STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION

2800 BERLIN TURNPIKE, P.O. BOX 317546
NEWINGTON, CONNECTICUT 06131-7546

Phone: 860-594-3128

September 25, 2014

Subject: Project No. 151-273
F.A.P. No. 0842(195)
Reconstruction of I-84, Washington Street to Pierpont Road, Town of Waterbury.

NOTICE TO CONTRACTORS:

This is to notify all concerned and especially the prospective bidders that the bid opening for the subject project is being postponed Two (2) additional weeks from October 1, 2014 to October 15, 2014 at 2:00 P.M. in the Conference Room of the Department of Transportation Administration Building, 2800 Berlin Turnpike, Newington, Connecticut.

Addendum No. 2 is attached and can also be obtained on the Statewide Contracting Portal at http://www.biznet.ct.gov/scp_search/BidResults.aspx?groupid=64

This Addendum is necessary to revise a contract documents.

Pre-Bid Questions and Answers: Questions pertaining to DOT advertised construction projects must be presented through the CTDOT Pre-Bid Q and A Website. The Department cannot guarantee that all questions will be answered prior to the bid date. **PLEASE NOTE - at 12:01 am, the day before the bid, the subject project(s) being bid will be removed from the Q and A Website, Projects Advertised Section, at which time questions can no longer be submitted through the Q and A Website. At this time, the Q and A for those projects will be considered final, unless otherwise stated and/or the bid is postponed to a future date and time to allow for further questions and answers to be posted.**

Philip J. Melchionne
For: Gregory D. Straka
Contracts Manager
Division of Contracts Administration

SEPTEMBER 25, 2014
RECONSTRUCTION OF I-84
FEDERAL AID PROJECT NO. 0842(195)
STATE PROJECT NO. 0151-0273
CITY OF WATERBURY

ADDENDUM NO. 2

This Addendum addresses the following questions and answers contained on the "CT DOT QUESTIONS AND ANSWERS WEBSITE FOR ADVERTISED CONSTRUCTION PROJECTS":

Question and Answer Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 18, 19, 21, 22, 23, 26, 43, 44, 45, 51, 56, 58, 59, 60, 62, 63, 68 and 70.

SPECIAL PROVISIONS
NEW SPECIAL PROVISIONS

The following Special Provisions are hereby added to the Contract:

- NOTICE TO CONTRACTOR – UTILITY GENERATED SCHEDULE
- NOTICE TO CONTRACTOR – NOISE BARRIER WALL
- SECTION 6.01 - CONCRETE FOR STRUCTURES
- ITEM NO. 0020765A – GUANO ABATEMENT
- ITEM NO. 0217003A – PRELOAD FILL
- ITEM NO. 0406268A - MILLING OF HOT MIX ASPHALT (HMA) – (OVER 100 MM TO 200 MM)
- ITEM NO. 0507005A – ABANDON CATCH BASIN / MANHOLE
- ITEM NO. 0507856A – CONCRETE BAFFLES
- TEM NO. 0521008A – SLIDING PLATE BEARINGS (PTFE)
- ITEM NO. 0507161A – MODIFIED TYPE "C-L" CATCH BASIN QUAD GRATE-TYPE II
- ITEM NO. 0507216A – SPECIAL TYPE "C-L" CATCH BASIN OVER 3M DEEP
- ITEM NO. 0507701A – RESET TYPE "C" CATCH BASIN
- ITEM NO. 0969030A – PROJECT COORDINATOR (MINIMUM BID)
- ITEM NO. 0969049A – DOCUMENT CONTROL SPECIALIST (MINIMUM BID)
- ITEM NO. 0969052A – CONTRACTOR QUALITY CONTROL PROGRAM (MINIMUM BID)
- ITEM NO. 1008791A - 100 MM PVC MULTI DUCT CONDUIT - IN MEDIAN
- ITEM NO. 1201802A – 4 CHORD TRUSS BRIDGE SIGN STRUCTURE
- ITEM NO. 1201804A – 4 CHORD TRUSS CANTILEVER SIGN STRUCTURE
- ITEM NO. 1202239A – OVERHEAD TRUSS SIGN SUPPORT FOUNDATION
- ITEM NO. 1202999A – DRILLED SHAFT TRAFFIC STRUCTURE FOUNDATION

