Those areas damaged by the Contractor shall be repaired by him in a manner suitable to the Engineer and at no expense to the State.

The materials and method used for this work should be suitable to the conditions encountered in the field.

Method of Measurement: This work will be measured for payment by the number of linear foot of drilled holes in which the bars are embedded.

Basis of Payment: This work will be paid for at the contract unit price per linear foot for "Drilling and Grouting Reinforcing Bars" which price shall include drilling and preparing holes

and grouting reinforcing bars. It shall also include all material, except reinforcing **bars, and all** equipment, tools and labor incidental thereto.

Pay Item	Pay Unit
Drilling and Grouting Reinforcing Bars	L.F.

ITEM #0651649A – CURED-IN-PLACE PIPE LINING

Description:

Work under this item shall consist of furnishing all plant, labor, transportation, equipment, appliances and materials, and perform all operations in connection with the installation of cured-in-place liner to rehabilitate 4 existing corrugated metal storm sewer pipes located at stations 100+00 RT, 102+50 RT, 206+55, and NB On-Ramp "H" station 11+80 RT as specified herein and shown on the drawings. The work includes closed-circuit television inspections/video recording and cleaning of the storm sewer pipes before and after the construction of the cured-in-place pipe lining, and the handling of stormwater flows to divert these flows away from or around the pipe lining work site until the completed cured-in-place pipe is complete and ready for service, and disposal of any curing, flushing, or cleaning water. Also included is any work necessary to fill voids in the soil in the vicinity of the pipe to be lined and any modifications to the existing drainage structures located on either side of said pipe as may be necessary to facilitate installation of the cured-in-place lining.

Materials:

Cured In-Place Pipe (CIPP) Lining:

A. Quality Assurance: The cured-in-place pipe lining and installation used on the project may be a patented operation and must be installed by a Contractor licensed by the patent holder. The Contractor shall indemnify the State from claims of patent infringement and any loss that may result therefrom.

B. Materials and installation shall be in accordance with ASTM Designation F 1216-93 "Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube".

C. Properties of the liner components shall meet or exceed the requirements of the latest edition of ASTM F 1216 and those listed below.

D. Liner Component Properties:

1. Tubing: Fiber fabric of at least five denier to retain resin, with sufficient needling and cross-lapping to yield a minimum burst strength of 1,000 PSI in transverse direction (hoop stress), free from tears, holes, cuts, foreign material and other defects, meeting the requirements of ASTM F1216 or ASTM F1743.

2. Liner Coating: Polyurethane, polyethylene, polyvinyl chloride, or nylon bonded to the layer of fiber fabric at 0.08 lb/ft^2 forming a nominal (0.01 in) pinhole-free coating layer.

3. Resin: Either polyester or epoxy, depending on application, defects, meeting the requirements of ASTM F1216 or ASTM F1743, with sufficient thixotropic properties to obtain no-draining characteristics when impregnated into the fiber fabric tubing that is compatible with the installation process.

4. Catalyst: Compatible with the resin and other materials used in the manufacture of the liner. The non-promoted resin shall be catalyzed by the addition of sufficient catalyst to produce the required physical properties of the cured pipe.

E. Finished and Cured Liner Properties:

1. The finished lining shall fit tightly and neatly against the existing inside pipe wall. The liner shall be fabricated from materials which, when cured, will be chemically resistant and show no signs of wicking when exposed to quantities of hydrogen sulfide, carbon monoxide, methane, petroleum hydrocarbons, moisture saturation, and diluted sulfuric acid.

2. The physical properties of the cured liner shall have the following minimum strength requirements:
   a. Tensile Strength at Yield – minimum 3,000 PSI per ASTM D 638.
   b. Modulus of Elasticity – 300,000 PSI per ASTM D 638.
   c. Flexural Strength – minimum 4,500 PSI per ASTM D 790.
   d. Flexural Modulus – minimum 250,000 PSI per ASTM D 790.
   e. Impact Strength – Izod – minimum 0.16 ft-lb per ASTM D 256.
   f. Shear Strength – minimum 5,550 PSI per ASTM D 732.

F. Samples:

1. Samples of material identical to the raw material to be used in the project shall be provided. In addition, specimens shall be prepared utilizing identical materials, curing, and technique that will be accepted as representative of the actual installed liner.

2. Following the curing of the installed liner, samples of the cured liner removed during the trimming shall be made available and certified test reports and materials certificates will be provided to the State in accordance with Section 1.06.07 of the Standard Specifications as ordered by the Engineer. Samples shall be prepared and physical properties tested in accordance with the requirements of ASTM F1216 or ASTM F1743.

G. Liner Design and Selection:

1. It is the intent of this pipe liner installation to improve the structural integrity in the existing culverts through a reduction in the internal pipe diameter.

2. The liner shall be designed by the manufacturer to be structurally self-supporting and shall not rely on the structural strength of the existing culverts. The liner shall be designed to support all dead and live loadings and any external hydrostatic pressure transferred to the new liner. HS-20 live loads shall be used for culverts under roadways.

3. The Contractor shall carefully inspect the condition of the existing pipe prior to manufacture of the pipe liner to verify the size, length, thickness, and material composition of the line, and to warrant its suitability for the particular application and existing conditions found. Shop drawings and calculations for design of the pipe and pipe thickness shall be submitted to the Engineer for review.

H. Controlled Low Strength Material (Flowable Fill) utilized to fill soil voids in the vicinity of the existing pipe shall conform to Item #0216012A – "Controlled Low Strength Material."

Construction Method:

A. Submittals:

1. Submit documentation of the Contractor's experience. The prime Contractor must submit a minimum of three references proving the satisfactory completion of cured-in-place pipe lining work performed by the pipe lining contractor within seven calendar days of the award of the contract for Engineer approval. The submittal shall include the names, addresses, and phone numbers of the personnel responsible for the administrating the contracts, and the location of the prior work. If the Engineer determines that the contractor proposed has insufficient experience, or has performed unsatisfactory work on other contracts, the prime Contractor will be required to resubmit documentation for an alternate contractor for the approval of the Engineer.

2. Furnish samples and Independent Testing Laboratory Certification that the liner material(s) are in compliance with the requirements contained herein.

3. Submit shop drawings which include details of all component materials and construction including complete manufacturer's recommendations for storage procedures and temperature control, handling and inserting the liner, curing details (i.e., written curing schedule based upon the selected resin system and curing environment conditions), water handling and disposal plan, service reconnection methods, and trimming and finishing. The submittal shall also include liner size and wall thickness, shop drawings and calculations for the design of the liner, insertion locations, set-up requirements at each insertion location including all equipment,

trucks, and material layouts, maintenance and protection of traffic requirements, and proposed channel flow controls.

4. Installation shall be in accordance with manufacturer's procedures and recommendations also meeting the requirements of ASTM F1216 or ASTM F1743.

B. Delivery, Storage and Handling:

1. Packing and Shipping: Exercise extreme care during transportation, handling, storing, and installation to ensure that liner material is not torn, cut, or otherwise damaged.

2. Acceptance at Site: If any part or parts of the liner material becomes torn, cut or otherwise damaged before or during installation, it shall be repaired or replaced before proceeding further, at no additional cost to the State.

3. Storage and Protection: Store and protect materials in accordance with manufacturer's recommendations.

C. Examination: The existing culverts to be lined shall be inspected immediately before installation of the liner to verify that conditions are acceptable for the liner installation to proceed and to confirm the design conditions of the liner. In the event of a discrepancy, the Engineer should be immediately notified. The inspection shall be done by video equipment.

D. Preparation:

1. Storm Flow Bypass: Bypass storm flows around the culvert sections to be lined.

2. Culvert Cleaning: The existing culvert shall be satisfactorily cleaned in accordance with Section 6.53 of the Standard Specifications and in compliance with manufacturer's specifications. Collect cleaning water and discharge at an off-site location approved by the inspecting engineer; do not discharge muddy cleaning wash water to wetlands. Cleaning will be measured for payment per contract unit price per linear foot for "Clean Exiting Culvert – 12" to 42" Diameter".

3. Line Obstructions: If inspection reveals an obstruction that cannot be removed by conventional cleaning equipment, in accordance with Section 6.53 of the Standard Specifications, or that grouting may be required prior to installation of the liner to completely stop infiltration through joints and defects in lieu of progressive rounding, the Engineer shall be immediately notified.

E. Liner Storage, Handling and Preparation: The location where the resins and liner material will be stored shall be designated by the Contractor subject to approval by the

Engineer. The Engineer will inspect and reject any materials found defective or otherwise unsatisfactory. The "wet out" procedure shall utilize the resin and catalyst in sufficient quantities to ensure complete impregnation of the liner and provide the properties specified in the Finished and Cured Liner Properties Section.

F. Liner Installation:

1. The Contractor's operations to furnish and install the lining shall be in strict conformance with the component material and liner manufacturer's recommendations. Install a plastic sheet or other methods to contain excess resin at the downhill outlet near wetlands.

2. The Contractor shall insert the liner into the pipe in accordance with the shop drawings. Precautions shall be taken not to damage the liner during installation. Trucks and equipment shall be staged on the road shoulder rather than building haul roads to the drainage outlets to minimize disturbance near wetlands.

3. Insertion of Uncured Lining: Insertion shall be through an existing storm sewer structure. The liner shall be positioned in the pipe using an inversion or a pull-in method. The internal pressure shall be sufficient to overcome external pressures exerted on the liner at service connections, joints, and open sections, and to hold the tube tightly to pipe wall, producing concave "dimples" at side connections. The Contractor shall ensure that the internal pressure will not damage the existing pipe.

4. Curing the Inserted Liner: After insertion is completed, the Contractor shall cure the liner using a steam pressure source. The equipment shall be capable of delivering steam throughout the liner per the manufacturer's recommendations, and shall uniformly raise and hold the temperature as required to completely cure the resin.

   Temperature gauges shall be placed between the liner and the host pipe's invert position to monitor the temperatures during the cure cycle.

   A small hole shall be cut at the end of the liner (top of the liner) so steam can circulate continuously into the liner throughout the curing period. Cure shall be completed when the exposed portions of the liner are hard and sound and the remote temperature sensor indicates that an exotherm has occurred. Particular care shall be exercised during the curing operation to ensure that the liner is not overstressed.

5. Cool-Down of the Cured Lining: The hardened liner shall be cooled to the recommended temperature before relieving the static head pressure. Care shall be taken in the release of the static head so that surges will not develop and damage the newly installed liner.

6. The Contractor is responsible to obtain any necessary permits or permissions for the work, including the disposal of condensed water. Condensate water shall be pumped out and disposed of offsite; do not discharge condensate or flushing water to wetlands. Submit a disposal ticket from the appropriate wastewater treatment plant or disposal site identified in the water handling plan to the inspecting engineer.

7. Trim the end of the liner from the pipe outlet or headwall, clean any disturbance, and remove the plastic sheet when cleaning the outlet headwall.

G. Acceptance Testing: The Contractor shall complete a post-installation television inspection immediately following completion of the work and provide the State with a video tape showing the completed work.

H. Sealing at Storm Sewer Structures: If the liner fails to make a tight seal at structures, the Contractor shall apply a seal at that point. The seal shall be of a resin mixture compatible with the liner.

I. Prior to the installation of the liner, the Contractor shall conduct an inspection and gather information to determine where voids in the soil around the pipe may exist. This determination shall include but may not be limited to visual inspection, sound transmission, mechanical testing, observation of areas of settlement in the pavement above, and other methods specified by the Engineer.

J. All voids in soil areas in the vicinity of the pipe will be filled using "Controlled Low Strength Material." Access to void areas will be gained by excavation, vacuuming or other methods approved by the Engineer.

L. Manufacturer's Field Service: Manufacturer's qualified personnel shall provide full-time supervision of the entire lining process.

M. Warranty: The Contractor shall warrant and shall obtain from the manufacturer and installer its warranty that the cured-in-place liner will be free from defects in materials and workmanship for a period of one (1) year from the date of substantial completion. Said manufacturer's warranty shall be in a form acceptable to and for the benefit of the State and shall be submitted as a condition of final payment. Any work found to be defective within the said warranty period shall be repaired, or replaced at the sole option of and at no cost to the State. Such repair or replacement shall include the cost of removal and reinstallation.

N. Supplemental Procedures

1. The Contractor shall ensure that properly-trained/certified Supervisor oversees the preparation, installation, curing and final inspection of the CIPP project.

2. CIPP installation procedures must promote complete polymerization/curing, prevent resin migration and loss, and prevent uncured resin residues on the interior of the final product. In no case may any uncured resin be allowed to discharge to the environment (i.e., soil, sediment or surface water).

3. Following completion of resin curing, the finished liner must be rinsed thoroughly to remove solid debris and resin residues. All cure water/condensate and rinse water must be captured for reuse or disposed at an appropriate off-site facility.

Method of Measurement:

This work will be measured for payment by the number of linear feet of storm sewer or culvert pipe installed with cured-in-place lining, completed and accepted in place, measured along the center of the pipe. Pipes cleaned for this item will not be measured separately for payment.

Determination of locations of soil voids and methods used to gain access to voids in the vicinity of the pipe, and repair or reconstruction of storm drainage structures modified or damaged by liner installation shall not be measured for payment, but shall be included in the cost of the work.

Basis of Payment:

This work will be paid for at the contract unit price per linear feet for "Cured-in-Place Pipe Lining", complete in place, which price shall include all submittals, pipe cleaning, installation of lining, inspection/video taping, handling of storm flow bypass, permits, disposal of excess cured lining, water supply, curing the liner, disposal of condensed water or flushing water, repairing or reconstructing end structures, sealing structures, additional grouting required for installation of liner and all material, equipment, tools, labor and work incidental thereto.

Delivery and placement of Controlled Low Strength Material shall be paid at the contract unit price per cubic yard for "Controlled Low Strength Material."

Storm sewer cleaning shall be paid for at the contract unit price per linear foot for "Clean Existing Culvert – 12" to 42" Diameter" in accordance with Section 6.53 of the Standard Specifications.

Pay Item	Pay Unit
Cured-In-Place Pipe Lining	L.F.

ITEM #0822064A – MOVEABLE TEMPORARY BARRIER

Description:

The work under this item shall consist of furnishing, installing, moving, relocating, maintaining and removing a moveable temporary barrier system at the locations indicated on the contract plans or as ordered by the Engineer.

Materials:

The barrier system shall be the portable steel barrier system, ArmorGuard Barrier System, manufactured by Barrier Systems, Inc. (BSI), Rio Vista California, (707) 374-6800 or approve equal. Any modifications from the system that was tested to the NCHRP 350 requirements shall be documented and approved by the State and the FHWA prior to use of the ArmorGuard Barrier System.

The ArmorGuard Barrier System consists of steel safety-shape segments approximating the "New Jersey Shape," modified at the top to minimize vehicular climb. These segments, when linked together to form a longitudinal barrier, shall perform in compliance with NCHRP 350, Test Level 2 (45 mph) or 3 (60 mph) Each link segment shall contain a manual and/or pneumatic raise/lower system to lift link segments onto integral internal wheels in order to move the link segments without the use of any external equipment. The wheels of the system shall be capable of allowing the individual link segments to be rolled, in any direction, on any smooth hard surface capable of supporting at least 3,700 pounds. When on their wheels, the segments of the system shall be capable of being manually moved by a two person crew, without the use of any specialized equipment, and of being moved longitudinally when linked together and pulled by a construction vehicle.

Construction Details:

Furnish and install Moveable Temporary Barrier at the locations shown on the plans in accordance with the manufacturer's instructions and the directions of the Engineer. The approach ends shall be shielded using an approved impact attenuator system compatible for use with the Moveable Temporary Barrier at locations shown in the contract documents or as directed by the Engineer.

To provide positive protection for workers, additional work room and/or positive protection between opposing directions of traffic, the Moveable Temporary Barrier shall be moved by the Contractor from its "Peak Hour" location to its "Off-Peak Hour" location, as shown in the contract documents or as directed by the Engineer.

Between construction stages, the Moveable Temporary Barrier shall be relocated as necessary to other locations within the project area as shown in the contract documents or as directed by the Engineer.

Method of Measurement:

Payment for Moveable Temporary Barrier will be made on a Lump Sum basis.

Basis of Payment:

The Lump Sum price bid for Moveable Temporary Barrier shall include all equipment, material, and labor necessary to furnish, install, move, relocate, maintain and remove the barrier system to include system compatible and approved impact attenuators. This price shall also include the cost of placing or removing individual barrier sections as may be required. Incidental movement of the barrier sections to achieve proper alignment or to realign barrier sections disturbed by traffic shall be included in the price. The price bid shall be based on the maximum quantity of barrier required to be in service at one time in accordance with the traffic control requirements as shown on the contract drawings.

All maintenance and protection of traffic for the purpose of deployment of the Moveable Temporary Barrier, including additional personnel and equipment, placement of additional traffic control devices or relocating existing traffic control devices, shall be included in the price bid.

Payment for the Moveable Temporary Barrier will be made at 50% of the lump sum price bid upon delivery, initial placement and acceptance of the system. Upon removal of the system from the project area, the Contractor shall receive 10% of the lump sum price bid. The remaining 40% balance of the price will be prorated over the duration of the contract for which the Moveable Temporary Barrier is required. No separate or additional payment will be made for any additional apparatus necessary to facilitate the various moves or barrier configurations.

ITEM #0822999A – MEDIAN BARRIER GATE

Description:

The work under this item shall consist of furnishing and installing a rigid longitudinal median gate barrier system at the location indicated on the contract plans or as ordered by the Engineer.

Materials:

The barrier system shall be a rigid longitudinal barrier median gate system, manufactured by Barrier Systems, Inc. (BSI), Rio Vista California, (707) 374-6800 or approve equal. Any modifications from the system that was tested to the NCHRP 350 requirements shall be documented and approved by the State and the FHWA prior to use of the SafeGuard Gate System.

The systems consist of four key elements and shall be made from materials conforming to the following specifications:

1. **Gate Assembly Section:** The gate assembly section is 13 feet in length. These are assembled together in two sections to create a gate of 26 feet in length. The Gate Assembly Section shall be composed of end supports, center supports, diagonal braces, a shear plate, and longitudinal panels for the top, center, and bottom. These components are held together using clamp strips and a variety of fasteners.

   a) All steel clamp strips, supports, braces, shear plates, and panels shall be fabricated from mild steel in conformance with ASTM A-36 specifications and galvanized in accordance with ASTM 123.
   b) All fasteners shall be Class 4.6 (Grade 2) or greater and galvanized in accordance with ASTM 153. Washers shall be hardened and galvanized.

2. **Connecting Hardware:** The connecting hardware is used to connect the 13 feet assemblies together. Connecting of the assembly sections is accomplished using upper and lower coupling strips, threaded rod, top panel connecting brackets, and a coupling shear plate. Fasteners and bolt strips hold the connection.

   a) All steel coupling strips, connecting brackets, shear plates, and bolt strips shall be fabricated from mild steel in conformance with ASTM A-36 specifications and galvanized in accordance with ASTM 123.
   b) Threaded Rods and fasteners shall be Class 4.6 (Grade 2) or greater and galvanized in accordance with ASTM 153. Washers shall be hardened and galvanized.

3. **Pneumatic System:** The pneumatic system provides the lifting capacity and control functions for the gate. The installation consists of the control and filter units and all necessary air lines to facilitate independent lifting and lowering of the steering and swing units as well as directional control of each steering unit.

   a) All steel components such as mounting brackets and steering and swing unit frames shall be fabricated from mild steel in conformance with ASTM A-36 specifications and galvanized in accordance with ASTM 123.
   b) All control and filter units and corresponding air lines shall be specified for outdoor use.

4. **Hinge Assembly:** The hinge assembly connects the ends of the gate to a transition assembly. A hinge set contains two aluminum hinge covers with load carrying engagement rails and pivot rods, opposing hinges, and a master pin.

   a) All aluminum components shall be made of 5052 H32 in conformance with ASTM B209.
   b) All steel hinges and hinge cover rails shall be fabricated from mild steel in conformance with ASTM A-36 specifications and galvanized in accordance with ASTM 123.
   c) The master hinge pin and hinge cover pivot rod shall be fabricated from C1018 CF steel and galvanized in accordance with ASTM 123.

Construction Methods:

Furnish and install Median Barrier Gate at the locations shown on the plans in accordance with the manufacturer's instructions and the directions of the Engineer.

Highway safety appurtenances should be applied to hazardous sites in accordance with the guidelines and recommendations in the American Association of State Highway Transportation Officials (AASHTO), "Roadside Design Guide", and other Federal Highway Administration and State Department of Transportation requirements. Placement of the SafeGuard Gate System must comply with these specifications and guidelines as well as those of the manufacturer.

Method of Measurement:

Median Barrier Gate will be measured as units, in place, and acceptable to the Engineer.

Basis of Payment:

This work will be paid for at the contract unit price each for "Median Barrier Gate", complete in place, which prices shall include all furnishing, transportation, equipment, material, all parts components associated with the system and labor incidental thereto.

All maintenance and protection of traffic for the purpose of deployment of the Median Barrier Gate, including additional personnel and equipment, placement of additional traffic control devices shall be included in the price bid.

Pay Item	**Pay Unit**
Median Barrier Gate	ea.

ITEM # 0904997A – REMOVAL OF EXISTING METAL BRIDGE RAIL

Description:

Work under this item shall consist of the removal and disposal of the existing bridge railing for the length indicated on the plans except where salvage of the rail is required. Salvage shall conform to Article 1.04.06 as supplemented in the General Special Provisions.

Where salvage is not required, the bridge railing shall become the Contractor's property and shall be removed by him from the site.

The contractor is hereby alerted to the possibility that the existing metal bridge rail may be coated with a lead-based paint system. The contractor shall exercise caution in removing, handling and disposal of the metal bridge rail and appurtenances.

Materials:

As needed.

Construction Methods:

All work shall proceed as directed by and to the satisfaction of the engineer in accordance with the details shown on the plans and in compliance with the requirements for Maintenance and Protection of Traffic.

Method of Measurement:

This work will be measured for payment by the number of linear foot of existing metal bridge rail removed.

Basis of Payments:

This work will be paid for at the contract unit price per linear foot for "Removal of Existing Metal Bridge Rail," which price shall include all equipment, tools, and labor incidental to the removal and disposal of materials.

ITEM #0912605A – RESET METAL BEAM RAIL (TYPE R-B 350)
ITEM #0912614A – RESET METAL BEAM RAIL (TYPE MD-B)

Description: Work under this item shall conform to the requirements of Section 9.12 – "Remove and Reset Posts, Rail and Rail Anchorages" supplemented as follow"

9.12.03 - Construction Methods: After the second paragraph add the following paragraph:

The Contractor when resetting the railing, the posts shall be pulled up to a height of 31" and then tapped down to achieve the standard rail height of 29".

ITEM #0917010A – REPAIR GUIDERAIL

Description: Work under this item shall consist of the repair of newly installed guiderail. It shall be repaired in the locations originally installed and fabricated in conformity with the lines, designations, dimensions, and details shown on the plans or as ordered by the Engineer.

Materials: The material for guiderail shall meet the requirements as specified within the original applicable contract items.

When repairing guiderail, the Contractor shall reuse any undamaged existing guiderail elements, timber rail, wire rope, appropriate posts, delineators, lap bolts, and other hardware within the project limits as approved by the Engineer to repair the guiderail. The Contractor shall use new materials when any components of the existing railing are damaged or missing and cannot be obtained from other guiderail systems being removed or converted within the Project limits.

Construction Methods: The repair of guiderail shall be in accordance with contraction methods as specified within the original applicable contract items.

Guiderail, including end anchors, which has been installed in final condition and accepted by the Engineer, shall be eligible for reimbursement for repairs subject to the conditions described below. If multiple runs are to be installed in a single stage as indicated in the contract documents, determination for reimbursement shall be made when all runs within the stage are complete and accepted as previously described. On projects without designated stages, guiderail installations must be complete and serving the intended function as determined by the Engineer.

When newly installed guiderail is damaged by public traffic, the following conditions must be satisfied prior to reimbursement for payment;

1. The damage must have been caused solely by the traveling public.

2. The contractor shall provide satisfactory evidence that such damage was caused by public traffic. Such as accident reports obtained from the Connecticut Department of Public Safety, police agencies or insurance companies; statements by reliable, unbiased eyewitnesses; or identification of the vehicle involved in the accident.

3. The contractor shall attempt to collect the costs from the person or persons responsible for the damage and provide documentation of those efforts to the satisfaction of the Engineer.

4. If such evidence cannot be obtained, the Engineer may determine that the damage was not caused by the Contractor and reimbursement for payment is warranted.

This repair provision does not relieve the Contractor of the requirements of Section 1.07, any other contractual requirements for maintenance and protection of traffic and final acceptance and relief of responsibility for the project.

The contractor shall remain responsible for the safety and integrity of the guiderail system for the duration of the project. In the event the guiderail is damaged, the Contractor shall provide sufficient cones, drums and other traffic control devices to provide safe passage by the public. When ordered by the Engineer, the Contractor shall furnish replacement parts and immediately repair the guiderail, but in no case more than 24 hours after notification from the Engineer. In non-emergency situations, the guiderail shall be repaired within 72 hours. The repaired guiderail or anchorages, when completed, shall conform to these specifications for a new system. The Contractor shall be responsible for the removal and the proper disposal of all damaged material and debris.

Method of Measurement: Guiderail damaged solely by the traveling public will be measured for payment. Damage caused by the Contractor's equipment or operations will not be measured for payment.

The sum of money shown on the estimate and in the itemized proposal as "Estimated Cost" for repair of guiderail will be considered the price bid even though payment will be made only for actual work performed. 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 bid for the contract.

Basis of Payment: Repair of guiderail will be paid for in accordance with Article 1.09.04 as required to restore the rail to its full working condition in conformance with these specifications for a new system. There will be no payment for maintenance and protection of traffic for work associated with this item unless, in the opinion of the Engineer, the sole purpose of the maintenance and protection of traffic is for repair of the guiderail.

Pay Item	Pay Unit
Repair Guiderail	est. (est.)

ITEM #0950019A – TURF ESTABLISHMENT - LAWN

Description: The work included in this item shall consist of providing an accepted stand of grass by furnishing and placing seed as shown on the plans or as directed by the Engineer.

Materials: The materials for this work shall conform to the requirements of Section 9.50 of Standard Specification Form 816. The following mix shall be used for this item:

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 Conn DOT Landscape Design office.

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

Construction Methods: Construction Methods shall be those established as agronomically acceptable and feasible and that are approved by the Engineer. Rate of application shall be field determined in Pure Live Seed (PLS) based on the minimum purity and minimum germination of the seed obtained. Calculate the PLS for each seed species in the mix. Adjust the seeding rate for the above composite mix, based on 250 lbs. (274 kg.) per acre (hectare). The seed shall be mulched in accordance with Article 9.50.03.

Method of Measurement: This work will be measured for payment by the number of square yards (square meters) of surface area of accepted established grasses as specified or by the number of square yards (square meters) of surface area of seeding actually covered and as specified.

Basis of Payment: This work will be paid for at the contract unit price per square yard (square meters) for "Turf Establishment - Lawn" which price shall include all materials maintenance, equipment, tools, labor, and work incidental thereto. Partial payment of up to 60% may be made for work completed, but not accepted.

Pay Item	Pay Unit
Turf Establishment - Lawn	S.Y. (S.M.)

ITEM #0969000A - PROJECT COORDINATOR

Section 1.05.08 of the Standard Specifications is hereby deleted and replaced with the following:

Description: Under this item the Contractor shall furnish the services of an administrative employee, entitled the Project Coordinator, for this project to coordinate and expedite all phases of the work required for the project and to ensure that the construction schedule is maintained.

The minimum lump sum bid for this item shall be equal to 0.5% of the Contractor's total bid. Failure of the Contractor to bid at least the minimum amount will result in the Department adjusting the Contractor's bid to include the minimum bid amount for this item.

The Project Coordinator shall be submitted for approval by name, in writing, with a resume of his qualifications, within seven (7) calendar days of the award of the Contract, but not later than the Preconstruction Meeting, and shall not be changed without prior written notice to the Department.

This resume must demonstrate the Project Coordinator is experienced and versatile in the preparation, interpretation and modification of Critical Path Method (CPM) construction schedules. This must include successful completion of at least three (3) construction projects of similar complexity, where he served in a lead scheduling capacity. If the Contractor does not have a person in their company that has these skills, then the Contractor shall engage the services of a Consultant, subject to the approval of the Engineer, for the scheduling work required. If a Consultant is engaged, they shall be present at the first meeting, along with the Project Contractor, prepared to discuss, in detail, the methods and techniques he proposes to use. Thereafter, the Project Coordinator or the Consultant responsible for updating the CPM Schedule shall attend all meetings between the Contractor, its Subcontractors, and any other meetings, which will affect the CPM schedule. The Contractor shall prepare CPM Schedules utilizing the latest version of Primavera Project Planner software as described more fully hereinafter.

If the Contract includes Article 1.20 the following requirement shall also apply:

The Project Coordinator shall have, in addition to the above noted requirements, a minimum of eight (8) years' experience related to commercial/industrial building construction as a Project Coordinator performing duties similar to those required herein.

The Project Coordinator shall have knowledge of all trades involved in the construction, including civil/site work, environmental work, concrete work, masonry work, steel work, wood work, electrical work, and mechanical work.

Other combinations of experience and education totaling ten (10) years in commercial building construction will be considered subject to the approval of the Engineer.

Computer Software and Printer: The Contractor shall provide the following equipment with all the required maintenance and repairs (to include labor and parts) throughout the Contract life. The Engineer reserves the right to expand or relax the specification to adapt to the software and hardware limitations and availability.

The Contractor shall provide the Engineer with a licensed copy registered in the Department's name of the latest versions of the software listed and maintain customer support services offered by the software producer for the duration of the project. The Contractor shall deliver to the Engineer all supporting documentation for the software and hardware including any instructions or manuals.

A. Software – Minimum Specification: _The Contractor shall provide the Engineer with a licensed copy of the latest version of the Primavera Contractor – Deluxe Version scheduling software, registered in the Department's name, and maintain the Primavera customer support service contract over the duration of the project.

B. HP Officejet Pro K8600 Color Printer – Minimum or equivalent (to be installed as a local printer on a computer provided under the Construction Field Office specification):

Paper – 11 in x17 in, 8.5 in x 11 in and duplex/double-side print
Resolution – 1200x1200 DPI
Print Drivers – Must support HP PCL6.
RAM – 32 MB RAM
Print speed – 10 ppm – color, 13 ppm - black
Printer cable – 6 ft (1.8 m)

The Contractor is responsible for service and repairs to all computer hardware. All repairs must be performed within 24 hours. If the repairs require more than a 24 hours then a replacement must be provided.

Construction Methods: The Project Coordinator shall attend all meetings between the Contractor and the Department, the Contractor and its Subcontractors, and any other meetings that affect the progress of the job. The Project Coordinator shall be knowledgeable of the status of all parts of the work throughout the length of the Contract.

The Contractor shall prepare a CPM Schedule in accordance with the pertinent provisions of "Section 1.03 - Award and Execution of Contract," "Section 1.05 - Control of the Work," and "Section 1.08 - Prosecution of Progress" of the Standard Specifications. The schedule shall incorporate the Sequence of Construction as outlined on the Plans and in the Specifications. All other limiting factors that affect construction shall also be incorporated into the schedule. All milestones or constrained dates within the schedule shall be clearly indicated.

The CPM schedule shall contain a list of activities that represent the major elements of the project. At a minimum, this list should include a breakdown by individual structure or stage, including major components of each. The schedule shall contain sufficient detail to describe the progression of the work in a comprehensive manner. As a guide, 10 to 15 activities should be provided for each $1 million of contract value.

The following list of items is provided as an example only and is not meant to be all-inclusive (or all-applicable):

General Items Applicable to all projects

Contractual Constraints including but not limited to

- Winter shutdowns
- Environmental permits/applications time of year restrictions
- Milestones
- Third Party approvals
- Long lead time items (procurement and fabrication of major elements)
- Adjacent Projects or work by others

Award
Notice to Proceed
Signing (Construction, temporary, permanent by location)
Mobilization
Permits as required
Field Office
Utility Relocations
Submittals/shop drawings/working drawings/product data
Construction of Waste Stock pile area
Clearing and Grubbing
Earthwork (Borrow, earth excavation, rock excavation, etc.)
Traffic control items (including illumination and signalization)
Pavement markings
Roadway Construction (Breakdown into components)
Drainage (Breakdown into components)
Culverts
Final Plantings (including turf establishment)
Final Cleanup

The following additional guidelines supplement the general guidelines listed above for the specific project types indicated:

A. For bridges and other structures, include major components such as: Abutments, wingwalls, piers, decks and retaining walls; further breakdown by footings, wall sections, parapets etc.

Temporary Earth Retention Systems
Cofferdam and Dewatering

Structure Excavation
Piles/test piles
Temporary Structures
Removal of Superstructure
Bearing Pads
Structural Steel (Breakdown by fabrication, delivery, installation, painting etc.)
Bridge deck

B. Multiple location projects such as traffic signal, incident management, lighting, planting and guiderail projects will be broken down first by location and then by operation. Other major activities of these types of projects should include, but are not limited to:

Installation of anchors
Driving posts
Foundations
Trenching and Backfilling
Installation of Span poles/mast arms
Installation of luminaires
Installation of cameras
Installation of VMS
Hanging heads
Sawcut loops
Energizing equipment

C. Facility Projects shall reflect the same breakdown of the project as the schedule of values:

CSI Division 2 – Existing Conditions
CSI Division 3 – Concrete
CSI Division 4 – Masonry
CSI Division 5 – Metals
CSI Division 6 – Wood, Plastic, and Composites
CSI Division 7 – Thermal and Moisture Protection
CSI Division 8 – Openings
CSI Division 9 – Finishes
CSI Division 10 – Specialties
CSI Division 11 – Equipment
CSI Division 12 – Furnishings
CSI Division 13 – Special Construction
CSI Division 14 – Conveying Equipment
CSI Division 21 – Fire Suppression
CSI Division 22 – Plumbing
CSI Division 23 – Heating, Ventilating, and Air Conditioning
CSI Division 26 – Electrical
CSI Division 27 – Communications
CSI Division 28 – Electronic Safety and Security

CSI Division 31 – Earthwork
CSI Division 32 – Exterior Improvements
CSI Division 33 – Utilities

The CPM schedule will be compiled using this list of major activities. It will be the responsibility of the contractor to detail all milestones, environmental permit "window" periods; winter shutdowns etc. and include them on their schedule under the corresponding dates.

Proper relationship between all major activities shall be indicated. Node numbers shall be coded such that the major activities shown on the Critical Path Schedule shall be easily referenced to the Detailed Project Schedule when it is developed. Break down the work covered under each Special Provision, or Division and Section of Article 1.20 of the Standard Specifications, into individual activities required and logically group related activities together within the CPM.

If the Engineer determines that additional detail is necessary, the Contractor shall provide it.

All documents, which require approval by the Department, shall be clearly identified within the schedule. The Department and any outside agency shall be allocated a minimum number of calendar days in accordance with Article 1.20-1.05.02. If Article 1.20 does not apply, then the Department shall be allocated a minimum of thirty (30) calendar days (exclusive of weekends and holidays) for review and approval of each submittal. Any submittals requiring approval by an outside Agency (ConnDEEP, Coast Guard, Army Corps of Engineers, etc.) shall be allocated a minimum of sixty (60) calendar days. The Department shall not be held responsible for any delay associated with the approval or rejection of any substitution or other revisions proposed by the Contractor.

The schedule shall indicate the logic of the work for the major elements and components of work under the Contract, such as the planned mobilization of plant and equipment, sequences of operations, procurement of materials and equipment, duration of activities, type of relationship, lag time (if any), and such other information as it is necessary to present a clear statement of the intended activities.

The Contractor is responsible to inform its subcontractor(s) and supplier(s) of the project schedule and any relevant updates.

The schedules shall consist of a network technique of planning, scheduling and control, shall be a clear statement of the logical sequence of work to be done, and shall be prepared in such a manner that the Contractor's work sequence shall be optimized between early start and late start restraints. The Contractor shall use the same criteria in a consistent manner throughout the term of the project. If, at any time, the Contractor alters logic, original durations, and descriptions, adds activities or activity codes or in any way modifies the Baseline Schedule, they must notify the Engineer of the change, in writing, presenting in detail the reasons for the change. The Engineer reserves the right to approve or reject any such change.

The critical path of the project must be identified on the CPM schedule. The critical path is the longest-duration path through the network. The significance of the critical path is that the activities that lie on it cannot be delayed without delaying the project. Because of its impact on the entire project, critical path analysis is an important aspect of project planning.

The critical path can be identified by determining the following four parameters for each activity:

- ES - earliest start time: the earliest time at which the activity can start given that its precedent activities must be completed first.
- EF - earliest finish time, equal to the earliest start time for the activity plus the time required to complete the activity.
- LF - latest finish time: the latest time at which the activity can be completed without delaying the project.
- LS - latest start time, equal to the latest finish time minus the time required to complete the activity.

The *float time* for an activity is the time between its earliest and latest start time, or between its earliest and latest finish time. Float is the amount of time that an activity can be delayed past its earliest start or earliest finish without delaying the project. Delays to activities on the critical path through the project network in which no float exists, that is, where ES=LS and EF=LF will delay the project.

Float available in the schedule, at any time shall not be considered for the exclusive use of either the State or the Contractor. During the course of contract execution, any float generated due to the efficiencies of either party is not for the sole use of the party generating the float; rather it is a shared commodity to be reasonably used by either party. Project float will be a resource available to both the State and the Contractor.

Each CPM Schedule submittal shall be in the form of an activity on node diagram (precedence diagramming method) and shall include at a minimum; an Early Start computer sort, a Total Float computer sort, an Activity Number computer sort, a Schedule Diagram in the Time Scaled Logic format and a backup data CD-ROM which includes all Primavera project files. The diagrams shall be on 2' x 3' sheets. Additional, more detailed diagrams for important aspects or phases of the work will be required on large or complex projects.

Activity I.D. numbers shall be keyed to the item numbers assigned on the detailed estimate sheet. The first three digits (four digits for highway illumination, signing, traffic signals and utility work) of the activity I.D. number shall be identical to the first three digits of the item number in the contract. The remaining digits may be used to provide unique, orderly and sequential I.D. numbers for each activity.

Activity codes shall be added to the schedule dictionary at the direction of the Engineer. At a minimum, activity codes for responsibility (prime, subcontractor by name), location of work

(bridge #, span #, sta. #, site, building, type of work, etc.) and stage or phase number should be included.

The Project Coordinator shall be required to prepare and submit the following documents:

1. Baseline Submittal Requirements: The Contractor shall be guided by the following requirements when submitting the CPM Schedules for review and approval.

   a. Within ten (10) calendar days after award, the Contractor and their scheduler will attend a meeting to discuss the submittal requirements. Within twenty (20) calendar days after contract award, the Contractor shall prepare and submit for review and approval a detailed CPM Schedule for all work. The review and approval process may take up to 21 calendar days and is more fully described in paragraph (b) of this section.

      The work shall be broken out into sufficient detail such that no activity has a duration greater than twenty (20) days, unless approved by the Engineer. As a guide, 25 to 35 activities should be provided per $1 million of contract work. The Engineer shall be the sole judge as to whether the schedule is sufficiently detailed.

      All work shall be shown in sufficient detail such that the Critical Path may be identified and the schedule shall incorporate all contract milestones. Upon approval, this schedule shall be designated the "Baseline".

      Failure to submit and gain approval for the "Baseline" may result in the Contractor being found in violation of Article 1.02.02 of the Standard Specifications. All elapsed contract time prior to the approval of the "Baseline", will be considered to be accurately represented by the actual as-built schedule of that time period. No claims for delays during that period will be allowed.

      The approval of a Baseline Schedule shall in no way waive the requirements of the contract nor shall it excuse the Contractor from any obligations under the contract.

      In no instance will the Contractor be permitted to commence work on any significant portion of the work for which a Baseline Schedule has not been approved without prior written approval from the Department.

   b. The Contractor, represented by the Project Coordinator and/or the Consultant, shall participate with the Engineer in the review and evaluation of each schedule submitted. Any and all revisions made necessary as a result of this review shall be made by the Contractor and a revised schedule submitted within ten (10) calendar days. Any further revisions required thereafter shall also be submitted for approval within (10) calendar days.

2. Monthly Updates: Each month, as of a calendar date mutually acceptable to the Contractor and to the Engineer, the Contractor shall deliver to the Engineer three (3) prints of all

required schedule diagrams and tabulations. In addition, the Contractor shall deliver one (1) copy of the project backup data CD-ROM(s), which includes all Primavera project files. The schedule shall be updated to show the work actually accomplished during the preceding months, the actual time consumed for each activity, and the estimated time remaining for any activity which as been started but not completed.

The monthly update shall also include revisions to the CPM schedule necessitated by revisions to the project, which have been directed by the Engineer (including, but not limited to extra work) during the month preceding the update. Similarly, any changes to the schedule due to Contractor influences shall also be included within the schedule.

Any changes or revisions made to the approved Baseline shall be identified in narrative form in a cover letter accompanying the monthly update. The Engineer reserves the right to approve or reject any such changes. The narrative shall also describe in general terms the progress of the work since the last schedule update and shall identify any items of special interest. If the schedule revisions extend the Contract completion date, due to extra or added work or delays beyond the control of the Contractor, the Contractor must submit a request in writing for an extension of time in accordance with Article 1.08.08. This request should be supported by the schedules submitted previously.

The Contractor shall be responsible to develop mitigation measures for all delays, regardless of responsibility, and to identify all time and cost impacts to the work associated with those mitigation measures.

Except as otherwise authorized by the Engineer, monthly submissions received after the due date are considered late.

The reports required for each monthly update shall include all reports generated for approval of the CPM Schedule for that particular portion of the work. On larger or complex projects, the Engineer may require the schedule data sorted by an activity code to better reflect the progression of the work. Summary barcharts may also be required.

3. Biweekly Schedules: Each week, the Contractor shall be required to produce and submit to the Engineer a biweekly schedule showing all activities planned for the following two week period. This short term schedule may be handwritten; however a two week "look ahead" filter from the CPM Schedule is preferred. The biweekly schedule shall clearly indicate all work planned on a crew basis for the two week period.

4. Recovery Schedules: If, in the opinion of the Engineer, the updated schedule indicates that the Project has fallen behind schedule, or that a revision in sequence of operations may be necessary for any other reason, absent a justifiable time extension, the Contractor shall immediately institute all necessary steps to improve the Project's progress and shall submit such revised network diagrams, tabulations and operational plans, as may be deemed necessary by the Engineer, to demonstrate the manner in which an acceptable rate of progress will be regained.

Should the Contractor not demonstrate an ability to regain an acceptable rate of progress, the Engineer shall require the schedule to be resource loaded with the next monthly update. No additional compensation will be allowed for resource loading the schedule.

5. As-Built Schedules: Within thirty (30) days of completion of the project, including all corrective work, the Contractor shall submit an "As-Built Schedule" showing the actual progress of work. The Contractor shall submit three prints of this final CPM Schedule and one project backup data CD-ROM which include all Primavera project files for the Engineer's exclusive use.