- ITEM NO. 1401027A - DROP MANHOLE (1.5M DIA.) 9M TO 12M DEEP (SANITARY SEWER)
- ITEM NO. 1401029A - DROP MANHOLE (1.8M DIA.) 9M TO 12M DEEP (SANITARY SEWER)
- ITEM NO. 1401661A - SANITARY MANHOLE (1.2M DIA.) 3M TO 6M DEEP
- ITEM NO. 1401670A - SANITARY MANHOLE (1.5M DIA.) 6M TO 9M DEEP
- ITEM NO. 1401671A - SANITARY MANHOLE (1.5M DIA.) 9M TO 12M DEEP
- ITEM NO. 1401675A - SANITARY MANHOLE (1.8M DIA.) 3M TO 6M DEEP

REVISED SPECIAL PROVISIONS

The following Special Provisions are hereby deleted in their entirety and replaced with the attached like-named Special Provisions:

- NOTICE TO CONTRACTOR – PROJECT LABOR AGREEMENT
- NOTICE TO CONTRACTOR – HMA S1 – EXTRA ASPHALT
- NOTICE TO CONTRACTOR – DETOUR ROADWAYS
- NOTICE TO CONTRACTOR - GENERAL PERMIT FOR STORMWATER DISCHARGE
- SECTION 1.03 – AWARD AND EXECUTION OF CONTRACT
- SECTION 1.05 – CONTROL OF THE WORK
- SECTION 4.06 - BITUMINOUS CONCRETE
- SECTION M.04 - BITUMINOUS CONCRETE
- ITEM NO. 0000905A – TOPSOILING
- ITEM NO. 0020801A – ASBESTOS ABATEMENT
- ITEM NO. 0020903A – LEAD COMPLIANCE FOR MISCELLANEOUS EXTERIOR TASKS
- ITEM NO. 0202315A – DISPOSAL OF CONTROLLED MATERIALS
- ITEM NO. 0202652A – DRILLED ROCK DRAINS
- ITEM NO. 0406999A – ASPHALT ADJUSTMENT COST (ESTIMATED COST)
- ITEM NO. 0503151A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 1)
- ITEM NO. 0503153A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 3)
- ITEM NO. 0503156A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 6)
- ITEM NO. 0503157A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 7)
- ITEM NO. 0503179A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 9)
- ITEM NO. 0503186A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 10)
- ITEM NO. 0503187A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 11)
- ITEM NO. 0503197A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 13)
- ITEM NO. 0507171A – HYDRODYNAMIC SEPARATOR (SITE NO. 1)
- ITEM NO. 0507172A – HYDRODYNAMIC SEPARATOR (SITE NO. 2)
- ITEM NO. 0507173A – HYDRODYNAMIC SEPARATOR (SITE NO. 3)
- ITEM NO. 0507174A – HYDRODYNAMIC SEPARATOR (SITE NO. 4)

- ITEM NO. 0507175A – HYDRODYNAMIC SEPARATOR (SITE NO. 5)
- ITEM NO. 0507176A – HYDRODYNAMIC SEPARATOR (SITE NO. 6)
- ITEM NO. 0507177A – HYDRODYNAMIC SEPARATOR (SITE NO. 7)
- ITEM NO. 0507178A – HYDRODYNAMIC SEPARATOR (SITE NO. 8)
- ITEM NO. 0969202A – CLASS B OFFICE
- ITEM NO. 0969205A – CLASS B OFFICE SUPPLIES (MONTH)

NOTICE: The Project Labor Agreement (PLA) found at the end of this addendum includes the Individual Signatory Unions page signed.