If the contract includes Article 1.20 the following shall also apply:

6. Daily Construction Reports: The Project Coordinator shall assist the Engineer in the preparation of a daily construction report by ensuring that each of the Contractor's employees and subcontractors working on the Project Site on a given day signs the Engineer's sign-in sheet for that day; and by keeping and providing to the Engineer its own daily list of employees and subcontractors who worked on the Project Site on that day.

Method of Measurement: Within ten (10) calendar days of the award of the Contract, the Contractor shall submit to the Engineer for approval a breakdown of its lump sum bid price for this item detailing:

1. The development cost to prepare the Baseline Schedule in accordance with these specifications. Development costs shall not exceed 25% of the total cost of the item and shall include costs to furnish and install all specified hardware.

2. The cost to provide the services of the Project Coordinator, including costs to prepare and submit the Monthly Updates; furnish and submit any Recovery Schedules; furnish and submit Two Week Look Ahead Schedules and maintenance of and supplies for the specified hardware noted above. A per month cost will be derived by taking this cost divided by the number of Contract months remaining from the date of acceptance of the Baseline Schedule.

3. The cost of submission and certification of the As-Built Schedule in accordance with these specifications. The submission and certification costs shall be no less than 2% of the total cost of the item.
4. Substantiation showing that the costs submitted are reasonable based on the Contractor's lump sum bid.

Upon approval of the payment schedule by the Engineer, payments for work performed will be made as follows:

1. Upon approval of the "Baseline" Schedule by the Engineer, the lump sum development cost will be certified for payment.

2. Upon receipt of each monthly update of the "Baseline" Schedule, the per month cost for the services of the Project Coordinator will be certified for payment.

3. Upon approval of the As-Built Schedule by the Engineer, the lump sum submission and certification cost will be certified for payment.

Basis of Payment: This service will be paid for at the contract lump sum price for "Project Coordinator" complete, which price shall include the preparation and submission of all schedules, updates, reports and submittals. The lump sum price shall also include the cost of providing a complete, licensed copy of the Primavera software which will remain the property of the Engineer, and all materials, equipment, labor and work incidental of this service.

The lump sum price will be certified for payment as described in "Method of Measurement" subject to the following conditions:

1. Any month where the monthly update of the "Baseline" CPM schedule is submitted late, without authorization from the Engineer, will result in the following actions:

   a. The monthly payment for the Project Coordinator item shall be deferred to the next monthly payment estimate. If any monthly submittal is more than thirty (30) calendar days late, there will be no monthly payment for the services of the Project Coordinator.

   b. The greater of 5% of the monthly payment estimate or $25,000 shall be retained from the monthly payment estimate until such time as the Contractor submits all required reports.

   c. If in the opinion of the Engineer, the contractor is not in compliance with this specification, the Engineer may withhold all project payments.

2. In the event the project extends beyond the original completion date by more than thirty (30) calendar days, and a time extension is granted to the Contractor, the Department may require additional CPM updates which will be paid at the per month cost for the services of the Project Coordinator.

3. If, in the opinion of the Engineer, the contractor is not in compliance with this specification or has failed to submit a "Baseline", monthly update or Recovery Schedule for any portion of the work in accordance with this specification, it shall result in the withholding of all contract payments until the schedule is submitted to, and approved by, the Engineer.

Pay Item	Pay Unit
Project Coordinator	L.S.

ITEM # 0969066A - CONSTRUCTION FIELD OFFICE, EXTRA-LARGE

Description: Under the item included in the bid document, adequate weatherproof office quarters will be provided by the Contractor for the duration of the work, and if required, for a maximum of ninety days thereafter for the exclusive use of ConnDOT forces and others who may be engaged to augment ConnDOT forces with relation to the contract. The office quarters shall be located convenient to the work site and installed in accordance with Article 1.08.02, this office shall be separated from any office occupied by the Contractor. Ownership and liability of the office quarters shall remain with the Contractor.

Materials: Materials shall be in like new condition for the purpose intended and shall be approved by the Engineer.

Office Requirements: The Contractor shall furnish the office quarters and equipment as described below.

	Description:
2,000 SF	Sq. Ft. of floor space with a minimum ceiling height of 7 ft. and shall be partitioned as shown on building floor plan as provided by the Engineer.
2 EA	Minimum number of exterior entrances.
15 EA	Minimum number of parking spaces.

Office layout: The office shall have a minimum square footage as indicated in the table above, and shall be partitioned as shown on building floor plan as provided by the Engineer. The underside of the office shall be fully skirted to the ground.

Lavatory Facilities: The Contractor shall furnish a minimum of two (2) separate lavatories and toilet facilities ("men" and "women"), in separately enclosed rooms that are properly ventilated and comply with applicable sanitary codes. The Contractor shall provide each lavatory with hot and cold running water and flush-type toilets. He shall also supply lavatory and sanitary supplies as required.

Windows and Entrances: The windows shall be of a type that will open and close conveniently, shall be sufficient in number and size to provide adequate light and ventilation, and shall be fitted with locking devices, blinds and screens. The entrances shall be secure, screened, and fitted with a lock for which four keys shall be furnished. All keys to the construction field office shall be furnished to the Department and will be kept in their possession while State personnel are using the office. Any access to the entrance ways shall meet applicable building codes and be slip resistant, with appropriate handrails.

Lighting: The Contractor shall equip the office interior with electric lighting that provides a minimum illumination level of 100 foot-candles at desk level height, and electric outlets for each desk and drafting table. The Contractor shall also provide exterior lighting that provides a minimum illumination level of 2 foot-candles throughout the parking area and for a minimum distance of 10 ft. on each side of the field office.

The Contractor shall provide the following additional equipment, facilities, and/or services at the Field Office on this project to include at least the following to the satisfaction of the Engineer:

Parking Facility: Adequate parking spaces with adequate illumination on a paved surface, with surface drainage if needed. If paved parking does not exist adjacent to the field office, the Contractor shall provide a parking area of sufficient size to accommodate the number of vehicles indicated in the table above. Construction of the parking area and driveway, if necessary, will consist of a minimum of 6 inches of processed aggregate base graded to drain. The base material will be extended to the office entrance.

Field Office Security: Physical Barrier Devices - This shall consist of physical means to prevent entry, such as: 1) All windows shall be barred or security screens installed; 2) All field office doors shall be equipped with dead bolt locks and regular day operated door locks; and 3) Other devices as directed by the Engineer to suit existing conditions.

Electric Service: The field office shall be equipped with an electric service panel to serve the electrical requirements of the field office, including: lighting, general outlets, computer outlets, calculators etc., and meet the following minimum specifications:

A. 120/240 volt, 1 phase, 3 wire.
B. Ampacity necessary to serve all equipment. Service shall be a minimum 100 amp dedicated to the construction field office.
C. The electrical panel shall include a main circuit breaker and branch circuit breakers of the size and quantity required.
D. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed at each computer workstation location.
E. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed, for use by the Telephone Company.
F. Additional 120-volt circuits and duplex outlets as required meeting National Electric Code requirements.
G. One exterior (outside) wall mounted GFI receptacle, duplex, isolated ground, 120 volt, straight blade.
H. After work is complete and prior to energizing, the State's ConnDOT electrical inspector, must be contacted at 860-594-2240. (Do Not Call Local Town Officials)
I. Prior to field office removal the ConnDOT Data Communications office must be notified to deactivate the communications equipment.

Heating, Ventilation and Air Conditioning (HVAC): The field office shall be equipped with sufficient heating, air conditioning and ventilation equipment to maintain a temperature range of 68°-80° Fahrenheit within the field office.

The Following Furnishings and Equipment Shall Be Provided In The Applicable Field Office Type:

QTY	Description:

QTY	Description:
8 EA	Office desks (2.5 ft x 5 ft) with drawers, locks, and matching desk chairs that have pneumatic seat height adjustment and dual wheel casters on the base.
1 EA	Standard secretarial type desk and matching desk chair that has pneumatic seat height adjustment and dual wheel casters on the base.
1 EA	Conference table, 3 ft x12 ft.
20 EA	Office Chairs.
3 EA	Fire resistant cabinets (legal size/4 drawer), locking.
4 EA	Non-fire resistant cabinets (legal size/4 drawer), locking.
2 EA	Storage racks to hold 3 ft x 5 ft display charts.
1 EA	Mail slot bin - legal size.
2 EA	Drafting type tables (3 ft x 6 ft) and supported by wall brackets and legs; and matching drafters stool that have pneumatic seat height adjustment, seat back and dual wheel casters on the base.
1 EA	Flat file (4/drawers).
4 EA	Personal computer tables (4 ft x 2.5 ft).
1 EA	Hot and cold water dispensing unit and supply of cups and bottled water shall be supplied by the Contractor for the duration of the project.
4 EA	Electronic office type printing calculators capable of addition, subtraction, multiplication and division with memory and a supply of printing paper.
1 EA	Business telephone system for three lines with ten handsets, intercom capability, and one speaker phone for conference table.
1 EA	Telephone answering machine.
1 EA	Plain paper facsimile (FAX) machine capable of transmitting via telephone credit card. All supplies, paper and maintenance shall be provided by the Contractor.
1 EA	Copier/Scanner - high speed, dry, plain paper with sorting capability, automatic feeder and reducing capability. The copier shall be capable of producing a minimum of 25 copies per minute. All supplies, paper and maintenance shall be provided by the Contractor.
8 EA	Computer systems as specified below under Computer Hardware and Software. All supplies and maintenance shall be provided by the Contractor.
1 EA	Laser printer as specified below under Computer Hardware and Software. All supplies, paper and maintenance shall be provided by the Contractor.
3 EA	Digital Camera as specified below under Computer Hardware and Software. All supplies and maintenance shall be provided by the Contractor.
2 EA	Wastebaskets - 30 gal., including plastic waste bags.
10 EA	Wastebaskets - 5 gal., including plastic waste bags.
2 EA	Electric pencil sharpeners.
2 EA	Electric wall clocks.
* EA	Fire extinguishers - provide and install type and number to meet applicable State and local codes for size of office indicated, including a fire extinguisher suitable for use on a computer terminal fire.
1 EA	Coat rack with 20 coat capacity.
1 EA	Tables - 3 ft x 6 ft.

QTY	Description:
6 EA	Interior partitions - 6 ft x 6 ft, soundproof type, portable and freestanding.
2 EA	Vertical plan racks for 2 sets of 2 ft x 3 ft plans for each rack..
2 EA	Double door supply cabinet with 4 shelves and a lock - 6 ft x 4 ft.
1 EA	Easel/chalkboard.
2 EA	Open bookcases - 3 shelf - 3 ft long.
2 EA	Infrared Thermometer, including certified calibration, case, cleaning wipes.
1 EA	Concrete Curing Box as specified below under Concrete Testing Equipment.
1 EA	Concrete Air Meter as specified below under Concrete Testing Equipment.
1 EA	Concrete Slump Cone as specified below under Concrete Testing Equipment.

The furnishings and equipment required herein shall remain the property of the Contractor. Any supplies required to maintain or operate the above listed equipment or furnishings shall be provided by the Contractor for the duration of the project.

Telephone Service: This shall consist of four (4) telephone lines: three (3) lines for phone/voice service and one (1) line dedicated for the facsimile machine. The Contractor shall pay all charges except for toll calls made by State personnel.

Data Communications Facility Wiring: Contractor shall install a Category 5e 468B patch panel in a central wiring location and Cat 5e cable from the patch panel to each PC station, terminating in a (category 5e 468B) wall or surface mount data jack. The central wiring location shall also house either the data circuit with appropriate power requirements or a category 5 cable run to the location of the installed data circuit. The central wiring location will be determined by the ConnDOT Data Center staff in coordination with the designated field office personnel as soon as the facility is in place. The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications, approved printer list and data wiring schematic as soon as possible after the contract is awarded.

Contractor to run CAT 5e LAN cables from workstations, install patch panel in data circuit demark area and terminate runs with RJ45 jacks at each computer location. Terminate runs to patch panel in LAN switch area. Each cable run / jack shall be clearly labeled with an identifying Jack Number.

The installation of a data communication circuit between the field office and the ConnDOT Data Communication Center in Newington will be coordinated between the ConnDOT District staff, ConnDOT Office of Information Systems and the local phone company. The ConnDOT District staff will coordinate the installation of the data communication service with ConnDOT PC Support once the field office phone number is issued. The Contractor shall provide the field office telephone number(s) to the ConnDOT Project Engineer as soon as possible to facilitate data line and computer installations.

Computer Hardware and Software:

The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications, approved printer list and data wiring schematic as soon as possible after the contract is awarded.

Before ordering the computer hardware and software, the Contractor must submit a copy of their proposed PC specifications and the type of printer to the ConnDOT Project Engineer for review by the ConnDOT Data Center. If the specification meets or exceeds the minimum specifications listed below, then the Contractor will be notified that the order may be placed.

Before any equipment is delivered to the Data Center, arrangements must be made a minimum of 24 hours in advance by contacting 860-594-3500. All software, hardware and licenses listed below shall be clearly labeled, specifying the (1) Project No., (2) Contractor Name, (3) Project Engineer's Name and (4) Project Engineer's Phone No., and shall be delivered to the ConnDOT Data Center, 2710 Berlin Turnpike, Newington, CT, where it will be configured and prepared for field installation. Installation will then be coordinated with ConnDOT field personnel and the computer system specified will be stationed in the Department's project field office.

The computer system furnished shall have all software and hardware necessary for the complete installation of the latest versions of the software listed, and therefore supplements the minimum specifications below. The Engineer reserves the right to expand or relax the specification to adapt to the software and hardware limitations and availability, the compatibility with current agency systems, and to provide the Department with a computer system that can handle the needs of the project. This requirement is to ensure that the rapid changing environment that computer systems have experienced does not leave the needs of the project orphan to what has been specified. There will not be any price adjustment due to the change in the minimum system requirements.

The Contractor shall provide the Engineer with a licensed copy registered in the Department's name of the latest versions of the software listed and maintain customer support services offered by each software producer for the duration of the Contract. The Contractor shall deliver to the Engineer all supporting documentation for the software and hardware including any instructions or manuals. The Contractor shall provide original backup media for the software.

The Contractor shall provide the computer system with all required supplies, maintenance and repairs (including labor and parts) throughout the Contract life.

Once the Contract has been completed, the computer will remain the property of the Contractor. Prior to the return of any computer(s) to the Contractor, field personnel will coordinate with the Data Center personnel for the removal of Department owned equipment, software, data, and associated equipment.

A) <u>Computer – Minimum Specification:</u>

Processor – Intel® Core 2 Duo Processor (2.00 GHz, 800 MHz FSB 2MB L2 Cache)
Memory – 2 GB DIMM DDR2 667MHz.
Monitor – 19.0 inch LCD color monitor.

Graphics – Intel Graphics Media Accelerator 3100. or equivalent.
Hard Drive – 160 GB Ultra ATA hard drive (Western Digital, IBM or Seagate).
Floppy Drive – 3.5 inch 1.44MB diskette drive.
Optical Drive – CD-RW/DVD-RW Combo.
Multimedia Package – Integrated Sound Blaster Compatible AC97 Sound and speakers.
Case – Small Form or Mid Tower, capable of vertical or horizontal orientation.
Integrated Network Adapter – comparable to 3COM PCI 10/100 twisted pair Ethernet.
Keyboard – 104+ Keyboard.
Mouse – Optical 2-button mouse with scroll wheel.
Operating System – Windows XP Professional Service Pack 2; Windows Vista Capable.
Application Software – MS Office 2007 Professional Edition.
Additional Software (Latest Releases, including subscription services for the life of the Contract.–

- Norton Anti-Virus and CD/DVD burning software (ROXIO or NERO),
- Adobe Acrobat Standard

Resource or Driver CD/DVD – CD/DVD with all drivers and resource information so that computer can be restored to original prior to shipment back to the contractor.
Uninterrupted power supply – APC Back-UPS 500VA.

Note A1: All hardware components must be installed before delivery. All software documentation and CD-ROMs/DVD for Microsoft Windows XP Professional, Microsoft Office 2007 Professional Edition, and other software required software must be provided. Computer Brands are limited to Dell, Gateway and HP brands only. No other brands will be accepted. The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

Note A2: As of June 30, 2008, Microsoft will no longer distribute Windows XP for retail sale, although the date for specific computer manufacturers may be different. Please consult your manufacturer for details. The Department still requires Windows XP on all PCs. Microsoft has stated that any PCs that are purchased with either Windows Vista Business, or Vista Ultimate are automatically entitled to "downgrade rights", which allow the PC to be rolled back to Windows XP. Please consult the specific manufacturer for details on downgrading new PCs to Microsoft Windows XP after June 30, 2008.

B) Laser Printer – Minimum Specification:

Print speed – 20 ppm.
Resolution – 1,200 x 1,200 dpi.
Paper size – Up to 216 mm x 355 mm (8.5 in x 14 in).
RAM – 16 MB.
Print Drivers – Must support HP PCL6 and HP PCL5e.
Printer cable – 1.8 m (6 ft).

Note B1: Laser printer brands are limited to Hewlett-Packard and Savin brands only. The ConnDOT Project Engineer will provide the Contractor with a copy of the current PC specifications and approved printer list as soon as possible after the contract is awarded.

Note B2: It is acceptable to substitute (1) a high-speed multi-function all-in-one printer/copier/scanner/fax machines listed on the approved printer list in place of one required laser printer and fax machine, and (2) a multi-function all-in-one printer/copier/scanner/fax machine listed on the approved printer list in place of the second required laser printer and fax machine. Only one of these devices is required to be set-up to function as the one required fax machine.

C) Digital Camera – Minimum Specification:

Optical – 5 mega pixel, with 3x optical zoom.
Memory – 2 GB.
Features – Date/time stamp feature.
Connectivity – USB cable or memory card reader.
Software – Must be compatible with Windows XP and Vista.
Power – Rechargeable battery and charger.

The Contractor is responsible for service and repairs to all computer hardware. All repairs must be performed with-in 48 hours. If the repairs require more than a 48 hours then a replacement must be provided. All supplies, paper and maintenance for the computers, laptops, printers, copiers, and fax machines shall be provided by the Contractor.

Concrete Testing Equipment: If the Contract includes items that require compressive strength cylinders for concrete, in accordance with the Schedule of Minimum Testing Requirements for Sampling Materials for Test, the Contractor shall provide the following. All testing equipment will remain the property of the Contractor at the completion of the project.

A) Concrete Cylinder Curing Box – meeting the requirements of Section 6.12 of the Standard Specifications.

B) Air Meter – The air meter provided shall be in good working order and will meet the requirements of AASHTO T 152.

C) Slump Cone Mold – Slump cone, base plate, and tamping rod shall be provided in like-new condition and meet the requirements of AASHTO T119, Standard Test Method for Slump of Hydraulic-Cement Concrete.

Insurance Policy: The Contractor shall provide a separate insurance policy, with no deductible, in the minimum amount of forty thousand dollars ($40,000.00) in order to insure all State-owned data equipment and supplies used in the office against all losses. The Contractor shall be named insured on that policy, and the Department shall be an additional named insured on the policy. These losses

shall include, but not be limited to: theft, fire, and physical damage. The Department will be responsible for all maintenance costs of Department owned computer hardware. In the event of loss, the Contractor shall provide replacement equipment in accordance with current Department equipment specifications, within seven days of notice of the loss. If the Contractor is unable to provide the required replacement equipment within seven days, the Department may provide replacement equipment and deduct the cost of the equipment from monies due or which may become due the Contractor under the contract or under any other contract. The Contractor's financial liability under this paragraph shall be limited to the amount of the insurance coverage required by this paragraph. If the cost of equipment replacement required by this paragraph should exceed the required amount of the insurance coverage, the Department will reimburse the Contractor for replacement costs exceeding the amount of the required coverage.

Maintenance: During the occupancy by the Department, the Contractor shall maintain all facilities and furnishings provided under the above requirements, and shall maintain and keep the office quarters clean through the use of weekly professional cleaning to include, but not limited to, washing & waxing floors, cleaning restrooms, removal of trash, etc. Exterior areas shall be mowed and clean of debris. A trash receptacle (dumpster) with weekly pickup (trash removal) shall be provided. Snow removal, sanding and salting of all parking, walkway, and entrance ways areas shall be accomplished during a storm if on a workday during work hours, immediately after a storm and prior to the start of a workday. If snow removal, salting and sanding are not completed by the specified time, the State will provide the service and all costs incurred will be deducted from the next payment estimate.

Method of Measurement: The furnishing and maintenance of the construction field office will be measured for payment by the number of calendar months that the office is in place and in operation, measured to the nearest month.

There will not be any price adjustment due to any change in the minimum computer system requirements.

Basis of Payment: The furnishing and maintenance of the construction field office will be paid at the listed unit price per month for the respective item "Construction Field Office, Extra-Large", which price shall include all material, equipment, labor, utility services and work incidental thereto.

The cost of providing the parking area, external illumination, trash removal and snow and ice removal shall be included in the monthly unit price bid for the respective item "Construction Field Office, Extra-Large".

The State will be responsible for payment of data communication user fees and for toll calls by State personnel.

Pay Item	Pay Unit
Construction Field Office, Extra-Large	Month

ITEM #0970006A - TRAFFICPERSON (MUNICIPAL POLICE OFFICER)

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.

Trafficpersons 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 Trafficpersons 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)	est.

ITEM NO. 0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

Article 9.71.01 – Description is supplemented by the following:

The Contractor shall maintain and protect traffic as described by the following and as limited in the Special Provision "Prosecution and Progress":

Route I-95

The Contractor shall maintain and protect the minimum number of through lanes and shoulders as dictated in the Special Provision for Section 1.08 - Prosecution and Progress "Limitations of Operations - Minimum Number of Lanes to Remain Open" Chart, on a paved travel path not less than 12 feet in width per lane.