DELETED SPECIAL PROVISIONS

The following Special Provisions are hereby deleted in their entirety:

- ITEM NO. 0507223A – TYPE "C-L" SPECIAL CATCH BASIN OVER 3M DEEP
- ITEM NO. 0507467A – TYPE "C-M" CATCH BASIN DOUBLE GRATE - TYPE II
- ITEM NO. 0969000A – PROJECT COORDINATOR
- ITEM NO. 0973724A – WORKSITE TRAFFIC SUPERVISOR
- ITEM NO. 1001001A – TRENCHING AND BACKFILLING
- ITEM NO. 1008770A - 100 MM PVC MULTI DUCT CONDUIT - IN TRENCH

CONTRACT ITEMS

NEW CONTRACT ITEMS

ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0020765A	GUANO ABATEMENT	CU.M	4
0108100	LUMP SUM INCENTIVE PAYMENT (ESTMATED COST)	EST.	$6,450,000
0217003A	PRELOAD FILL	L.S.	1
0406268A	MILLING OF HMA (OVER 100 MM TO 200 MM)	SQ.M	31750
0507701A	RESET TYPE "C" CATCH BASIN	EA	13
0507856A	CONCRETE BAFFLES	M	65
0521008A	SLIDING PLATE BEARING (PTFE)	SQ. M	52
0651023	1500 MM R. C. PIPE	M	5
0651615	1200 MM STEEL CASING	M	20
0969030A	PROJECT COORDINATOR (MINIMUM BID)	L.S.	1
0969049A	DOCUMENT CONTROL SPECIALIST (MINIMUM BID)	L.S.	1

0969052A	CONTRACTOR QUALITY CONTROL PROGRAM (MINIMUM BID)	L.S.	1
1008791A	100 MM PVC MULTI DUCT CONDUIT – IN MEDIAN	M	3550
1202239A	OVERHEAD TRUSS SIGN SUPPORT FOUNDATION	EA	4
1202999A	DRILLED SHAFT TRAFFIC STRUCTURE FOUNDATION	EA	9
1401027A	DROP MANHOLE (1.5M DIA.) 9M TO 12M DEEP (SANITARY SEWER)	EA	1
1401029A	DROP MANHOLE (1.8M DIA.) 9M TO 12M DEEP (SANITARY SEWER)	EA	1
1401661A	SANITARY MANHOLE (1.2M DIA.) 3M TO 6M DEEP	EA	8
1401670A	SANITARY MANHOLE (1.5M DIA.) 6M TO 9M DEEP	EA	4
1401671A	SANITARY MANHOLE (1.5M DIA.) 9M TO 12M DEEP	EA	1
1401675A	SANITARY MANHOLE (1.8M DIA.) 3M TO 6M DEEP	EA	1

REVISED CONTRACT ITEMS

ITEM NO.	DESCRIPTION	ORIGINAL QUANTITY	REVISED QUANTITY
0209001	FORMATION OF SUBGRADE	296300 SQ.M	320300 SQ.M
0212000	SUBBASE	82600 CU.M	88600 CU.M
0406159	PMA S0.5	60900 T	71200 T
0406170	HMA S1	29860 T	38720 T
0406171	HMA S0.5	21038 T	23750 T
0406236	MATERIAL FOR TACK COAT	251150 L	302770 L
0406267A	MILLING OF HMA (0 MM TO 100 MM)	100550 SQ.M	24000 SQ.M
0601053A	CLASS “50” CONCRETE	40 CU.M	30 CU.M
0651649A	CURED-IN-PLACE PIPE LINING	85 M	134 M
1401663A	SANITARY MANHOLE (1.5M DIA.) 3 TO 6M DEEP	11 EA	6 EA
1401664A	SANITARY MANHOLE (1.2M DIA.) 6 TO 9M DEEP	7 EA	5 EA
1401023A	DROP MANHOLE (1.2M DIA.) 9 TO 12M DEEP (SANITARY MANHOLE)	2 EA	1 EA

DELETED CONTRACT ITEMS

ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0217002A	PRELOAD FILL	CU.M	57000
0507223A	SPECIAL TYPE "C-L" CATCH BASIN DOUBLE GRATE TYPE I	EA	5
0507467A	TYPE "C-M" CATCH BASIN DOUBLE GRATE – TYPE II	EA	2
0507754A	RESET TYPE "C" CATCH BASIN DOUBLE GRATE – TYPE II	EA	13
0729001	SEDIMENTATION BOWL	EA	10
0729055	CLEAN SEDIMENTATION BOWL	EA	10
0973724A	WORKSITE TRAFFIC SUPERVISOR	L.S.	1
1008770A	100 MM PVC MULTI DUCT CONDUIT – IN TRENCH	M	3550

PLANS
NEW PLANS

01.02.002

09.01.034, 09.01.035, 09.01.036, 09.01.037, 09.01.038, 09.01.039, 09.01.040, 09.01.041, 09.01.042, 09.01.043, 09.01.044, 09.01.045, 09.01.046, 09.01.047, 09.01.048, 09.01.049

09.04.031, 09.04.032, 09.04.033, 09.04.034, 09.04.035, 09.04.036, 09.04.037, 09.04.038, 09.04.039, 09.04.040, 09.04.041, 09.04.042, 09.04.043, 09.04.044

11.01.000, 11.01.001, 11.01.002, 11.01.003, 11.01.004, 11.01.005, 11.01.006, 11.01.007, 11.01.008, 11.01.009, 11.01.010, 11.01.011, 11.01.012

12.01.001, 12.01.002, 12.02.001, 12.02.002, 12.02.003, 12.02.004, 12.02.005, 12.02.006, 12.02.007, 12.02.008, 12.02.009

REVISED PLANS
The following Plan Sheets are hereby deleted and replaced with the like-numbered Plan Sheets:

1.02.001

01.05.06

02.01.006, 02.01.014, 02.01.026, 02.01.043, 02.01.044, 02.01.045, 02.01.046, 02.01.082, 02.01.084, 02.01.114, 02.01.115, 02.01.116

03.01.030, 03.01.031, 03.01.032, 03.01.033, 03.01.034

05.01.001, 05.01.002, 05.01.003, 05.01.005, 05.01.006, 05.01.011, 05.01.013, 05.01.014, 05.01.015, 05.01.016, 05.01.017, 05.01.025, 05.01.028, 05.01.031, 05.01.034, 05.01.036, 05.01.044

05.02.001, 05.02.002, 05.02.003, 05.02.004, 05.02.005, 05.02.014, 05.02.021, 05.02.023, 05.02.026, 05.02.027, 05.02.028, 05.02.029, 05.02.030, 05.02.036

05.03.001, 05.03.002, 05.03.004, 05.03.005, 05.03.011, 05.03.013, 05.03.015, 05.03.023, 05.03.029, 05.03.033, 05.03.035

05.04.001, 05.04.002, 05.04.004, 05.04.011, 05.04.016, 05.04.017, 05.04.018, 05.04.023, 05.04.024, 05.04.026, 05.04.027

05.05.001, 05.05.002, 05.05.004

05.08.001, 05.08.002, 05.08.004, 05.08.005, 05.08.009, 05.08.015, 05.08.020, 05.08.021, 05.08.024, 05.08.025, 05.08.026, 05.08.027, 05.08.029, 05.08.030, 05.08.032

06.07.011

07.01.16, 07.01.17, 07.01.50, 07.01.51, 07.01.52, 07.01.62, 07.01.63, 07.01.64

DELETED PLAN
The following Plan Sheet is hereby deleted in its entirety:

05.02.035

The Detailed Estimate Sheets do not reflect these changes.

The Bid Proposal Form has been revised to reflect these changes.

There will be no change in the number of calendar days due to this Addendum.

The foregoing is hereby made a part of the contract.