Ramps and Turning Roadways

The Contractor shall maintain and protect existing traffic operations.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall be allowed to maintain and protect a minimum of one lane of traffic, on a paved travel path not less than 12 feet in width.

Except therefrom will be those periods, during the allowable periods, when the Contractor is actively performing paving operations on a ramp where the available ramp width is less than 28 feet and detour the ramp traffic in accordance with the pre-approved detour. The Contractor shall submit the ramp detour plan for approval to the engineer a minimum of 30 days prior to any ramp closures.

During the reconstruction of the I-95 southbound Exit 71 on and off –ramps, the Contractor will be allowed to close the ramps and detour traffic in accordance with the Detour Plans (Drawing DTR-1 and DTR-2). The duration of the detour shall not exceed 14 consecutive days for each of the on-ramp and off-ramp detours.

The Contractor shall notify the Engineer and Town Officials (Old Lyme and East Lyme) at least 14 days in advance of the start of the ramp closure.

All Other Roadways

The Contractor shall maintain and protect a minimum of one lane of traffic in each direction, each lane on a paved travel path not less than 11 feet in width.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall maintain and protect at least an alternating one-way traffic operation, on a paved travel path not less than 11 feet in width. The length of the alternating one-way traffic operation shall not exceed 300 feet and there shall be no more than one

alternating one-way traffic operation within the project limits without prior approval of the Engineer.

Commercial and Residential Driveways

The Contractor shall maintain access to and egress from all commercial and residential driveways throughout the project limits. The Contractor will be allowed to close said driveways to perform the required work during those periods when the businesses are closed, unless permission is granted from the business owner to close the driveway during business hours. If a temporary closure of a residential driveway is necessary, the Contractor shall coordinate with the owner to determine the time period of the closure.

Article 9.71.03 - Construction Method is supplemented as follows:

General

The Contractor is required to delineate any raised structures within the travel lanes, so that the structures are visible day and night, unless there are specific contract plans and provisions to temporarily lower these structures prior to the completion of work.

The Contractor shall schedule operations so that pavement removal and roadway resurfacing shall be completed full width across a roadway (bridge) section by the end of a workday (work night), or as directed by the Engineer.

When the installation of all intermediate courses of bituminous concrete pavement is completed for the entire roadway, the Contractor shall install the final course of bituminous concrete pavement.

When the Contractor is excavating adjacent to the roadway, the Contractor shall provide a 3-foot shoulder between the work area and travel lanes, with traffic drums spaced every 50 feet. At the end of the workday, if the vertical drop-off exceeds 3 inches, the Contractor shall provide a temporary traversable slope of 4:1 or flatter that is acceptable to the Engineer.

The Contractor shall not store any material on-site which would present a safety hazard to motorists or pedestrians (e.g. fixed object or obstruct sight lines).

The field installation of a signing pattern shall constitute interference with existing traffic operations and shall not be allowed, except during the allowable periods.

Construction vehicles entering travel lanes at speeds less than the posted speed are interfering with traffic, and shall not be allowed without a lane closure. The lane closure shall be of sufficient length to allow vehicles to enter or exit the work area at posted speeds, in order to merge with existing traffic.

Traffic Signals

Loop detectors disturbed by the Contractor's operations shall be made operational, in accordance with the special provision for Item No. 1111451A – Loop Detector Saw Cut, or temporary detection shall be provided within 24 hours of the termination of the existing loop detectors.

Existing Signing

The Contractor shall maintain all existing overhead and side-mounted signs throughout the project limits during the duration of the project. The Contractor shall temporarily relocate signs and sign supports as many times as deemed necessary, and install temporary sign supports if necessary and as directed by the Engineer.

Requirements for Winter

The Contractor shall schedule a meeting with representatives from the Department including the offices of Maintenance and Traffic, and the Town/City to determine what interim traffic control measures the Contractor shall accomplish for the winter to provide safety to the motorists and permit adequate snow removal procedures. This meeting shall be held prior to October 31 of each year and will include, but not be limited to, discussion of the status and schedule of the following items: lane and shoulder widths, pavement restoration, traffic signal work, pavement markings, and signing.

Signing Patterns

The Contractor shall erect and maintain all signing patterns in accordance with the traffic control plans contained herein. Proper distances between advance warning signs and proper taper lengths are mandatory.

Pavement Markings - Limited Access Highways, Turning Roadways and Ramps

During construction, the Contractor shall maintain all pavement markings throughout the limits of the project.

Interim Pavement Markings

The Contractor shall install painted pavement markings, which shall include lane lines (broken lines), shoulder edge lines, stop bars, lane-use arrows and gore markings, on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work day/night. All painted pavement markings will be paid under the appropriate items.

If the Contractor does not install permanent Epoxy Resin Pavement Markings by the end of the work day/night on exit ramps where the final course of bituminous concrete pavement has been installed, the Contractor shall install temporary 12 inch wide white stop bars. The temporary stop bars shall consist of Temporary Plastic Pavement Marking Tape and shall be installed by the end of the work day/night. Stop bars may consist of two 6 inch wide white markings or three 4 inch wide white markings placed side by side. The Contractor shall remove and dispose of these

markings when the permanent Epoxy Resin Pavement Markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

If an intermediate course of bituminous concrete pavement will be exposed throughout the winter, then Epoxy Resin Pavement Markings should be installed unless directed otherwise by the Engineer.

Final Pavement Markings

The Contractor should install painted pavement markings on the final course of bituminous concrete pavement by the end of the work day/night. If the painted pavement markings are not installed by the end of the work day/night, then Temporary Plastic Pavement Marking Tape shall be installed as described above and the painted pavement markings shall be installed by the end of the work day/night on Friday of that week.

If Temporary Plastic Pavement Marking Tape is installed, the Contractor shall remove and dispose of these markings when the painted pavement markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

The Contractor shall install permanent Epoxy Resin Pavement Markings in accordance with Section 12.10 entitled "Epoxy Resin Pavement Markings, Symbols, and Legends" after such time as determined by the Engineer.

TRAFFIC CONTROL DURING CONSTRUCTION OPERATIONS

The following guidelines shall assist field personnel in determining when and what type of traffic control patterns to use for various situations. These guidelines shall provide for the safe and efficient movement of traffic through work zones and enhance the safety of work forces in the work area.

TRAFFIC CONTROL PATTERNS

Traffic control patterns shall be used when a work operation requires that all or part of any vehicle or work area protrudes onto any part of a travel lane or shoulder. For each situation, the installation of traffic control devices shall be based on the following:

Speed and volume of traffic
Duration of operation
Exposure to hazards

Traffic control patterns shall be uniform, neat and orderly so as to command respect from the motorist.

In the case of a horizontal or vertical sight restriction in advance of the work area, the traffic control pattern shall be extended to provide adequate sight distance for approaching traffic.

If a lane reduction taper is required to shift traffic, the entire length of the taper should be installed on a tangent section of roadway so that the entire taper area can be seen by the motorist.

Any existing signs that are in conflict with the traffic control patterns shall be removed, covered, or turned so that they are not readable by oncoming traffic.

When installing a traffic control pattern, a Buffer Area should be provided and this area shall be free of equipment, workers, materials and parked vehicles.

Typical traffic control plans 19 through 25 may be used for moving operations such as line striping, pot hole patching, mowing, or sweeping when it is necessary for equipment to occupy a travel lane.

Traffic control patterns will not be required when vehicles are on an emergency patrol type activity or when a short duration stop is made and the equipment can be contained within the shoulder. Flashing lights and appropriate trafficperson shall be used when required.

Although each situation must be dealt with individually, conformity with the typical traffic control plans contained herein is required. In a situation not adequately covered by the typical traffic control plans, the Contractor must contact the Engineer for assistance prior to setting up a traffic control pattern.

PLACEMENT OF SIGNS

Signs must be placed in such a position to allow motorists the opportunity to reduce their speed prior to the work area. Signs shall be installed on the same side of the roadway as the work area. On multi-lane divided highways, advance warning signs shall be installed on both sides of the highway. On directional roadways (on-ramps, off-ramps, one-way roads), where the sight distance to signs is restricted, these signs should be installed on both sides of the roadway.

ALLOWABLE ADJUSTMENT OF SIGNS AND DEVICES SHOWN ON THE TRAFFIC CONTROL PLANS

The traffic control plans contained herein show the location and spacing of signs and devices under ideal conditions. Signs and devices should be installed as shown on these plans whenever possible.

The proper application of the traffic control plans and installation of traffic control devices depends on actual field conditions.

Adjustments to the traffic control plans shall be made only at the direction of the Engineer to improve the visibility of the signs and devices and to better control traffic operations. Adjustments to the traffic control plans shall be based on safety of work forces and motorists, abutting property requirements, driveways, side roads, and the vertical and horizontal curvature of the roadway.

The Engineer may require that the traffic control pattern be located significantly in advance of the work area to provide better sight line to the signing and safer traffic operations through the work zone.

Table I indicates the minimum taper length required for a lane closure based on the posted speed limit of the roadway. These taper lengths shall only be used when the recommended taper lengths shown on the traffic control plans cannot be achieved.

TABLE I – MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT MILES PER HOUR	MINIMUM TAPER LENGTH IN FEET FOR A SINGLE LANE CLOSURE
30 OR LESS	180
35	250
40	320
45	540
50	600
55	660
65	780

SECTION 1. WORK ZONE SAFETY MEETINGS

1.a) Prior to the commencement of work, a work zone safety meeting will be conducted with representatives of DOT Construction, Connecticut State Police (Local Barracks), Municipal Police, the Contractor (Project Superintendent) and the Traffic Control Subcontractor (if different than the prime Contractor) to review the traffic operations, lines of responsibility, and operating guidelines which will be used on the project. Other work zone safety meetings during the course of the project should be scheduled as needed.

1.b) A Work Zone Safety Meeting Agenda shall be developed and used at the meeting to outline the anticipated traffic control issues during the construction of this project. Any issues that can't be resolved at these meetings will be brought to the attention of the District Engineer and the Office of Construction. The agenda should include:

- Review Project scope of work and time
- Review Section 1.08, Prosecution and Progress
- Review Section 9.70, Trafficpersons
- Review Section 9.71, Maintenance and Protection of Traffic
- Review Contractor's schedule and method of operations.
- Review areas of special concern: ramps, turning roadways, medians, lane drops, etc.
- Open discussion of work zone questions and issues
- Discussion of review and approval process for changes in contract requirements as they relate to work zone areas

SECTION 2. GENERAL

2.a) If the required minimum number of signs and equipment (i.e. one High Mounted Internally Illuminated Flashing Arrow for each lane closed, two TMAs, Changeable Message Sign, etc.) are not available; the traffic control pattern shall not be installed.

2.b) The Contractor shall have back-up equipment (TMAs, High Mounted Internally Illuminated Flashing Arrow, Changeable Message Sign, construction signs, cones/drums, etc.) available at all times in case of mechanical failures, etc. The only exception to this is in the case of sudden equipment breakdowns in which the pattern may be installed but the Contractor must provide replacement equipment within 24 hours.

2.c) Failure of the Contractor to have the required minimum number of signs, personnel and equipment, which results in the pattern not being installed, shall not be a reason for a time extension or claim for loss time.

2.d) In cases of legitimate differences of opinion between the Contractor and the Inspection staff, the Inspection staff shall err on the side of safety. The matter shall be brought to the District Office for resolution immediately or, in the case of work after regular business hours, on the next business day.

SECTION 3. INSTALLING AND REMOVING TRAFFIC CONTROL PATTERNS

3.a) Lane Closures shall be installed beginning with the advanced warning signs and proceeding forward toward the work area.

3.b) Lane Closures shall be removed in the reverse order, beginning at the work area, or end of the traffic control pattern, and proceeding back toward the advanced warning signs.

3.c) Stopping traffic may be allowed:

- As per the contract for such activities as blasting, steel erection, etc.
- During paving, milling operations, etc. where, in the middle of the operation, it is necessary to flip the pattern to complete the operation on the other half of the roadway and traffic should not travel across the longitudinal joint or difference in roadway elevation.
- To move slow moving equipment across live traffic lanes into the work area.

3.d) Under certain situations when the safety of the traveling public and/or that of the workers may be compromised due to conditions such as traffic volume, speed, roadside obstructions, or sight line deficiencies, as determined by the Engineer and/or State Police, traffic may be briefly impeded while installing and/or removing the advanced warning signs and the first ten traffic cones/drums only. Appropriate measures shall be taken to safely slow traffic. If required, traffic slowing techniques may be used and shall include the use of Truck Mounted Impact Attenuators (TMAs) as appropriate, for a minimum of one mile in advance of the pattern starting point. Once the advanced warning signs and the first ten traffic cones/drums are installed/removed, the TMAs and sign crew shall continue to install/remove the pattern as described in Section 4c and traffic shall be allowed to resume their normal travel.

3.e) The Contractor must adhere to using the proper signs, placing the signs correctly, and ensuring the proper spacing of signs.

3.f) Additional devices are required on entrance ramps, exit ramps, and intersecting roads to warn and/or move traffic into the proper travelpath prior to merging/exiting with/from the

main line traffic. This shall be completed before installing the mainline pattern past the ramp or intersecting roadway.

3.g) Prior to installing a pattern, any conflicting existing signs shall be covered with an opaque material. Once the pattern is removed, the existing signs shall be uncovered.

3.h) On limited access roadways, workers are prohibited from crossing the travel lanes to install and remove signs or other devices on the opposite side of the roadway. Any signs or devices on the opposite side of the roadway shall be installed and removed separately.

SECTION 4. USE OF HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

4.a) On limited access roadways, one Flashing Arrow shall be used for each lane that is closed. The Flashing Arrow shall be installed concurrently with the installation of the traffic control pattern and its placement shall be as shown on the traffic control plan. For multiple lane closures, one Flashing Arrow is required for each lane closed. If conditions warrant, additional Flashing Arrows should be employed (i.e.: curves, major ramps, etc.).

4.b) On non-limited access roadways, the use of a Flashing Arrow for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the Flashing Arrow.

4.c) The Flashing Arrow shall not be used on two lane, two-way roadways for temporary alternating one-way traffic operations.

4.d) The Flashing Arrow board display shall be in the "arrow" mode for lane closure tapers and in the "caution" mode (four corners) for shoulder work, blocking the shoulder, or roadside work near the shoulder. The Flashing Arrow shall be in the "caution" mode when it is positioned in the closed lane.

4.e) The Flashing Arrow shall not be used on a multi-lane roadway to laterally shift all lanes of traffic, because unnecessary lane changing may result.

SECTION 5. USE OF TRUCK MOUNTED IMPACT ATTENUATOR VEHICLES (TMAs)

5.a) For lane closures on limited access roadways, a minimum of two TMAs shall be used to install and remove traffic control patterns. If two TMAs are not available, the pattern shall not be installed.

5.b) On non-limited access roadways, the use of TMAs to install and remove patterns closing a lane(s) is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to utilize the TMAs.

5.c) Generally, to establish the advance and transition signing, one TMA shall be placed on the shoulder and the second TMA shall be approximately 1,000 feet ahead blocking the lane. The flashing arrow board mounted on the TMA should be in the "flashing arrow" mode when taking the lane. The sign truck and workers should be immediately ahead of the second TMA. In no case shall the TMA be used as the sign truck or a work truck. Once the transition is in place, the TMAs shall travel in the closed lane until all Changeable Message Signs, signs, Flashing Arrows, and cones/drums are installed. The flashing arrow board mounted on the TMA should be in the "caution" mode when traveling in the closed lane.

5.d) A TMA shall be placed prior to the first work area in the pattern. If there are multiple work areas within the same pattern, then additional TMAs shall be positioned at each additional work area as needed. The flashing arrow board mounted on the TMA should be in the "caution" mode when in the closed lane.

5.e) TMAs shall be positioned a sufficient distance prior to the workers or equipment being protected to allow for appropriate vehicle roll-ahead in the event that the TMA is hit, but not so far that an errant vehicle could travel around the TMA and into the work area. For additional placement and use details, refer to the specification entitled "Type 'D' Portable Impact Attenuation System". Some operations, such as paving and concrete repairs, do not allow for placement of the TMA(s) within the specified distances. In these situations, the TMA(s) should be placed at the beginning of the work area and shall be advanced as the paving or concrete operations proceed.

5.f) TMAs should be paid in accordance with how the unit is utilized. When it is used as a TMA and is in the proper location as specified, and then it should be paid at the specified hourly rate for "Type 'D' Portable Impact Attenuation System". When the TMA is used as a Flashing Arrow, it should be paid at the daily rate for "High Mounted Internally Illuminated Flashing Arrow". If a TMA is used to install and remove a pattern and then is used as a Flashing Arrow, the unit should be paid as a "Type 'D' Portable Impact Attenuation System" for the hours used to install and remove the pattern, typically 2 hours (1 hour to install and 1 hour to remove), and is also paid for the day as a "High Mounted Internally Illuminated Flashing Arrow".

SECTION 6. USE OF TRAFFIC DRUMS AND TRAFFIC CONES

6.a) Traffic drums shall be used for taper channelization on limited-access roadways, ramps, and turning roadways and to delineate raised catch basins and other hazards.

6.b) Traffic drums shall be used in place of traffic cones in traffic control patterns that are in effect for more than a 36-hour duration.

6.c) Traffic Cones less than 42 inches in height shall not be used on limited-access roadways or on non-limited access roadways with a posted speed limit of 45 mph and above.

6.d) Typical spacing of traffic drums and/or cones shown on the Traffic Control Plans in the Contract are maximum spacings and may be reduced to meet actual field conditions as required.

SECTION 7. USE OF (REMOTE CONTROLLED) CHANGEABLE MESSAGE SIGNS (CMS)

7.a) For lane closures on limited access roadways, one CMS shall be used in advance of the traffic control pattern. Prior to installing the pattern, the CMS shall be installed and in operation, displaying the appropriate lane closure information (i.e.: Left Lane Closed - Merge Right). The CMS shall be positioned ½ - 1 mile ahead of the lane closure taper. If the nearest Exit ramp is greater than the specified ½ - 1 mile distance, than an additional CMS shall be positioned a sufficient distance ahead of the Exit ramp to alert motorists to the work and therefore offer them an opportunity to take the exit.

7.b) CMS should not be installed within 1000 feet of an existing CMS.

7.c) On non-limited access roadways, the use of CMS for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the CMS.

7.d) The advance CMS is typically placed off the right shoulder, 5 feet from the edge of pavement. In areas where the CMS cannot be placed beyond the edge of pavement, it may be placed on the paved shoulder with a minimum of five (5) traffic drums placed in a taper in front of it to delineate its position. The advance CMS shall be adequately protected if it is used for a continuous duration of 36 hours or more.

7.e) When the CMS are no longer required, they should be removed from the clear zone and have the display screen cleared and turned 90° away from the roadway.

7.f) The CMS generally should not be used for generic messages (ex: Road Work Ahead, Bump Ahead, Gravel Road, etc.).

7.g) The CMS should be used for specific situations that need to command the motorist's attention which cannot be conveyed with standard construction signs (Examples include: Exit 34 Closed Sat/Sun - Use Exit 35, All Lanes Closed - Use Shoulder, Workers on Road - Slow Down).

7.h) Messages that need to be displayed for long periods of time, such as during stage construction, should be displayed with construction signs. For special signs, please

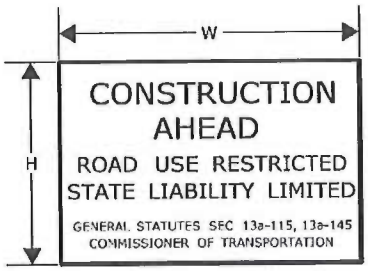
coordinate with the Office of Construction and the Division of Traffic Engineering for the proper layout/dimensions required.

7.i) The messages that are allowed on the CMS are as follows:

Message No.	Frame 1	Frame 2	Message No.	Frame 1	Frame 2
1	LEFT LANE CLOSED	MERGE RIGHT	9	LANES CLOSED AHEAD	REDUCE SPEED
2	2 LEFT LANES CLOSED	MERGE RIGHT	10	LANES CLOSED AHEAD	USE CAUTION
3	LEFT LANE CLOSED	REDUCE SPEED	11	WORKERS ON ROAD	REDUCE SPEED
4	2 LEFT LANES CLOSED	REDUCE SPEED	12	WORKERS ON ROAD	SLOW DOWN
5	RIGHT LANE CLOSED	MERGE LEFT	13	EXIT XX CLOSED	USE EXIT YY
6	2 RIGHT LANES CLOSED	MERGE LEFT	14	EXIT XX CLOSED USE YY	FOLLOW DETOUR
7	RIGHT LANE CLOSED	REDUCE SPEED	15	2 LANES SHIFT AHEAD	USE CAUTION
8	2 RIGHT LANES CLOSED	REDUCE SPEED	16	3 LANES SHIFT AHEAD	USE CAUTION

For any other message(s), approval must be received from the Office of Construction prior to their use. No more than two (2) displays shall be used within any message cycle.

SERIES 16 SIGNS



		W H
16-E	80-1605	84" x 60"
16-H	80-1608	60" x 42"
16-M	80-1613	30" x 24"

		W H
16-S	80-1619	48" x 30"

THE 16-S SIGN SHALL BE USED ON ALL PROJECTS THAT REQUIRE SIDEWALK RECONSTRUCTION OR RESTRICT PEDESTRIAN TRAVEL ON AN EXISTING SIDEWALK.