NOTICE TO CONTRACTOR – UTILITY GENERATED SCHEDULE

The attached project specific utility work schedule was provided to the Connecticut Department of Transportation (Department) by the utility companies regarding their identified work on this project.

The utility scheduling information is provided to assist the Contractor in scheduling its activities. However, the Department does not ensure its accuracy and Section 1.05.06 of the Standard Specifications still is in force.

The utility scheduling information shall be incorporated into the Contractor's pre-award schedule in accordance with the Department's Bidding and Award Manual and Section 1.05.08 of the Contract.

After award, the Contractor shall conduct a utility coordination meeting or meetings to obtain contemporaneous scheduling information from the utilities prior to submitting its baseline schedule to the Department in accordance with Section (***1.05.08 – Schedules and Reports***) of the Contract.

The Contractor shall incorporate the contemporaneous utility scheduling information into its baseline schedule submittal. The baseline schedule shall include Contractor predecessor and successor activities to the utility work in such detail as acceptable to the Engineer.

The utility work schedules are based on the sequence of construction as shown on the bidders plan set. If the contractor makes changes to the proposed sequence of construction the utility relocation schedules must be revised and coordinated by the contractor prior to start of construction.

rev. 5/20/2013	UTILITY WORK SCHEDULE		
CTDOT Project Number:	151-273	Town:	Waterbury
Project Description:	Reconstruction of I-84		
CTDOT Utilities Engineer:	Derek Brown		
Phone: 860-594-2555		Email:	Derek.Brown@ct.gov
Utility Company:	AT&T - East		
Prepared By:	Michael Brecher / Tom Delorenzo	Date Prepared:	15-Aug-14
Phone: 203-575-6779		Email:	MB2738@att.com

Scope of Work

The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.

All Work to be done by AT&T, it's contractors and the State's contractors will be permanent. All conduit material and manholes will be supplied by AT&T. The State's contractor will install all conduits on the Hamilton Av. Bridge to AT&T specifications and under the the inspection of AT&T's Conduit Inspector. AT&T will place innerducts, copper and fiber cables and perform all splicing as required and needed at AT&T approved time frames. Removal of existing copper and fiber cables will be completed once service to the new cables has been verified. All locations and quantities are estimated. Due to the large scope of this project the work will have to be done in stages; Hamilton Av. Bridge, Scott Rd. Bridge, Reidville Dr., and Harpers Ferry Rd. The State can determine which stage will go 1st, 2nd, 3rd and 4th. The large copper cables being replaced in the two bridges are not stocked items and can take 4-8 weeks to receive once ordered. This is the Hamilton Av. stage.

Special Considerations and Constraints

The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..

Customer notification cannot begin until all the new copper and fiber cables have been placed and tested. The customer notification process for splicing and cutting over an active cable can take 8 to 12 weeks, (cutovers will take place during off hours on overtime). Please note that any time frame given as a start time or duration of work can be affected by make ready work required prior to the start of the job, coordination with the State's contractor, other utilities, permit applications, (State and Municipality, if required), changes in scope of work, inclement weather, lockdown days, (holidays, end of quarter etc.), and emergency situations.

UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273 Hamilton Av.		
Utility Company:	AT&T - East		
Prepared By:	Tom Delorenzo/Michael Brecher	Total Calendar Days:	133

Schedule

The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of calendar days required to complete the utility work activity based on historical information and production rates.

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (calendar days)
HA25+400 L of BL	Test Pits to determine if new manhole #1 can fit.	None	2
HA25+210 L of BL	Test Pits to determine if new manhole #2 can fit.	None	2
HA25+400 L of BL	Place new manhole #1	Test Pits	2
HA25+210 L of BL	Place new manhole #2	Test Pits	2
HA25+420 to 25+360	Place 8-4" P Type conduits, 200'	New MH #1 & 2 placed	4
HA25+200 to 25+080	Place 8-4" P Type conduits, 460'	State's contractor place 8-4" Fiberglass conduits in the new Hamilton Av. Bridge	6
HA25+440 to 25+000	Rod and rope conduits, place fiber and copper cables	All conduit work on Hamilton Av Bridge complete. Cable ordered and delivered	20
HA25+440 to 25+000	Splice new fiber and copper cables, test and verify	Fiber and copper cables placed into new duct structure	90
HA25+440 to 25+000	Removal of old cables	Splicing complete	5

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UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273	Town:	Waterbury
Project Description:	Reconstruction of I-84		
CTDOT Utilities Engineer:	Derek Brown		
Phone:	860-594-2555	Email:	Derek.Brown@ct.gov
Utility Company:	AT&T - East		
Prepared By:	Michael Brecher	Date Prepared:	15-Aug-14
Phone:	203-575-6779	Email:	MB2738@att.com

Scope of Work

The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.

All Work to be done by AT&T, it's contractors and the State's contractors will be permanent. AT&T will replace 13 poles on Reidville Dr. and 2 poles on East Main St. Reidville Dr. appears to consist of ledge so additional "core bore" may be required to get them set. The copper cables on these poles will be replaced, the fiber shifted. All locations and quantities are estimated. Due to the large scope of this project the work will have to be done in stages; Hamilton Av. Bridge, Scott Rd. Bridge, Reidville Dr., and Harpers Ferry Rd. The State can decide which stage will go 1st, 2nd, 3rd and 4th. The large copper cables that are being replaced in the two bridges are not stocked items and can take 4-8 weeks to receive once ordered. This is the Reidville Drive stage.

Special Considerations and Constraints

The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..

Customer notification cannot begin until all the new copper and fiber cables have been placed and tested. The customer notification process for splicing and cutting over an active cable can take 8 to 12 weeks, (cutovers will take place during off hours on overtime). Please note that any time frame given as a start time or duration of work can be affected by make ready work required prior to the start of the job, coordination with the State's contractor, other utilities, permit applications, (State and Municipality, if required), changes in scope of work, inclement weather, lockdown days, (holidays, end of quarter etc.), and emergency situations.

UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273 Reidville Dr		
Utility Company:	AT&T - East		
Prepared By:	Michael Brecher	Total Calendar Days:	63

Schedule

The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of calendar days required to complete the utility work activity based on historical information and production rates.

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (calendar days)
EM30+340 to 30+420	Place new poles and anchors	State to get easement for anchors at both locations	2
EM30+340 to 30+420	Shift existing fiber cables, place new copper cable and terminals	All other utilities and CLEC's must have shifted to new poles	5
EM30+340 to 30+420	Splice copper cables and terminals, test and verify	Cable and terminals placed	10
EM30+340 to 30+420	Remove old poles and cable	New cables spliced	1
RD10+100 to 10+500	Place new poles and anchors	Receive ordered material	20
RD10+100 to 10+500	Shift existing fiber cables, place new copper cable and terminals	All other utilities and CLEC's must have shifted to new poles	10
RD10+100 to 10+500	Splice new fiber and copper cables, test and verify	Cable and terminals placed	10
RD10+100 to 10+500	Remove old poles and cable	Splicing complete	5

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UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273	Town:	Waterbury
Project Description:	Reconstruction of I-84		
CTDOT Utilities Engineer:	Derek Brown		
Phone:	860-594-2555	Email:	Derek.Brown@ct.gov
Utility Company:	AT&T - East		
Prepared By:	Michael Brecher	Date Prepared:	15-Aug-14
Phone:	203-575-6779	Email:	MB2738@att.com

Scope of Work

The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.

All Work to be done by AT&T, it's contractors and the State's contractors will be permanent. AT&T will replace 2 poles on Plank Rd. and 16 poles on Harpers Ferry Rd. The copper cables on these poles will be replaced, the fiber shifted. All locations and quantities are estimated. Due to the large scope of this project the work will have to be done in stages; Hamilton Av. Bridge, Scott Rd. Bridge, Reidville Dr., and Harpers Ferry Rd. The State can determine which stage will go 1st, 2nd, 3rd and 4th. The large copper cables being replaced in the two bridges are not stocked items and can take 4-8 weeks to receive once ordered. This is the Harpers Ferry Rd. stage.