SERIES 16 SIGNS SHALL BE INSTALLED IN ADVANCE OF THE TRAFFIC CONTROL PATTERNS TO ALLOW MOTORISTS THE OPPORTUNITY TO AVOID A WORK ZONE. SERIES 16 SIGNS SHALL BE INSTALLED ON ANY MAJOR INTERSECTING ROADWAYS THAT APPROACH THE WORK ZONE. ON LIMITED-ACCESS HIGHWAYS, THESE SIGNS SHALL BE LOCATED IN ADVANCE OF THE NEAREST UPSTREAM EXIT RAMP AND ON ANY ENTRANCE RAMPS PRIOR TO OR WITHIN THE WORK ZONE LIMITS.

THE LOCATION OF SERIES 16 SIGNS CAN BE FOUND ELSEWHERE IN THE PLANS OR INSTALLED AS DIRECTED BY THE ENGINEER.

SIGNS 16-E AND 16-H SHALL BE POST-MOUNTED.

SIGN 16-E SHALL BE USED ON ALL EXPRESSWAYS.

SIGN 16-H SHALL BE USED ON ALL RAMPS, OTHER STATE ROADWAYS, AND MAJOR TOWN/CITY ROADWAYS.

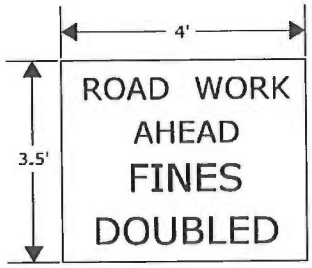
SIGN 16-M SHALL BE USED ON OTHER TOWN ROADWAYS.

REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"

THE REGULATORY SIGN "ROAD WORK AHEAD FINES DOUBLED" SHALL BE INSTALLED FOR ALL WORK ZONES THAT OCCUR ON ANY STATE HIGHWAY IN CONNECTICUT WHERE THERE ARE WORKERS ON THE HIGHWAY OR WHEN THERE IS OTHER THAN EXISTING TRAFFIC OPERATIONS.

THE "ROAD WORK AHEAD FINES DOUBLED" REGULATORY SIGN SHALL BE PLACED AFTER THE SERIES 16 SIGN AND IN ADVANCE OF THE "ROAD WORK AHEAD" SIGN.

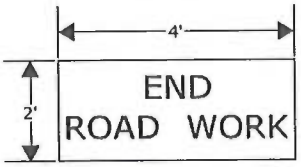
31-1906



"END ROAD WORK" SIGN

THE LAST SIGN IN THE PATTERN MUST BE THE "END ROAD WORK" SIGN.

80-9612



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

REQUIRED SIGNS

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.08.05 11:35:43-04'00'
PRINCIPAL ENGINEER

NOTES FOR TRAFFIC CONTROL PLANS

1. IF A TRAFFIC STOPPAGE OCCURS IN ADVANCE OF SIGN (A), THEN AN ADDITIONAL SIGN (A) SHALL BE INSTALLED IN ADVANCE OF THE STOPPAGE.

2. SIGNS (AA), (A), AND (D) SHOULD BE OMITTED WHEN THESE SIGNS HAVE ALREADY BEEN INSTALLED TO DESIGNATE A LARGER WORK ZONE THAN THE WORK ZONE THAT IS ENCOMPASSED ON THIS PLAN.

3. SEE TABLE 1 FOR ADJUSTMENT OF TAPERS IF NECESSARY.

4. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN TRAFFIC DRUMS SHALL BE USED IN PLACE OF TRAFFIC CONES.

5. ANY LEGAL SPEED LIMIT SIGNS WITHIN THE LIMITS OF A ROADWAY / LANE CLOSURE AREA SHALL BE COVERED WITH AN OPAQUE MATERIAL WHILE THE CLOSURE IS IN EFFECT, AND UNCOVERED WHEN THE ROADWAY / LANE CLOSURE IS RE-OPENED TO ALL LANES OF TRAFFIC.

6. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN ANY EXISTING CONFLICTING PAVEMENT MARKINGS SHALL BE ERADICATED OR COVERED, AND TEMPORARY PAVEMENT MARKINGS THAT DELINEATE THE PROPER TRAVELPATHS SHALL BE INSTALLED.

7. DISTANCES BETWEEN SIGNS IN THE ADVANCE WARNING AREA MAY BE REDUCED TO 100' ON LOW-SPEED URBAN ROADS (SPEED LIMIT < 40 MPH).

8. IF THIS PLAN IS TO REMAIN IN OPERATION DURING THE HOURS OF DARKNESS, INSTALL BARRICADE WARNING LIGHTS - HIGH INTENSITY ON ALL POST-MOUNTED DIAMOND SIGNS IN THE ADVANCE WARNING AREA.

9. A CHANGEABLE MESSAGE SIGN SHALL BE INSTALLED ONE HALF TO ONE MILE IN ADVANCE OF THE LANE CLOSURE TAPER.

10 SIGN (P) SHALL BE MOUNTED A MINIMUM OF 7 FEET FROM THE PAVEMENT SURFACE TO THE BOTTOM OF THE SIGN.

TABLE 1 - MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT (MILES PER HOUR)	MINIMUM TAPER LENGTH FOR A SINGLE LANE CLOSURE
30 OR LESS	180' (55m)
35	250' (75m)
40	320' (100m)
45	540' (165m)
50	600' (180m)
55	660' (200m)
65	780' (240m)

METRIC CONVERSION CHART (1" = 25mm)

ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC
12"	300mm	42"	1050mm	72"	1800mm
18"	450mm	48"	1200mm	78"	1950mm
24"	600mm	54"	1350mm	84"	2100mm
30"	750mm	60"	1500mm	90"	2250mm
36"	900mm	66"	1650mm	96"	2400mm

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

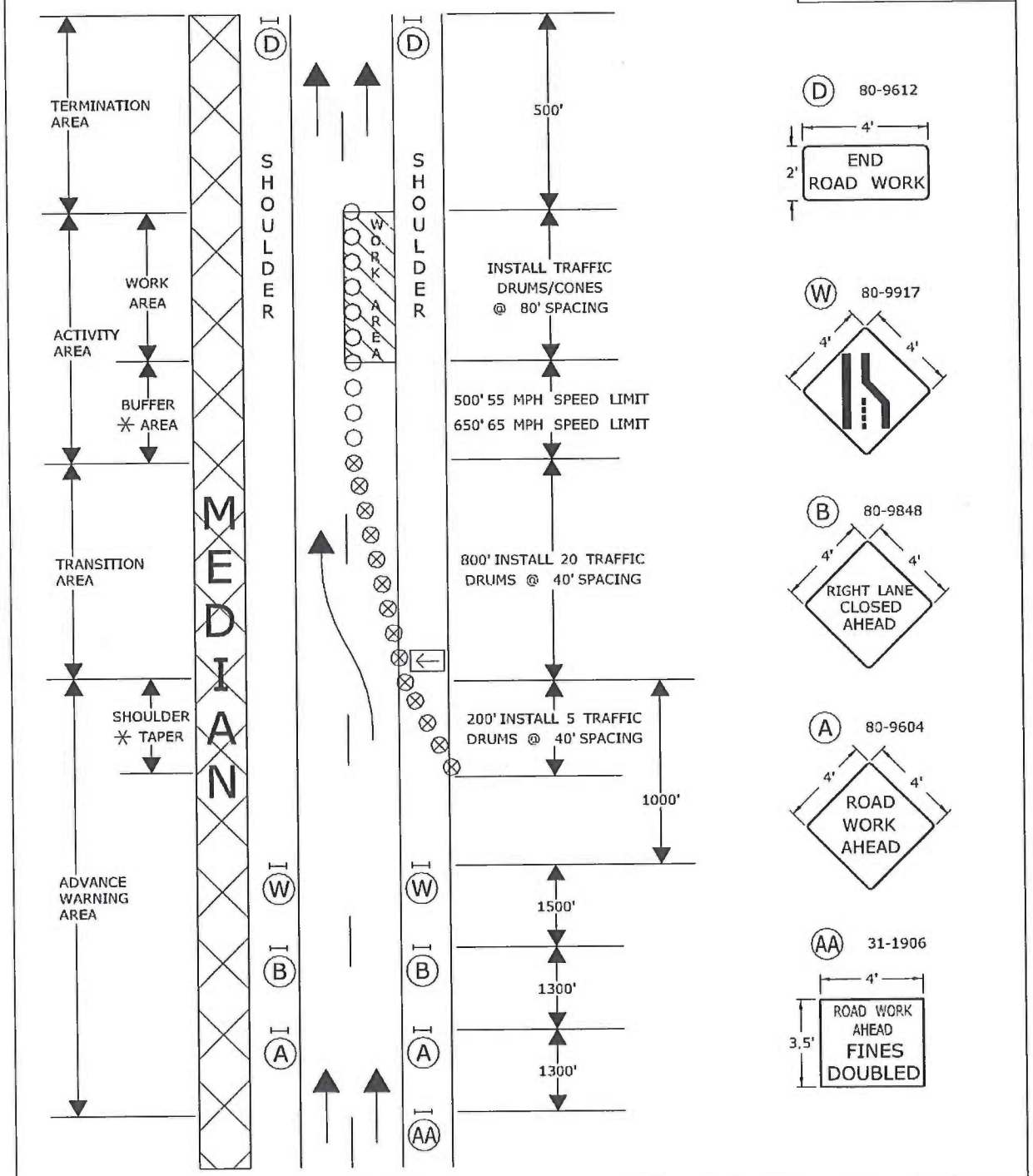
NOTES

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.06.05 15:50:35-04'00'
PRINCIPAL ENGINEER

WORK IN RIGHT LANE - MULTILANE HIGHWAY

SIGN FACE
126 SQ. FT (MIN.)



○ TRAFFIC CONE **OR** TRAFFIC DRUM
✳ OPTIONAL ⊗ TRAFFIC DRUM ⊢⊣ PORTABLE SIGN SUPPORT
⟵ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 1

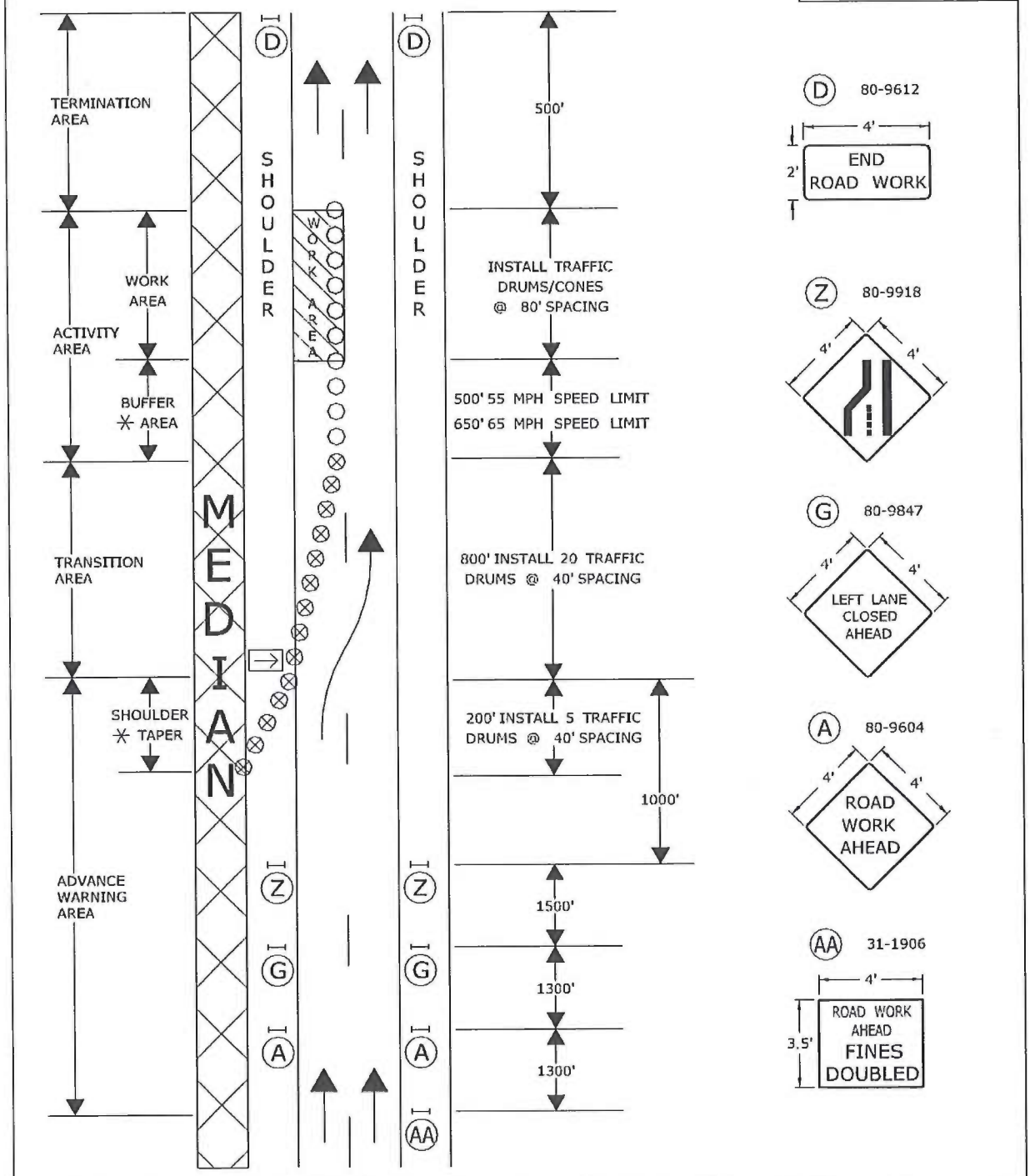
SEE NOTES 1, 2, 3, 4, 5, 6, 8, 9

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.05.05 15:51:00-04'00'
PRINCIPAL ENGINEER

WORK IN LEFT LANE - MULTILANE HIGHWAY

SIGN FACE
126 SQ. FT (MIN.)



○ TRAFFIC CONE **OR** TRAFFIC DRUM
✳ OPTIONAL ⊗ TRAFFIC DRUM ⊢⊣ PORTABLE SIGN SUPPORT
⇦ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 3

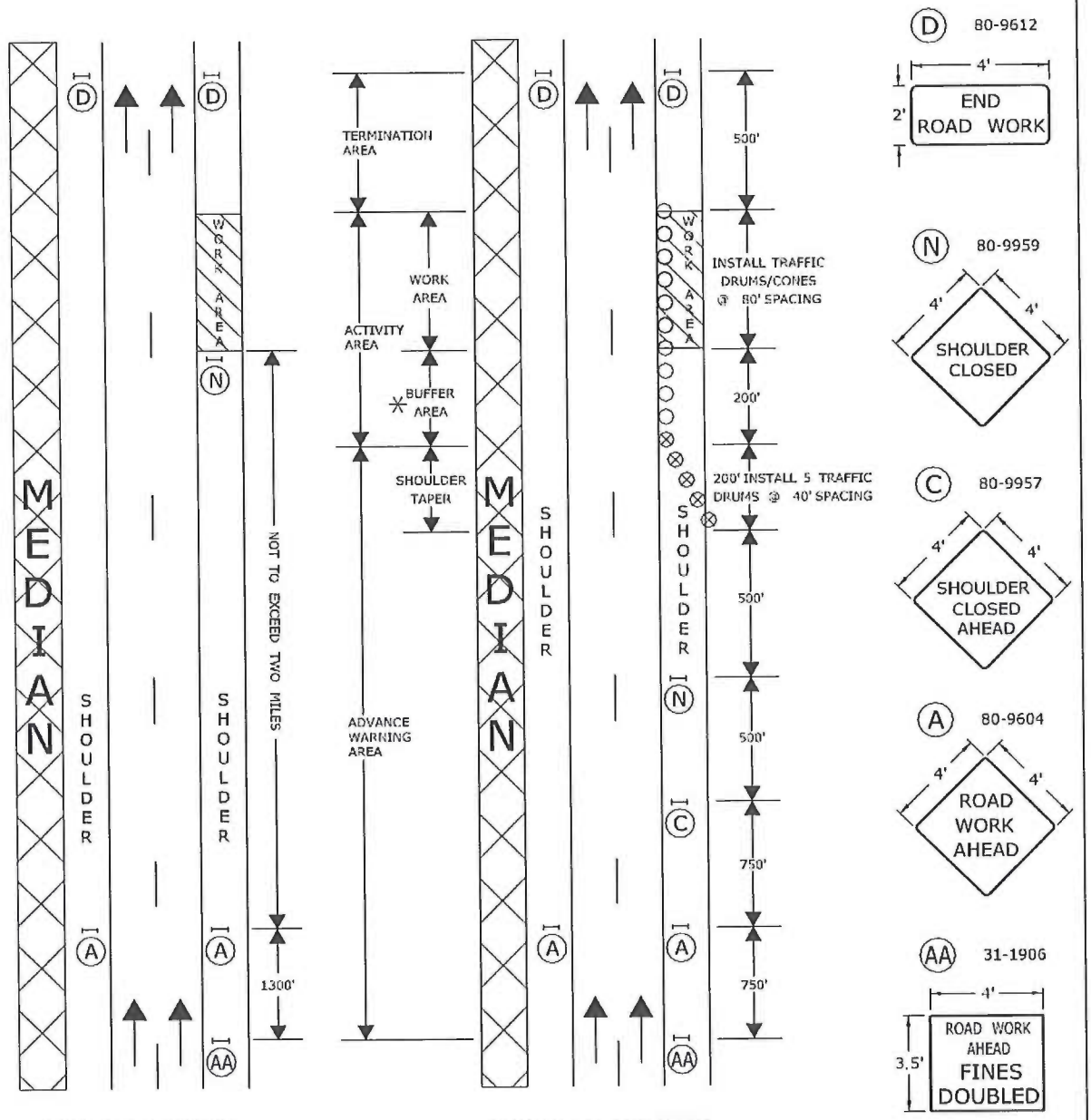
SEE NOTES 1, 2, 3, 4, 5, 6, 8, 9

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.08.05 15:51:48-0400
PRINCIPAL ENGINEER

WORK IN SHOULDER AREA - MULTILANE HIGHWAY

SIGN FACE
94 SQ. FT (MIN.)



TRAFFIC CONE **OR** TRAFFIC DRUM
OPTIONAL TRAFFIC DRUM PORTABLE SIGN SUPPORT
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 6

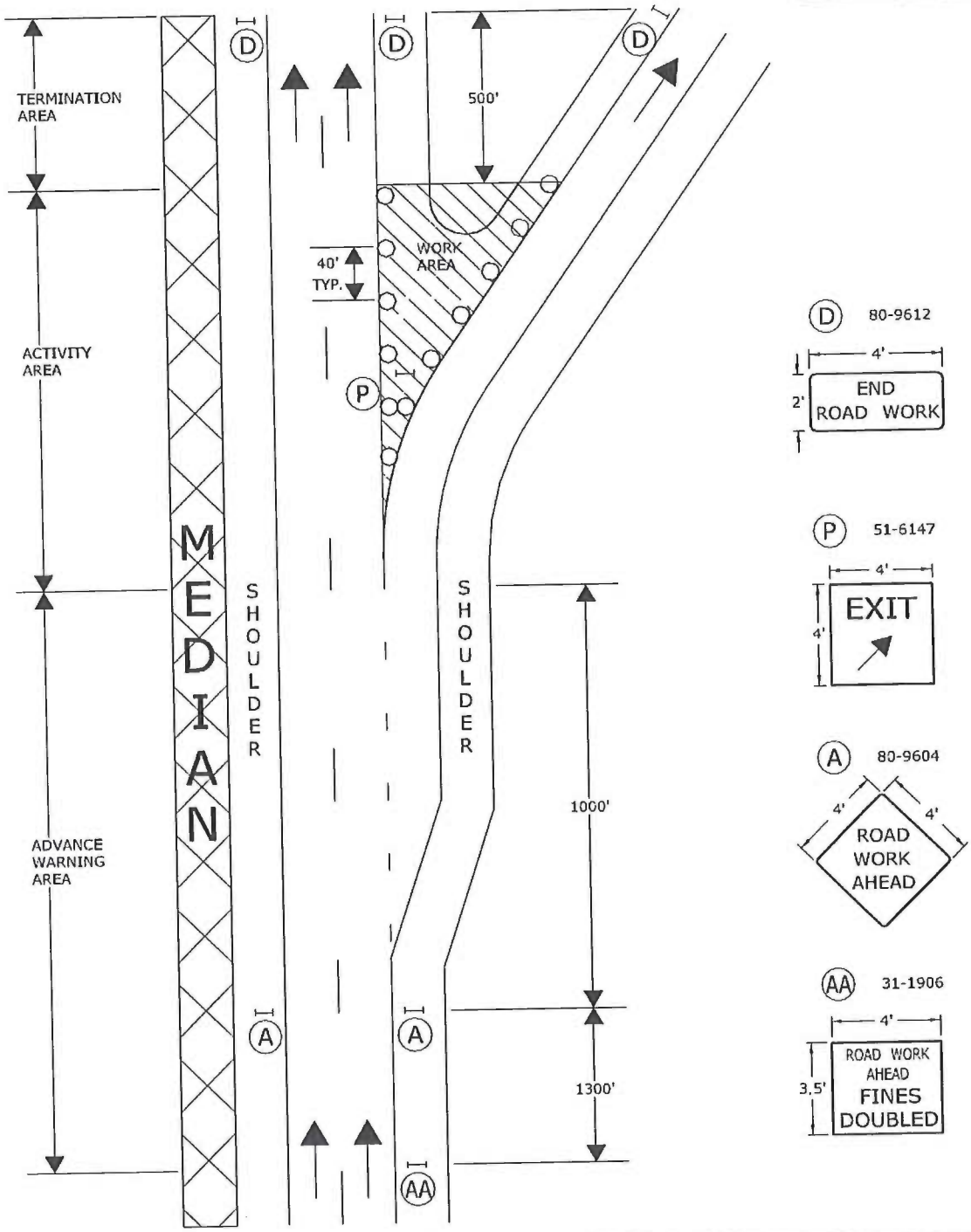
SEE NOTES 1, 2, 4, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012 06 05 15 52 38-04 00
PRINCIPAL ENGINEER

WORK IN RAMP GORE AREA

SIGN FACE
86 SQ. FT (MIN.)