Special Considerations and Constraints

The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..

Customer notification cannot begin until all the new copper and fiber cables have been placed and tested. The customer notification process for splicing and cutting over an active cable can take 8 to 12 weeks, (cutovers will take place during off hours on overtime). Please note that any time frame given as a start time or duration of work can be affected by make ready work required prior to the start of the job, coordination with the State's contractor, other utilities, permit applications, (State and Municipality, if required), changes in scope of work, inclement weather, lockdown days, (holidays, end of quarter etc.), and emergency situations.

UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273 Harpers Ferry		
Utility Company:	AT&T - East		
Prepared By:	Michael Brecher	Total Calendar Days:	41

Schedule

The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of calendar days required to complete the utility work activity based on historical information and production rates.

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (calendar days)
HFR60+800 to 60+100	Place new poles and anchors	Receive ordered material	12
HFR60+800 to 60+100	Shift existing fiber cables, place new copper cable and terminals	All other utilities and CLEC's must have shifted to new poles	8
HFR60+800 to 60+100	Splice copper cables and terminals, test and verify	Cable and terminals placed	10
HFR60+800 to 60+100	Remove old poles and cable	New cables spliced	8
PR70+400	Place new poles and anchors	Receive ordered material	2
PR70+400	Shift cable, remove old pole	All other utilities and CLEC's must have shifted to new poles	1

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UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273	Town:	Waterbury
Project Description:	Reconstruction of I-84		
CTDOT Utilities Engineer:	Derek Brown		
Phone: 860-594-2555		Email:	Derek.Brown@ct.gov
Utility Company:	AT&T - East		
Prepared By:	Michael Brecher/Tom Delorenzo	Date Prepared:	15-Aug-14
Phone: 203-575-6779		Email:	MB2738@att.com

Scope of Work

The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.

All Work to be done by AT&T, it's contractors and the State's contractors will be permanent. AT&T will move existing pole line, 5 poles, from East side of bridge to the West side. All conduit material and manholes will be supplied by AT&T. The State's contractor will install all conduits on the Scott Rd. bridge to AT&T specifications and under the the inspection of AT&T's Conduit Inspector. AT&T will place innerducts, copper and fiber cables and perform all splicing as required and needed at AT&T approved time frames. Removal of existing copper and fiber cables will be completed once service to the new cables has been verified. All locations and quantities are estimated. Due to the large scope of this project the work will have to be done in stages; Hamilton Av. Bridge, Scott Rd. Bridge, Reidville Dr., and Harpers Ferry Rd. The State can determine which stage will go 1st, 2nd, 3rd and 4th. The large copper cables being replaced in the two bridges are not stocked items and can take 4-8 weeks to receive once ordered. This is the Scott Rd. Bridge stage.

Special Considerations and Constraints

The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..

Customer notification cannot begin until all the new copper and fiber cables have been placed and tested. The customer notification process for splicing and cutting over an active cable can take 8 to 12 weeks, (cutovers will take place during off hours on overtime). Please note that any time frame given as a start time or duration of work can be affected by make ready work required prior to the start of the job, coordination with the State's contractor, other utilities, permit applications, (State and Municipality, if required), changes in scope of work, inclement weather, lockdown days, (holidays, end of quarter etc.), and emergency situations.

UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273 Scott Rd		
Utility Company:	AT&T - East		
Prepared By:	Tom Delorenzo/Michael Brecher	Total Calendar Days:	122

Schedule

The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of calendar days required to complete the utility work activity based on historical information and production rates.