○ TRAFFIC CONE **OR** TRAFFIC DRUM
✳ OPTIONAL ⊗ TRAFFIC DRUM ⊢ PORTABLE SIGN SUPPORT
⇦ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 7
SEE NOTES 1, 2, 4, 8, 10

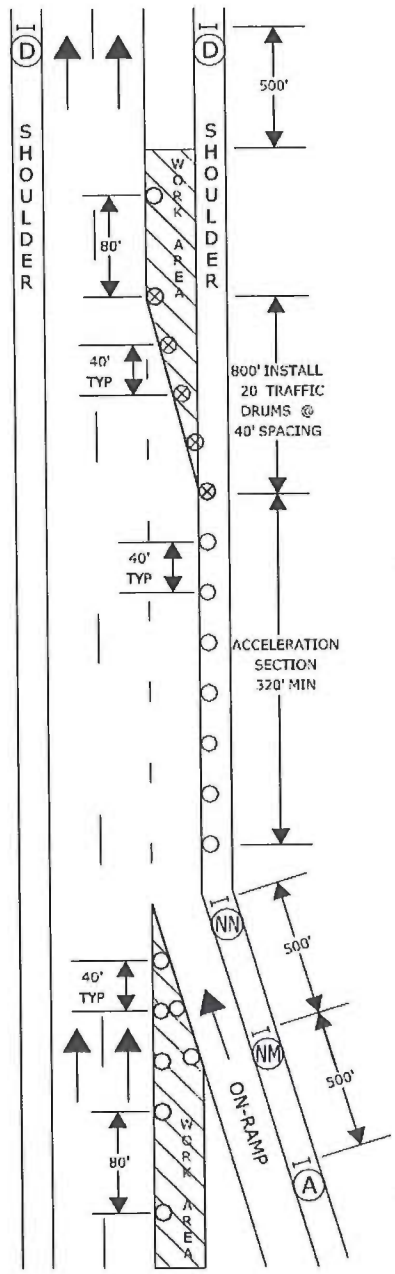
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.05.05 15:53:03-0400
PRINCIPAL ENGINEER

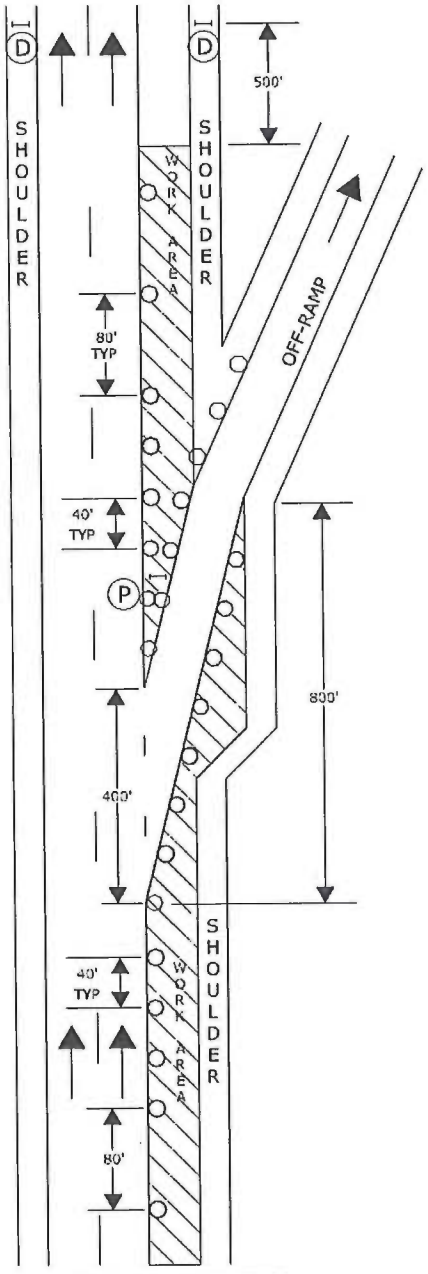
ITEM #0971001A

TYPICAL RAMP TREATMENTS FOR MAINLINE LANE CLOSURE - MULTILANE HIGHWAY

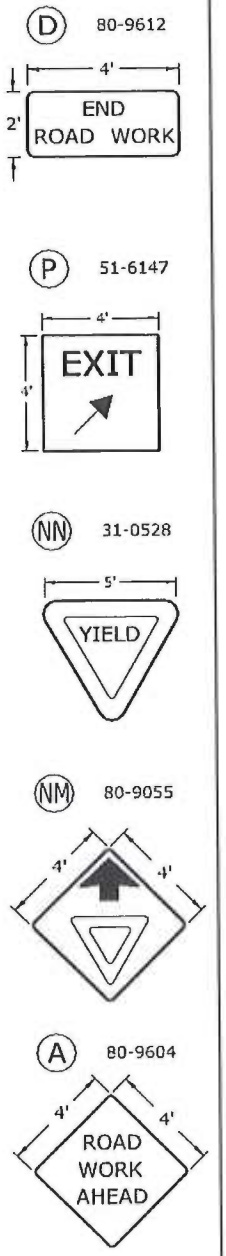
SIGN FACE
SQ. FT VARIES



ON-RAMP TREATMENT



OFF-RAMP TREATMENT



USE TRAFFIC CONTROL PLAN 1 TO CLOSE THE RIGHT LANE

○ TRAFFIC CONE **OR** TRAFFIC DRUM
✳ OPTIONAL ⊗ TRAFFIC DRUM ⊢ PORTABLE SIGN SUPPORT
⇦ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 8

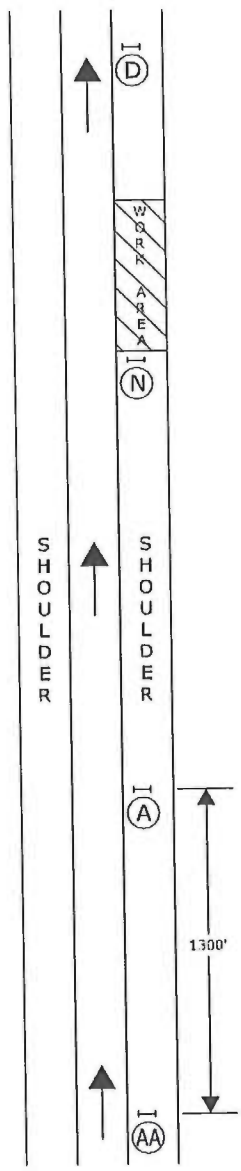
SEE NOTES 1, 2, 3, 4, 5, 6, 8, 9, 10

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

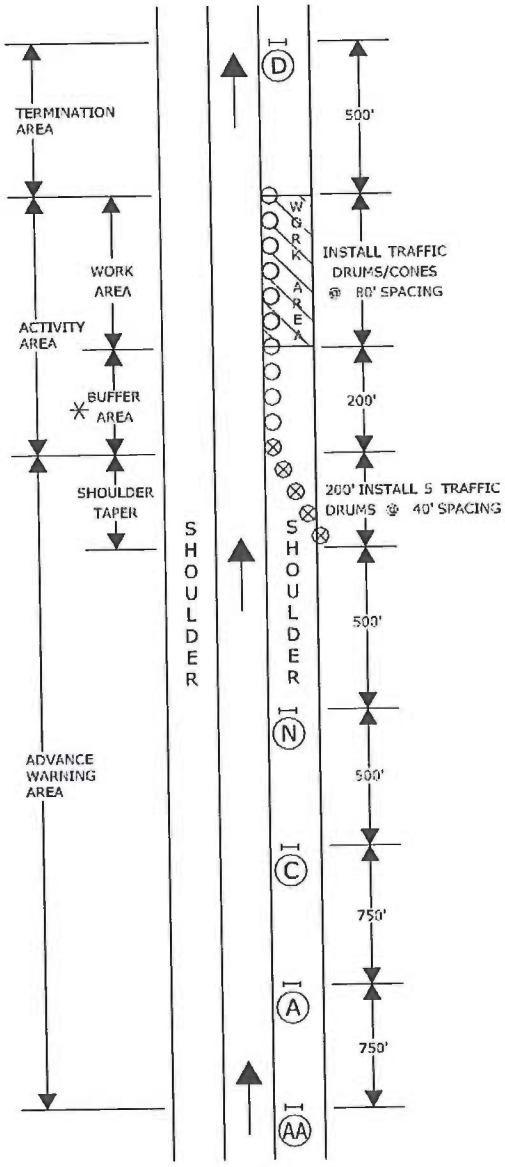
APPROVED Charles S. Harlow 2012.09.05 15:53:31-0400
PRINCIPAL ENGINEER

WORK IN SHOULDER AREA - TURNING ROADWAYS / RAMPS

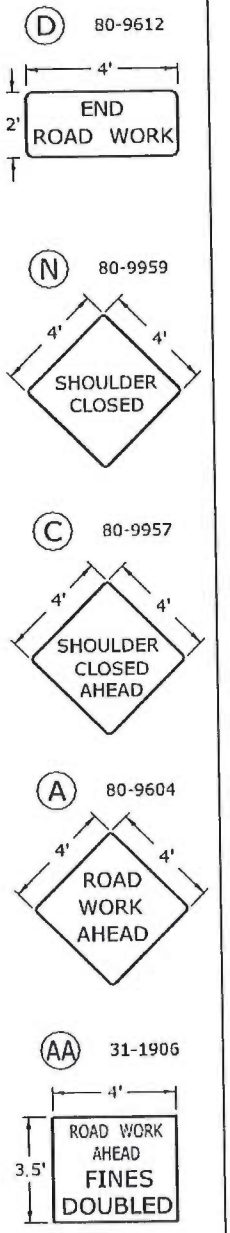
SIGN FACE
70 SQ. FT (MIN.)



MOVING OPERATION



STATIONARY OPERATION



○ TRAFFIC CONE **OR** TRAFFIC DRUM
✳ OPTIONAL ⊗ TRAFFIC DRUM ⊢⊣ PORTABLE SIGN SUPPORT
⇦ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 9
SEE NOTES 1, 2, 4, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.06.05 15:53:53-04'00'
PRINCIPAL ENGINEER

Article 9.71.05 – Basis of Payment is supplemented by the following:

The temporary relocation of signs and supports, and the furnishing, installation and removal of any temporary supports shall be paid for under the item "Maintenance and Protection of Traffic". Temporary overhead sign supports and foundations shall be paid for under the appropriate item(s).

The cost of furnishing, installing, and removing the material for the 4H:1V traversable slope shall be paid for under the item "Maintenance and Protection of Traffic."

ITEM #0974001A - REMOVAL OF EXISTING MASONRY

Work under this item shall conform to the requirements of Section 9.74 amended as follows:

Article 9.74.02 - Construction Methods: Add the following:

The concrete shall be removed to the limits shown on the plans. The concrete shall be saw cut to delineate the removal limits. Pneumatic hammers or any other method approved by the Engineer may be used to remove the concrete. Maximum 30 lbs hammers shall be used for general removal while maximum 15 lbs hammers shall be used near reinforcing steel that is to remain. Pneumatic tools shall not be placed in direct contact with the reinforcing steel that is to remain.

Reinforcing steel shall be cut and removed as shown on the plans. Loose and small concrete fragments shall be cleaned from the reinforcing steel required to be left in place.

Bridge railing and posts shall be cut, removed and reset as shown on the plans

The Contractor shall take necessary precautions to prevent any damage to the portions of the structure to remain. Any damage shall be repaired by the Contractor, as directed by the Engineer, and at no cost to the State.

When removing the concrete and reinforcing steel, the Contractor shall take necessary precautions to prevent debris from dropping to areas below the structure in to the roadway, sidewalks or onto adjacent traffic lanes.

All debris shall be disposed of, from the site, by the Contractor.

Article 9.74.05 - Basis of Payment: Delete in its entirety and replace with the following:

This work will be paid for at the contract unit price per cubic yard for "Removal of Existing Masonry", which price shall include all equipment, tools and labor incidental thereto.

Pay Item	Pay Unit
Removal of Existing Masonry	c.y.

ITEM #0975004A - MOBILIZATION AND PROJECT CLOSEOUT

9.75.01 – Description:
This item shall consist of all work necessary for the movement of personnel and furnishing equipment to the project site, and for the establishment of all Contractors' field offices, buildings and other facilities necessary to the performance of the work. In addition, this item shall include the preparation of work plans and submittals necessary to facilitate the commencement of physical construction. These initial submittals are identified elsewhere in the contract and may include project schedules, project management plans, safety plans, quality plans, erosion and sedimentation control plans and similar submittals addressing the general sequencing and management of the project. This item shall also include demobilization of plant and equipment, completion of all punchlist work, and administrative closeout items necessary to satisfy all contract requirements.

This item may not be subcontracted, in whole or part.

9.75.04 – Method of Measurement:
This work will be measured for payment in the manner described hereinafter; however, the determination of the total contract price earned shall not include the amount of mobilization earned during the period covered by the current monthly estimate - but shall include amounts previously earned and certified for payment.

1. When the first payment estimate is made, 25 percent of the lump sum bid price for this item or 2.5 percent of the total original contract price, whichever is less, shall be certified for payment.

2. When the initial project submittals necessary to begin construction are accepted by the Engineer, 50 percent of the lump sum bid price for this item or 5.0 percent of the total original contract price, whichever is less, minus any previous payments, shall be certified for payment.

3. When the initial project submittals are accepted by the Engineer, and 15 percent of the total original contract price is earned, 70 percent of the lump sum price of this item or 7.0 percent of the total original contract price, whichever is less, minus any previous payments, will be certified for payment.

4. When 30 percent of the total original contract price is earned 85 percent of the lump sum price of this item or 8.5 percent of the total original contract price, whichever is less, minus any previous payments, will be certified for payment.

5. When the requirements of Article 1.08.13 have been satisfied 95 percent of the lump sum price of this item, minus any previous payments, will be certified for payment.

6. When the requirements of Article 1.08.14 have been satisfied 100 percent of the lump sum price of this item, minus any previous payments, will be certified for payment.

Nothing herein shall be construed to limit or preclude partial payments otherwise provided for by the contract.

9.75.05 – Basis of Payment:
This work will be paid for at the contract lump sum price for "Mobilization and Project Closeout" which price shall include materials, equipment, tools, transportation, labor and all work incidental thereto.

This item shall not be paid more than one time. If the Contractor is required to mobilize equipment or facilities more than one time, due to reasons solely the responsibility of the Department, any additional efforts will be paid as Extra Work under Section 1.04.05.

Pay Item	Pay Unit
Mobilization and Project Closeout	l.s. (l.s.)

ITEM #0979003A - CONSTRUCTION BARRICADE TYPE III

Article 9.79.01 – Description: The Contractor shall furnish construction barricades to conform to the requirements of NCHRP Report 350 (TL-3) and to the requirements stated in Article 9.71 "Maintenance and Protection of Traffic," as shown on the plans and/or as directed by the Engineer.

Article 9.79.02 – Materials: Prior to using the construction barricades, 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 conform to NCHRP Report 350 (TL-3).

Alternate stripes of white and orange Type III or Type VI reflective sheeting shall be applied to the horizontal members as shown on the plans. Application of the reflective sheeting shall conform to the requirements specified by the reflective sheeting manufacturer. Only one type of sheeting shall be used on a barricade and all barricades furnished shall have the same type of reflective sheeting. Reflective sheeting shall conform to the requirements of Article M.18.09.01.

Construction barricades shall be designed and fabricated so as to prevent them from being blown over or displaced by the wind from passing vehicles. Construction barricades shall be approved by the Engineer before they are used.

Article 9.79.03 – Construction Methods: Ineffective barricades, 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.

Barricades that are no longer required shall be removed from the project and shall remain the property of the Contractor.

Article 9.79.04 – Method of Measurement: Construction Barricade Type III will be measured for payment by the number of construction barricades required and used.

Article 9.79.05 – Basis of Payment: "Construction Barricade Type III" required and used will be paid for at the Contract unit price per each. Each barricade will be paid for once, regardless of the number of times it is used.

Pay Item	Pay Unit
Construction Barricade Type III	EA.

ITEM NO. 0980001A – CONSTRUCTION STAKING

9.80.01—Description: The work under this item shall consist of construction layout and reference staking necessary for the proper control and satisfactory completion of all work on the project, except property lines, highway lines, or non-access lines. The work shall also include construction layout and reference staking required for identifying existing pavement conditions.

9.80.02—Materials: All stakes used for control staking shall be of the same quality as used by the Department for this purpose. For slope limits, pavement edges, gutter lines, etc., where so-called "green" or "working" stakes are commonly used, lesser quality stakes will be acceptable, provided the stakes are suitable for the intended purpose.

9.80.03—Construction Methods: The Department will furnish the Contractor such control points, bench marks, and other data as may be necessary for the construction staking and layout by qualified engineering or surveying personnel as noted elsewhere herein.

The Contractor shall be responsible for the placement and preservation of adequate ties to all control points, necessary for the accurate re-establishment of all base lines, center lines, and all critical grades as shown on the plans or directed by the Engineer.

All stakes, references, and batter boards which may be required for construction operations, signing and traffic control shall be furnished, set and properly referenced by the Contractor. The Contractor shall be solely and completely responsible for the accuracy of the line and grade of all features of the work. Any errors or apparent discrepancies found in previous surveys, plans, specifications or special provisions shall be called to the Engineer's attention immediately for correction or interpretation prior to proceeding with the work.

During roadway construction (or site work), the Contractor shall provide and maintain for the periods needed, as determined by the Engineer, reference stakes at 25 foot intervals outside the slope limits or as directed by the Engineer Further, the Contractor shall provide and maintain reference stakes at 25 foot intervals immediately prior to milling operations and during the formation of subgrade and the construction of all subsequent pavement layers, including shim course. These stakes shall be properly marked as to station, offset and shall be referenced to the proposed grade, even if laser or GPS machine controls are used.

The Contractor shall provide and maintain reference stakes at drainage structures, including reference stakes for the determination of the structure alignments as may be needed for the proper construction of the drainage structure. The reference stakes shall be placed immediately prior to and maintained during the installation of the drainage structure. These stakes shall be properly marked as to station, offset and shall be referenced to the proposed grade.

The Contractor shall furnish copies of data used in setting and referencing stakes and other layout markings used by the Contractor after completion of each operation.

The Contractor shall provide safe facilities for convenient access by Department forces to control points, batter boards, and references.

All staking shall be performed by qualified engineering or surveying personnel who are trained, experienced and skilled in construction layout and staking of the type required under the contract. Prior to start of work, the Contractor shall submit for review and comment the qualifications of personnel responsible for construction staking on the project. All survey work shall be performed under the direct supervision of a Professional Surveyor licensed in the State of Connecticut. The submission shall include a description of the experience and training which the proposed staff possesses and a list of similar projects the personnel have worked on previously. All field layout and staking required for the project shall be performed under the direct supervision of a person, or persons, of engineering background experienced in the direction of such work and acceptable to the Engineer. If the personnel responsible for construction staking change during the course of the project, then a revised submittal will be required.

The Department may check the control of the work, as established by the Contractor, at any time as the work progresses. The Contractor will be informed of the results of these checks, but the Department by so doing in no way relieves the Contractor of responsibility for the accuracy of the layout work. The Contractor shall correct or replace, at the Contractor's own expense, any deficient layout and construction work which may be the result of the inaccuracies in the Contractor's staking operations or the failure to report such inaccuracies, or the Contractor's failure to report inaccuracies found in work done by the Department or by others. If, as a result of these inaccuracies, the Department is required to make further studies, redesign, or both, all expenses incurred by the Department due to such inaccuracies will be deducted from any monies due the Contractor.

The Contractor shall furnish all necessary personnel, engineering equipment and supplies, materials, transportation, and work incidental to the accurate and satisfactory completion of this work.

For Roadway Elevation Review: The Contractor shall provide additional reference stakes to assist the Engineer and design personnel in their duties identified in the Contact Documents or as directed. These additional stakes may include stakes to identify areas of adverse grades. Stakes are to be installed at a maximum spacing of 25 feet along slope limits and curblines. Where the roadway elevation become adverse at smaller intervals per the direction of the Engineer. Each stake shall be marked to identify its baseline station, offset, and the feature it represents.

For roadways where the existing pavement markings need to be reestablished:
Prior to any resurfacing or obliteration of existing pavement markings, the Contractor and a representative of the Engineer must establish and document pavement marking control points from the existing markings. These control points shall be used to reestablish the positions of the lanes, the beginnings and endings of tapers, channelization lines for on and off ramps, lane use arrows, stop bars, and any lane transitions in the project area. The Contractor shall use these control points to provide appropriate premarking prior to the installation of the final markings.

The Contractor shall provide and maintain reference stakes and/or markings at 50 foot intervals immediately off the edge of pavement to be used to reestablish the existing pavement markings. The Contractor shall also provide and maintain reference stakes and/or markings at any point where there is a change in pavement markings to reestablish the existing pavement markings.

For non-limited access roadways
On non-limited access roadways it may be necessary to adjust the final locations of the pavement markings to accommodate pedestrians and bicyclists where feasible. Prior to any resurfacing or obliteration of existing pavement markings, the Contractor, a representative of the Engineer, and a representative of the Division of Traffic Engineering must establish and document pavement marking control points from the existing markings as described above. The control points at that time may be adjusted to provide minimum shoulder widths of 4 to 5 feet wherever possible while maintaining travel lane widths of no less than 11 feet and no more than 12 feet.

9.80.04—Method of Measurement: Construction staking will be at the Contract lump sum for construction staking.

When no price for "Construction Staking" is asked for on the proposal form, the cost of the work described above shall be included in the general cost of the work and no direct payment for "Construction Staking" will be made.

9.80.05—Basis of Payment: Construction staking will be paid for at the Contract lump sum price for "Construction Staking," which price shall include all materials, tools, equipment, labor and work incidental thereto. A schedule of values for payment shall be submitted to the Department for review and comment prior to payment.

Pay Item	Pay Unit
Construction Staking	l.s.

ITEM #1010060A – CLEAN EXISTING CONCRETE HANDHOLE

DESCRIPTION:

Clean all debris from an existing concrete handhole where shown on the plans or as directed.

MATERIAL:

Insulated Bonding Bushings:
- Specification Grade
- Threaded
- Malleable Iron or Steel
- Galvanized
- UL listed

Bonding Wire:
- M.15.13

Grout:
- M.03.05

CONSTRUCTION METHODS:

Remove to a level even with the bottom of the handhole all sand, silt and other debris. Remove any material that is accessible from the ends of conduit. Additional conduit cleaning will be paid for under Item 1008908A-Clean Existing Conduit. Place approximately 4" (100) of ¾" (19) crushed stone in bottom of handhole using care not to allow crushed stone to enter conduits. Grout around conduits to prevent future entrance of dirt and silt. Properly dispose all removed debris. Inspect bonding bushings. Tighten loose bushings. Secure loose bond connections. Install new bonding bushings on spare conduits and bond to other conduits.

METHOD OF MEASUREMENT:

This work will be measured for payment by the number of concrete handholes cleaned, complete and accepted.

BASES OF PAYMENT:

This work will be paid for at the contract unit price each for "Clean Existing Concrete Handhole", which price shall include the removal and disposal of debris from handhole and associated conduit, crushed stone, grout, bonding bushings, bonding wire, and all equipment and work incidental thereto.

Pay Item	Pay Unit
Clean Existing Concrete Handhole	Each (Ea)

ITEM #1111401A - LOOP VEHICLE DETECTOR

Replace Section 11.11.02, Article M16.12, with the following:
11.11.02 – Materials:
Article M.16.12

M.16.12 - LOOP VEHICLE DETECTOR AND SAWCUT

1. Loop Vehicle Detector:
   - Comply with National Electrical Manufacturers Association (NEMA) standards, Section 6.5, Inductive Loop Detectors.
   - Comply with the current CT DOT Functional Specifications for Traffic Control Equipment, Section 3 B, Loop Vehicle Detector with Delay/Extend Option.

Replace Section 11.11.03, Article 1. Loop Vehicle Detector, with the following:
11.11.03 - Construction methods:
1. Loop Vehicle Detector
   - Shelf-mount the detector amplifier in the controller cabinet.
   - Terminate the harness conductors with crimped spade connectors. Connect conductors to appropriate terminals, eg, black wire to 110vac, white wire to 110vac neutral.
   - Tie loop harness and conductors to controller cabinet wiring harness. Leave enough slack in loop harness so that amplifier may be moved around on cabinet shelf; ± 2 feet (0.6 meter) slack.
   - Attach a loop identification tag to the harness. Record pertinent detector information on the tag with indelible ink. See example below.
     - Loop No.: D4
     - Phase Call: Phase 4
     - Field Location: Rt. 411(West St.)
     - Eastbound, Left Lane
     - Detector No.: 4
     - Cabinet Terminals: 234, 235

Replace Section 11.11.04, Article 1. Loop Vehicle Detector, with the following:
11.11.04 – Method of Measurement:
1. Loop Vehicle Detector is measured by the number of installed, operating, tested, and accepted vehicle detector amplifiers of the type specified.

Replace Section 11.11.05, Article 1. Loop Vehicle Detector, with the following:
11.11.05 – Basis of Payment:
1. Loop Vehicle Detector is paid at the contract unit price each of the type specified.

Pay Item	Pay Unit
Loop Vehicle Detector	ea. (ea.)

ITEM #1111451A - LOOP DETECTOR SAWCUT

11.11.02 – Materials:

Replace Article M.16.12 with the following:

Sawcut:

(a) Wire in sawcut:

- International Municipal Signal Association (IMSA) Specification 51-7, single conductor cross-linked polyethylene insulation inside polyethylene tube.
- # 14 AWG

(b) Sealant:

(1) Polyester Resin Compound

- Two part polyester which to cure, requires a liquid hardener.
- Use of a respirator not necessary when applied in an open air environment.
- Cure time dependent on amount of hardener mixed.
- Flow characteristics to guarantee encapsulation of loop wires.
- Viscosity: 4000 CPS to 7000 CPS at 77 degrees Fahrenheit (25° C).
- Form a tack-free skin within 25 minutes and full-cure within 60 minutes at 77 degrees Fahrenheit (25° C).
- When cured, resist effects of weather, vehicular abrasion, motor oil, gasoline, antifreeze, brake fluid, de-icing chemicals, salt, acid, hydrocarbons, and normal roadway encounters.
- When cured, maintain physical characteristics throughout the ambient temperature ranges experienced within the State of Connecticut.
- When cured, bonds (adheres) to all types of road surfaces.
- Weight per Gallon (3.8 l): 11 lbs ±1 lb (5kg ± .45kg)
- Show no visible signs of shrinkage after curing.
- 12 month shelf life of unopened containers when stored under manufacturers specified conditions.
- Cured testing requirements:
  - Gel time at 77 degrees F (25° C): 15 - 20 minutes, ASTM C881, D-2471
  - Shore D Hardness at 24 hours: 55-78, ASTM D-2240
  - Tensile Strength: > 1000 psi (6895 kPa), ASTM D-638
  - Elongation: 18 - 20 %, ASTM D-638
  - Adhesion to steel: 700 - 900 psi (4826 - 6205 kPa), ASTM D-3163
  - Absorption of water, sodium chloride, oil, and gasoline: < 0.2%, ASTM D-570
- Include in the Certificate of Compliance:
  - Manufacturer's confirmation of the uncured and cured physical properties stated above.
  - Material Safety Data Sheet (MSDS) stating sealant may be applied without a respirator in an open air environment.
- Designed to allow clean-up without the use of solvent that is harmful to the workers and the environment.

(2) Elasotmeric Urethane Compound:

- One part urethane which to cure, does not require a reactor initiator, or a source of thermal energy prior to or during its installation.
- Use of a respirator not necessary when applied in an open air environment.

- Cure only in the presence of moisture.
- Flow characteristics to guarantee encapsulation of loop wires.
- Viscosity such that it does not run out of the sawcut in sloped pavement during installation; 5000 CPS to 85,000 CPS.
- Form a tack-free skin within 24 hours and 0.125 inch (0.33mm) cure within 30 hours at 75 degrees Fahrenheit (24° C).
- When cured, resist effects of weather, vehicular abrasion, motor oil, gasoline, antifreeze, brake fluid, de-icing chemicals, salt, acid, hydrocarbons, and normal roadway encounters.
- When cured, maintain physical characteristics throughout the ambient temperature ranges experienced within the State of Connecticut.
- Show no visible signs of shrinkage after curing.
- Shelf life when stored under manufacturers specified conditions:
  - Caulk type cartridges: minimum 9 months
  - Five gallon containers: minimum 12 months
- Designed for application when the pavement surface temperature is between 40 and 100 degrees Fahrenheit (4° and 38° C).
- Uncured testing requirements:
  - Weight/Gallon: ASTM D-1875
  - Determination of Non-volatile Content: ASTM D-2834
  - Viscosity: ASTM D-1048B
  - Tack-free Time: ASTM D-1640
- Cured testing requirements:
  - Hardness: ASTM D-2240
  - Tensile Strength & Elongation: ASTM D-412A
- Include in the Certificate of Compliance:
  - Manufacturer's confirmation of the uncured and cured physical properties stated above.
  - Material Safety Data Sheet (MSDS) stating sealant may be applied without a respirator in an open air environment.
- Designed to allow clean-up without the use of solvent that is harmful to the workers and the environment.

3. Miscellaneous:

(a) Liquidtight Flexible Nonmetallic Conduit
- UL listed for direct burial
- UL 1660
- Smooth polyvinyl chloride inner surface

(b) Water Resistant Pressure Type Wire Connector
- Ul listed for direct burial and wet locations
- UL 486D

11.11.03 - Construction methods:

2. Loop Detector Sawcut
- Loop size, number of turns, and location is shown on the intersection plan.
- Do not cut through a patched trench, damaged or poor quality pavement without the approval of the Engineer.
- Wet-cut pavement with a power saw using a diamond blade ⅜ inch (9.5mm) wide. Dry-cut is not allowed.
- Ensure slot depth is between 1 ¾ inch to 2.0 inch (45mm to 50mm).
- Overlap corners to ensure full depth of cut.

- To prevent wire kinking and insulation damage, chamfer inside of corners that are ≤ 120 degrees.
- Clean all cutting residue and moisture from slot with oil-free compressed air. Ensure slot is dry before inserting wire and sealing sawcut.
- Cut home-run, from loop to curb or edge-of-road, as shown on the typical installation sheet.
- To prevent cross-talk and minimize electrical interference, twist home-run wires, from edge of road to handhole, with at least 5 turns per foot (16 turns per meter). Tape together twisted home-run wires at 2 foot (0.6 meter) ± intervals.
- In new or resurfaced pavement, install loops in the wearing course. If the wearing course is not scheduled for immediate placement (within 24 hours) after the base course, provide temporary detection when directed by the Engineer. Temporary detection may be sawcut loops, preformed loops, microwave sensor, video, or other method approved by the Engineer.
- Splice(s) not allowed anywhere in loop wire either in loop or in home-run.
- Ensure wires are held in place at bottom of slot by inserting at 2 foot (0.6 m) intervals, 1 inch sections of foam backer rod or wedges formed from 1 inch (25mm) sections of the polyethylene tubing. Loop detectors with wires that have floated to the top of the sealant will not be accepted.
- To create a uniform magnetic field in the detection zone, wind adjacent loops in opposite directions.
- Use **polyester compound** as the sealant unless another type is allowed by the Engineer.
- Mix hardening agent into polyester resin with a power mixer or in an application machine designed for this type of sealant in accordance with the manufacturer's instructions.
- Apply the loop sealant in accordance with the manufacturer's instructions and the typical installation sheet. Do not apply sealant when pavement temperature is outside the manufacturers recommended application range.
- Solder splice the loop wires to the lead-in cable and install water resistant connector as shown on the typical installation sheet.
- Test the loop circuit resistance, inductance, and amplifier power-interruption as shown on the typical installation sheet. Document all test results.

3. Damaged, Patched, or Excessively Worn Pavement
   - Where the existing pavement is damaged, patched or excessively worn and is found to be not suitable for reliable loop detection, notify the Engineer.
   - When directed by the Engineer, remove and replace an area of pavement to allow the proper installation of the loop.
   - Remove a minimum of 3 inches (75mm) depth.
   - Comply with the applicable construction methods of Section 2.02 Roadway Excavation, Formation Of Embankment and Disposal of Surplus Material, and Section 4.06 Bituminous Concrete, such as:
     - Cut Bituminous Concrete
     - Material for Tack Coat
     - Bituminous Concrete Class 1

4. Re-surface/Overlay Project
   - Prior to disconnecting the existing loop confirm that the amplifier is operating properly and is programmed according to plan. Document loop operation. Report any discrepancies and malfunctions to Engineer.
   - Remove all abandoned sawcut home-run wire from handhole.
   - Sawcut new loop according to plan.

- Solder splice new loop wires to the existing lead-in cable and install new water resistant twist connectors as shown on the typical installation sheet. Do not re-use the removed connectors.
- Test the loop circuit resistance and inductance. Document results.
- Ensure the existing loop amplifier has re-tuned to the new loop and is operating according to plan.

11.11.04 – Method of Measurement:

Loop Detector Sawcut is measured by the number of linear feet (meters) of installed, tested, operating, and accepted sawcut only where there is loop wire. Over-cuts at corners that do not contain wire are not measured.

11.11.05 – Basis of Payment:

Loop Detector Sawcut is paid at the contract unit price per linear foot (meter). The price includes sawcut, loop wire, sealant, liquidtight flexible nonmetallic conduit, duct seal, water resistant splice connectors, testing, incidental material, equipment, and labor.

Pay Item	Pay Unit
Loop Detector Sawcut	l.f. (m)

INTERSECTION	#	104-204
PROJECT	#	104-164

ALL TRAFFIC SIGNAL EQUIPMENT IS EXISTING EXCEPT AS NOTED.

INSTALL NEW LOOP DETECTORS FOR THE I-95 SOUTHBOUND OFF-RAMP.

INSTALL LOOP DETECTORS 3' OFF EDGE OF ROAD AND 8' APART UNLESS OTHERWISE SPECIFIED.

SEE STANDARD SHEET - LOOP VEHICLE DETECTOR AND SAWCUT, TR-1111.01.

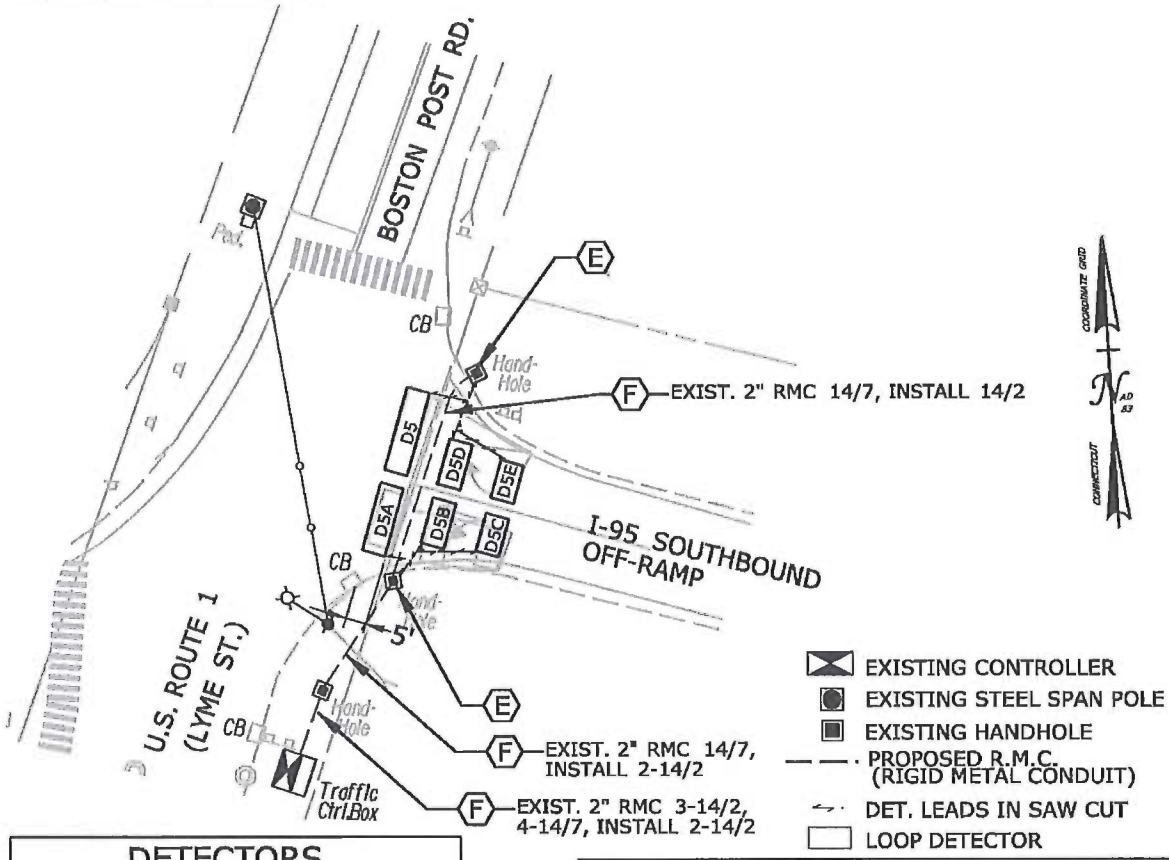
SERIES SPLICE SEGMENTED LOOPS PER LANE.

INSTALL TWO NEW LOOP AMPLIFIERS IN THE CONTROLLER CABINET FOR NEW LOOPS D5A, D5B, D5C AND D5, D5D, D5E.

REMOVE EXISTING 14/2 CABLE THAT WAS BEING USED FOR THE EXISTING D5, D5A, D5B, D5C, D5D, D5E DETECTORS FOR THE W.B. APPROACH.

(E) INSTALL LOOP DETECTOR SAWCUT WIRES TO HANDHOLE AND SPLICE TO CORESPONDING LOOPS IN EACH LANE.

(F) INSTALL NEW 14/2 CABLE FROM THE CONTROLLER TO THE NEW LOOPS D5, D5A, D5B, D5C, D5D, D5E.



DETECTORS			
IDENT	SIZE	TURNS	MODE
D5	22'x6'	3	DELAY 3"
D5A	18'x6'	3	PRESENCE
D5B	12'x6'	3	PRESENCE
D5C	10'x6'	3	PRESENCE
D5D	12'x6'	3	DELAY 6"
D5E	10'x6'	3	DELAY 6"

SCALE - NONE

CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUR. OF ENGINEERING & CONSTRUCTION
DIVISION OF TRAFFIC ENGINEERING

TRAFFIC CONTROL SIGNAL LAYOUT
LOOP DETECTOR REPLACEMENT

TOWN OF OLD LYME
U.S. ROUTE 1 (LYME STREET) AT
I-95 SOUTHBOUND OFF-RAMP

INTERSECTION	#	104-206
PROJECT	#	104-164

ALL TRAFFIC SIGNAL EQUIPMENT IS EXISTING EXCEPT AS NOTED.

INSTALL NEW LOOP DETECTORS FOR THE I-95 NORTHBOUND OFF-RAMP.

INSTALL LOOP DETECTORS 3' OFF EDGE OF ROAD AND 8' APART UNLESS OTHERWISE SPECIFIED.

SEE STANDARD SHEET - LOOP VEHICLE DETECTOR AND SAWCUT, TR-1111.01.

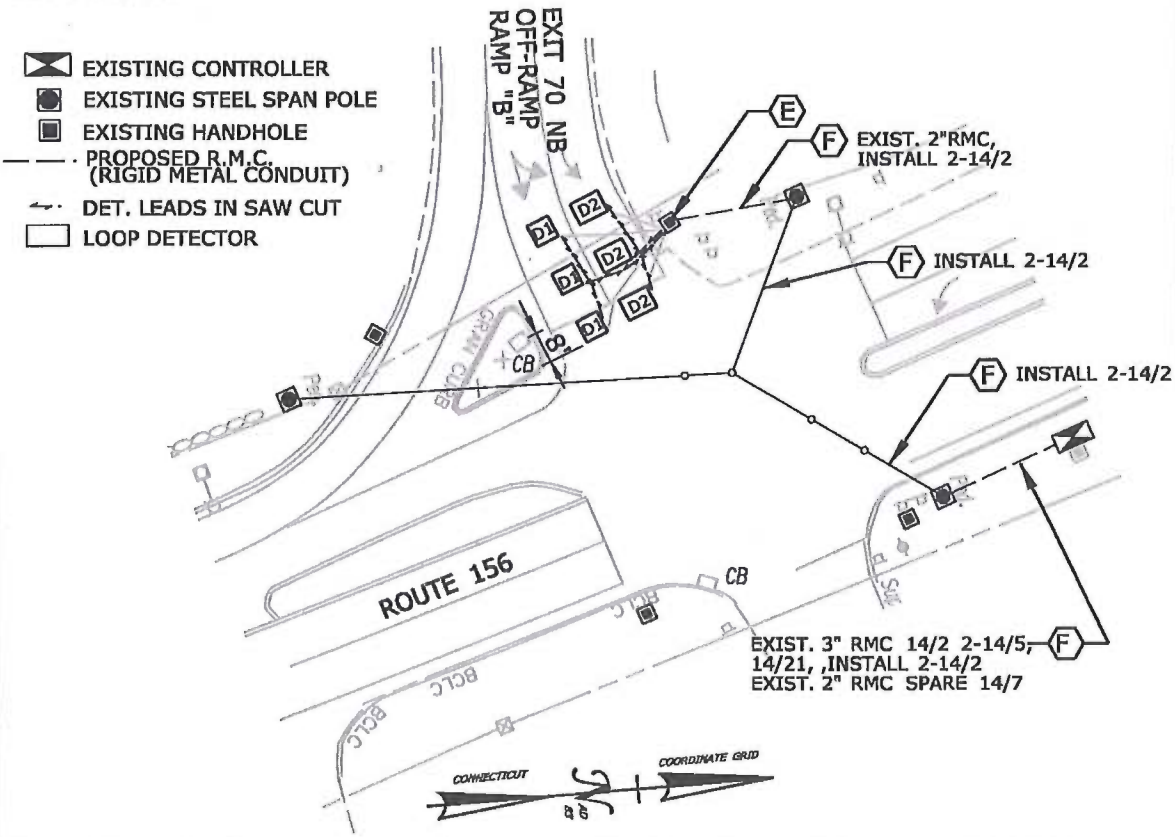
SERIES SPLICE SEGMENTED LOOPS PER LANE.

INSTALL TWO NEW LOOP AMPLIFIERS IN THE CONTROLLER CABINET FOR NEW LOOPS D5A, D5B, D5C AND D5, D5D, D5E.

REMOVE EXISTING 14/2 CABLE THAT WAS BEING USED FOR THE EXISTING D1, AND D2 DETECTORS FOR THE E.B. APPROACH.

(E) INSTALL LOOP DETECTOR SAWCUT WIRES TO HANDHOLE AND SPLICE TO CORESPONDING LOOPS IN EACH LANE.

(F) INSTALL NEW 14/2 CABLE FROM THE CONTROLLER TO THE NEW LOOPS D1 AND D2.



DETECTORS			
IDENT	SIZE	TURNS	MODE
D1	6'x6'	3	PRESENCE
D2	6'x8'	3	PRESENCE

SCALE - NONE

CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUR. OF ENGINEERING & CONSTRUCTION
DIVISION OF TRAFFIC ENGINEERING

TRAFFIC CONTROL SIGNAL LAYOUT
LOOP DETECTOR REPLACEMENT

TOWN OF OLD LYME
ROUTE 156 (SHORE RD.) AT
I-95 NORTHBOUND OFF-RAMP

S:\traffic\1406\SIGNAL SPECS\SPECS\1111451A-LOOP DETECTOR SAWCUT only, rev 1-11, polyester compound

ITEM #1131002A - REMOTE CONTROLLED CHANGEABLE MESSAGE SIGN

Description: Work under this item shall include furnishing and maintaining a trailer-mounted, "Changeable Message Sign", "Remote Controlled Changeable Message Sign", "Changeable Message Sign with Radar", or "Remote Controlled Changeable Message Sign with Radar" whichever is applicable, at the locations indicated on the plans or as directed by the Engineer.

Materials: The full matrix, internally illuminated variable message sign shall consist of a LED, fiber optic, lamp matrix, or hybrid magnetically operated matrix – LED message board; and a computer operated interface, all mounted on a towable, heavy duty trailer.

The sign shall have a minimum horizontal dimension of 2920 mm and rotate a complete 360 degrees atop the lift mechanism.

In the raised position, the bottom of the sign shall be at least 2.1 m above the roadway. The messages displayed shall be visible from a distance of 800 m and be clearly legible from a distance of 274 m during both the day and night.

The lighting system shall be controlled both manually and by a photocell for automatic sign dimming during nighttime use.

The sign shall be capable of storing a minimum of 100 preprogrammed messages and be able to display any one of those messages upon call from the trailer mounted terminal and/or through the cellular telephone hookup for the remote controlled sign.

The sign shall be a full matrix sign that is able to display messages composed of any combination of alphanumeric text, punctuation symbols, and graphic images (notwithstanding NTCIP limitations). The display shall be capable of producing arrow functions. Full- matrix displays shall allow the use of graphics, traffic safety symbols and various character heights.

Standard messages shall be displayed in a three-line message format with 8 characters per line. The letter height shall not be less than 460 mm.

The sign shall utilize yellow green for the display with a black background. Each matrix shall have a minimum size of 6 x 9 pixels. Each pixel shall utilize a minimum of four high output yellow green LEDs or equivalent light source. The LEDs or light source shall have a minimum 1.4 candela luminance intensity, 22 degrees viewing angle, and wavelength of 590 (+/- 3) nanometers.

For hybrid magnetically operated matrix – LED matrix, each pixel shall have one single shutter faced with yellow green retro-reflective sheeting with a minimum of four high output yellow green LEDs or equivalent light source. The hybrid magnetically operated matrix – LED matrix sign shall be capable of operating in three display modes; shutter only, LED only, and both LED

and shutter. These modes shall be automatically controlled by a photocell for day and night conditions and also capable of being manually controlled through the software.

The sign shall be controlled by an on-board computer. The sign shall automatically change to a preselected default message upon failure. That default message shall remain on display until the problem is corrected.

The sign shall include all necessary controls, including, but not limited to, personal computer, keyboard or alphanumeric hand-held keyboard, and software. The sign shall interface with PCs, cellular phones, and radar speed detection devices as required.

Controls shall be furnished for raising and lowering the message board, aligning the message board and, for solar powered units, a read-out of the battery bank charge.

Power shall be provided by a self-contained solar maintained power source or a diesel engine driven generator. Hardware for connection to a 110-volt power source shall also be provided.

Solar powered signs shall display programmed messages with the solar panel disconnected, in full night conditions, for a minimum of 30 consecutive days.

Remote Controlled Changeable Message Signs shall include one (1) industrial-grade cellular telephone and be equipped with a modem to control the sign and a security system to prevent unauthorized access. The security system shall allow access only through use of a code or password unique to that sign. If the proper code or password is not entered within 60 seconds of initial telephone contact, the call will be terminated. Remote control for the Remote Controlled Changeable Message Sign shall be by cellular telephone and touch tone modem decoder.

The radar equipped signs shall include a high-speed electronic control module (ECM-X), Radar SI transceiver, signal processing board and radar logging software.

The radar software will operate the sign in four modes:
1) The sign will display words "YOUR SPEED" followed by the speed (2 digits). The display will repeat the message as long as vehicles are detected. The sign will blank when no vehicles are present.
2) The sign will display a series of up to six messages (programmed by the user) when a preset speed (programmed by the user) is exceeded. The sign will blank when no vehicles are present.
3) Will perform like mode #2 with the addition of displaying the actual speed with it.
4) The sign will work as a standard Changeable Message Sign or Remote Controlled Changeable Message Sign with no radar.

Construction Methods: The Contractor shall furnish, place, operate, maintain and relocate the sign as required. When the sign is no longer required, it shall be removed and become the property of the Contractor. The cellular telephone required for the Remote Controlled Changeable Message Sign shall be provided to the Engineer for his use, and subsequently returned to the Contractor.

When the sign is not in use, it shall either be turned off with a blank display or turned from view.

Any signs that are missing, damaged, defaced or improperly functioning so that they are not effective, 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.

Method of Measurement: This work will be measured for payment for each "Changeable Message Sign", "Remote Controlled Changeable Message Sign", "Changeable Message Sign with Radar", or "Remote Controlled Changeable Message Sign with Radar", whichever applies, furnished and installed, for the number of calendar days that the sign is in place and in operation, measured to the nearest day. When a sign is in operation for less than a day, such a period of time shall be considered to be a full day regardless of actual time in operation.

Basis of Payment: This work will be paid for at the Contract unit price per day for each "Changeable Message Sign", "Remote Controlled Changeable Message Sign", "Changeable Message Sign with Radar", or "Remote Controlled Changeable Message Sign with Radar" which price shall include placing, maintaining, relocating and removing the sign and its appurtenances and all material, labor, tools and equipment incidental thereto. Additionally, for the "Remote Controlled Changeable Message Sign", or "Remote Controlled Changeable Message Sign with Radar", the cellular telephone service and telephone charges shall be included.

Pay Item	Pay Unit
Remote Controlled Changeable Message Sign	Day

ITEM # 1210101A – 4" (100mm) WHITE EPOXY RESIN PAVEMENT MARKINGS

ITEM # 1210102A – 4" (100mm) YELLOW EPOXY RESIN PAVEMENT MARKINGS

ITEM # 1210103A – 6" (150mm) WHITE EPOXY RESIN PAVEMENT MARKINGS

ITEM # 1210104A – 8" (200mm) WHITE EPOXY RESIN PAVEMENT MARKINGS

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 sublot.
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 - mcd/ft^2/fc (millicandelas per square meter per lux (mcd/m^2/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/ft^2/fc (mcd/m^2/lux)
Yellow Epoxy: minimum retroreflectivity reading of 325 mcd/ft^2/fc (mcd/m^2/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 retro-reflectivity. 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 #1216020A - 6" BLACK AGGREGATE COVER-UP RESIN PAVEMENT MARKINGS

12.16.01—Description: This item shall consist of furnishing and installing black aggregate cover-up resin pavement markings of the width specified to cover existing markings in accordance with this section and in conformance with the plans or as directed by the Engineer.

The black aggregate cover-up resin pavement markings shall be a highly durable, skid resistant, non-reflective material designed to cover existing pavement markings.

The black aggregate cover-up resin pavement marking material, when applied according to the recommendations of the manufacturer, shall provide a neat, durable masking that will not flow or distort. The black aggregate cover-up resin pavement marking material shall be weather resistant and, through normal traffic wear, shall show no wearing which would significantly impair the intended usage.

12.16.02—Materials: Materials for this work shall conform to the requirements of Article M.07.25.

12.16.03—Construction Methods: The black aggregate cover-up resin pavement markings shall be applied strictly in accordance with the manufacturer's recommendations and installed as shown on the plans and to the control points as established by the Engineer.

The areas to be covered shall be dry and sufficiently cleaned of sand and debris so as to provide an acceptable bond. All surfaces which are power washed shall be allowed to dry sufficiently prior to the application of the black aggregate cover-up resin pavement markings. The areas that have been pre-marked shall be broom cleaned immediately prior to the application of the black aggregate cover-up resin pavement markings.

Operations shall be conducted only when the road surface temperatures are 32° F (0° C) or greater. Operations shall be discontinued during periods of rain, and shall not continue until the Engineer determines that the pavement surface is dry enough to achieve adhesion. The cover-up resin pavement markings shall be applied uniformly to a prepared surface in a manner that ensures a wet film thickness (without black aggregate) of 20 mils +/- 1 mils (500 um +/- 25 um).

Black aggregate shall be applied at a rate of 100 pounds per gallon (12 kilograms per liter) of black aggregate pavement marking material. The black aggregate shall be applied using a double drop bead system, with each drop distributing 50 pounds per gallon (6 kilograms per liter) of black aggregate pavement marking material.

The black aggregate cover-up resin pavement markings shall extend approximately 1 inch (25 millimeters) beyond the edges of the existing markings which are to be covered.

After application, the pavement markings shall be protected from crossing vehicles for a time at least equivalent to the drying time of the material, as specified by the manufacturer.

Initial, In-Service Retro-Reflectivity and Serviceability for Cover-Up Long-Lines: In order to be acceptable, the applied cover-up markings shall meet the following maximum retro-reflectivity and minimum serviceability readings, as measured by the Engineer using a LTL 2000 Retrometer with 30-meter geometry:

1. Initial Retro-reflectivity: shall measure up to a maximum of 20 milli-candelas per square meter per lux, or as otherwise approved by the Engineer, when tested within 14 days of installation.

2. In-service retro-reflectivity: shall measure up to a maximum of 30 milli-candelas per square meter per lux, or as otherwise approved by the Engineer when tested at anytime within one (1) year of installation.

The Contractor shall replace, at its own expense, such amount of cover-up resin pavement markings that fail the initial or in-service retro-reflectivity when, in the opinion of the Engineer, it is no longer effective for the intended use or do not meet the requirements, as specified herein.

Servicibility: shall retain a minimum of 95% linear feet. Determination of percentages of serviceability values will be made anytime within one (1) year by the Contractor's representative and by the Engineer. The decision of the Engineer shall be final. The term "percentage of serviceability" shall be defined as the percentage of the total linear feet for cover-up resin pavement markings measured on the project for payment.

The Contractor shall replace, at its own expense, such amount of markings, if any, required to meet the above stated percentage. The Engineer will indicate the areas and lines to be replaced to meet the above stated percentages.

Replacement under either situation shall include all materials, equipment, labor and work incidental thereto.

Removal of Cover-up Resin Pavement Markings: The cover-up resin pavement markings shall be removed by the Contractor by an appropriate mechanical means that ensures complete removal with minimal pavement scarring, to the satisfaction of the Engineer. Painting over existing pavement markings with black paint or spraying with asphalt shall not be accepted as a substitute for removal or obliteration of pavement markings.

12.16.04—Method of Measurement: Black aggregate cover-up resin pavement markings shall be measured for payment by the actual number of linear feet (meters) of black aggregate cover-up resin pavement markings acceptably installed on and removed from the pavement when it is no longer applicable or when its removal is directed by the Engineer.

12.16.05—Basis of Payment: This work shall be paid for at the contract unit price per linear foot (meter) for "Black Aggregate Cover-up Resin Pavement Markings" of the width specified, acceptably installed on and removed from the pavement. This price shall be for all the work

required by this section including the cleaning and preparing of the pavement surface, installation and removal, and all materials, equipment, tools, and labor incidental thereto.

Any black aggregate cover-up resin pavement marking material which is not effective, in the opinion of the Engineer, shall be replaced by the Contractor at no cost to the State.

Pay Item	Pay Unit
6" Black Aggregate Cover-Up Resin Pavement Markings	l.f. (m)

M.07.25—Black Cover-up Resin Pavement Markings:

Identification: Each container shall have a label affixed to it with the following information thereon: name and address of manufacturer, shipping point, grade production batch number, date of manufacture, grade name and/or identification number, type of material, number of liters, contract number, use intended, directions for application, and formula. Improperly labeled samples and deliveries shall be rejected.

Certification: For each batch of black cover-up resin, a Certified Test Reports conforming to Article 1.06.07 shall be submitted from an independent testing laboratory and approved by the Engineer, prior to installation on the project.

Detailed Requirements:

(a) Cover-up **Resin Material:** The material shall be composed of resins and pigments only.

(b) Composition:

Component	Percent by Weight (Mass)
Carbon Black	7 ± 2
(ASTM D 476 Type III)	
Talc	14 ± 2
Resins	79 ± 4

(c) Black Aggregate: The moisture resistant aggregate shall meet the gradation requirements as follows:

Sieve Size	Percent Retained
#20 (850 μm)	23 - 38
#50 (300 μm)	58 - 74
#270 (53 μm)	1 - 6
Pan	0 - 0.5

The moisture resistant aggregate shall have a urethane coating. The aggregate shall be angular with no dry dispensement pigment allowed.

(d) Adhesion: The black resin pavement marking material shall be formulated so as to adhere to the pavement and existing pavement markings under climatic and traffic conditions normally encountered in the construction work zone.

(e) Abrasion Resistance: When the abrasion resistance of the material is tested according to ASTM D 4060 with a CS-17 wheel under a load of 1000 grams for 1000 cycles, the wear index shall be no greater than 82.

(f) Hardness: The Type D durometer hardness of the material shall not be less than 75 nor more than 90 when tested according to ASTM D 2240 after the material has cured for 72 hours at 73.5° F ± 3.5° F (23° C ± 2° C).

(g) Compressive Strength: The compressive strength of the material, when tested according to ASTM D 695, shall not be less than 12,000 psi (82 740 kilopascals) after 72 hours cured at 73.5° F ± 3.5° F(23° C ± 2° C).

ITEM #1220013A – CONSTRUCTION SIGNS - BRIGHT FLUORESCENT SHEETING

Article 12.20.01 – 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.

Article 12.20.02 – 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 B_1) shall be -4 degrees and +30 degrees.

TABLE I

Minimum Coefficient of Retroreflection R_A
Candelas per footcandle per square foot

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

Color Specification Limits** (Daytime)

Color	1		2		3		4		Reflectance Limit Y (%)	
	X	Y	X	Y	X	Y	X	Y	MIN	MAX
Orange (new)	.583	.416	.523	.397	.560	.360	.631	.369	28	-
Orange (weathered)	.583	.416	.523	.397	.560	.360	.631	.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. Sheeting 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 weatherometer 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.

Article 12.20.03 – 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.

Article 12.20.04 – 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.

Article 12.20.05 – 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	S.F.

ITEM #1303230A – FIRE SUPPRESSION STANDPIPE SYSTEM

Description:

This work shall consist of furnishing and installing fire suppression standpipe systems at the locations shown on the plans or as directed by the Engineer. All work shall conform to these specifications and the requirements of the National Fire Protection Association (NFPA) "Standard for the Installation of Stand Pipe and Hose Systems".

Materials:

1. Pipe: Pipe for standpipe systems shall be Schedule 80, hot dip galvanized, welded and seamless pipe conforming to the requirements of ASTM A53 (Grade B). Pipe bends may be used to eliminate elbows. The minimum pipe bend shall be 12 times the diameter of the pipe (inside diameter of bend). Couplings may be used to join straight sections of pipe. Couplings shall conform to the requirements of ASTM A865, and shall be hot dip galvanized.

2. Elbows and Fittings: Elbows and fittings shall be malleable iron conforming to the requirements of ASTM A 197 (ANSI B16.3 Class 300) and shall be galvanized according to the requirements of ASTM A153. All connections shall be threaded to match the adjoining pipe. The elbows and fittings shall be rated for 300 psi pressure.

3. Pipe Supports and Shims: Steel for pipe supports and shims shall conform to be requirements of ASTM A 709 Grade 345, and shall be galvanized according to the requirements of ASTM A123.

4. Bolts and Anchor Rods: Bolts shall conform to the requirements of ASTM A325, and shall be supplied with matching nuts and washers. Anchor rods shall conform to the requirements of ASTM A449, and shall be supplied with matching nuts and washers. All bolts, anchor rods, nuts, and washers shall be mechanically galvanized in accordance with the requirements of ASTM B695, Class 50.

5. Adhesive Bonding Material: The adhesive bonding material shall be a resin compound specially formulated to anchor steel bars in holes drilled into concrete for the purpose of resisting tension pull-out. The Contractor shall select one of the product systems listed in Standard Specification, Subarticle M.03.01-15- Chemical Anchors.

6. A Materials Certificate shall be required in accordance with Article 1.06.07, confirming the conformance of the adhesive bonding material to the requirements set forth in the manufacturer's specification.

7. End Connections: End connections of standpipe systems shall be 5-inch diameter Storz couplings, Style S-37 (female) supplied by:

   Red Head Brass, Inc.
   643 Legion Drive
   Box 566
   Shreve, Ohio 44676
   (216) 567-2903

   End connections shall be capped with 5-inch diameter locking Storz end caps style SC-L with 18-inch stainless steel cable.

   Couplings at both ends of the standpipe shall be secured to the steel pipe by means of set screws through the collar of the Storz Coupling. Strainers shall also be placed between the Storz coupling and the standpipe to prevent debris from entering the standpipe.

   All Hardware shall be constructed of 6061-T6 aluminum with a chrome plated Lustra-Lite finish.

8. Piping: Installation of piping shall conform to standard plumbing practice to ensure no leakage under operating pressures.

9. Testing: After the system has been installed, the Contractor shall test the system in the following manner:

   a. The system shall be pressurized with water to 200 psi for two hours. The system will be inspected for leaks at the joints and connections. If any leaks are detected, the Contractor shall repair the leaks and retest the system.

   b. The Contractor shall perform a low pressure flow test to insure that there are no clogs in the system. If any clogs are detected, the Contractor shall repair the clog, and retest the system.

      The Contractor shall coordinate with the Town of North Thompsonville Fire Department the date and time of the testing so the Fire Department may be present to witness the testing. Testing shall not be performed until the Fire Department is present.

Construction Methods:

1. Shop Drawings: The Contractor shall furnish shop drawings including all field verified measurements at each location for the standpipe systems and foundations in accordance with Article 1.05.02.

2. Adhesive Anchors: Installation of adhesive anchors shall be according to the recommendations of the manufacturer. The Contractor shall take care not to drill through or damage existing reinforcing steel.

Method of Measurement:

This item shall be measured for payment by the actual number of Standpipe Systems installed and accepted. A system consists of all materials from the inlet of the pipe to the outlet of the pipe including, but not limited to the pipe, fittings, couplings, end connections, expansion devises, support brackets, concrete foundations, anchors, and all hardware.

Basis of Payment:

This work will be paid for at the contract unit price, each for "Fire Suppression Standpipe System", complete in place, which price shall include all materials, equipment, tools, and labor incidental thereto.

Pay Item	Pay Unit
Fire Suppression Standpipe System	Each

ITEM #1803070A - TYPE B IMPACT ATTENUATION SYSTEM (FLARED)

Description: This item shall consist of furnishing and installing an impact attenuation system for use as a metal beam rail terminal where shown on the design plans, in accordance with the Manufacturer's details and specifications including reflective sheeting for delineation.

Performance Criteria: This attenuation system shall be a crash tested device having approval in writing from FHWA conforming to the requirements in National Cooperative Highway Research Program (NCHRP) Report 350 or the AASHTO Manual for Assessing Safety Hardware (MASH).

Materials: The materials shall conform to the following requirements:

1. All materials for the impact attenuation system shall meet the Manufacturer's specification for the latest version of a Flared system chosen from the Department's Qualified Products List.
2. The Contractor shall submit a material certificate or certificate of compliance for each system in accordance with Article 1.06.07.
3. A Type III reflective sheeting shall be provided in conformance with Section M18.09 and Connecticut Traffic Standard Sheet TR-1205_01, Sign #50-5032 or as provided by the Manufacturer.

Construction Methods: The impact attenuation system shall be installed in a neat and workman like manner at the location(s) shown on the plans and constructed in conformance with the Manufacturer's details. The reflective sheeting shall be installed on the nose of the impact attenuation system.

Failure to comply: In the event that, in the judgment of the Engineer, an impact attenuation system is not maintained adequately and/or safely on any part of the project, or the Contractor does not move or relocate traffic control devices to meet construction requirements for the safety of the traveling public when directed to do so by the Engineer, on any day, the sum of $1500.00 per day will be deducted from any money due the Contractor as a charge for failure to comply with this specification.

Method of Measurement: This work shall be measured for payment by the number of each system installed as shown on the plans, conforming to the details and specifications and as accepted by the Engineer

Basis of Payment: The impact attenuation systems will be paid for at the Contract unit price for each "Type B Impact Attenuation System (Flared)" chosen from the Department's Qualified Products List. This price shall include all materials, excavation, transition section, reflective sheeting, site preparation, and transportation, removal of surplus material, equipment, tools and labor incidental to complete the installation.

Pay Item	Pay Unit
Type B Impact Attenuation System (Flared)	Each