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (calendar days)
SR5+250 R of BL	Test Pits to determine if new manhole can fit.	None	2
SR5+150 R of BL	Test Pits to determine if new manhole can fit.	None	2
SR5+150 to 5+250	Place new manhole	Test Pits	2
EM30+275 to SR5+380	Place 8-4" P Type conduits, 400'	New Manhole placed	6
SR5+120 to 5+040	Place 8-4" P Type conduits, 265'	State's contractor place 8-4" Fiberglass conduits in the new Scott Rd. bridge	6
SR5+330 to 5+000	Rod and rope conduits, place fiber and copper cables	All conduit work on Hamilton Av Bridge complete. Cable ordered and delivered	15
SR5+330 to 5+000	Splice new fiber and copper cables, test and verify	Fiber and copper cables placed into new duct structure	75
SR5+330 to 5+000	Removal of old cables	Splicing complete	4
SR5+330 to 5+000	Place new pole line over I-84 on West side of Scott Rd. bridge	Beaver Pond Brook gets relocated, trees trimmed	5
SR5+330 to 5+000	Relocate aerial fiber to new pole line	All other utilities & CLEC's shift to new pole line	3
SR5+330 to 5+000	Remove old poles	All cables shifted to new poles	2

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UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273	Town:	Waterbury
Project Description:	I-84 Reconstruction		
CTDOT Utilities Engineer:	Derek Brown		
Phone:	(860) 594-2555	Email:	Derek.Brown@ct.gov
Utility Company:	Comcast of CT/GA/MA/NH/NY/NC/VA/VT,LLC		
Prepared By:	Dave Gerrish	Date Prepared:	8/21/2014
Phone:	203-732-0146 x73801	Email:	dave_gerrish@cable.comcast.com

Scope of Work

The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.

For the two overpasses, Harpers Ferry Rd. and Scott Rd, that Comcast has current facilieies on, will need to temporarily relocate aerial facilities to a temporary pole line away from the construction area. Once the new bridges are in place, place new facilities in the new structures. This will include rising on the closest pole to the new bridge and placing a vault at or near the base of the pole and extending conduit to the new bridge at the location where the conduits specified for Comcast will be located. Repeat this at each end of the two bridges. Pull fiber and coax through the conduit and across the bridges and tie in at each end.

Special Considerations and Constraints

The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..

All CL&P and Fibertech work will need to be 100% completed before Comcast can begin our reconstruction. Police detail will need to be scheduled and present for all Comcast work. Cutover of new facilities will need to be completed before 8:00AM on day of cutover which will need to fall between Tuesday and Thursday of the week of construction.

UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273		
Utility Company:	Comcast of CT/GA/MA/NH/NY/NC/VA/VT,LLC		
Prepared By:	Dave Gerrish	Total Calendar Days:	13.5

Schedule

The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of calendar days required to complete the utility work activity based on historical information and production rates.

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (calendar days)
60+240 to 60+480	Place strand, feeder and fiber cable to temporary pole line across I-84	New poles in place and CL&P and Fibertech work 100% complete	2
60+240 to 60+480	Perform night cut of coax and fiber cables to move traffic to new temporary pole line.	New cables have been run	0.5
60+240 to 60+480	Wreck out all old facilities off old poles line near existing bridge that are to be removed.	Cutover complete and CL&P have completed their removals.	1
5+50 to 5+300	Place strand, feeder and fiber cable to temporary pole line across I-84	New poles in place and CL&P and Fibertech work 100% complete	2
5+50 to 5+300	Perform night cut of coax and fiber cables to move traffic to new temporary pole line.	New cables have been run	0.5
5+50 to 5+300	Wreck out all old facilities off old poles line near existing bridge that are to be removed.	Cutover complete and CL&P have completed their removals.	1
60+240 to 60+480	Trench and place vault and conduit from last permanent pole to bridge abutment on each end.	Permanent pole closest to bridge abutment is in place and new bridge is in place and	2
60+240 to 60+480	Place risers and pull coax and fiber across new bridge through newly placed conduit.	Conduit run has full continuity	1
60+240 to 60+480	Perform night cut of coax and fiber cables to move traffic to permanent conduit structures.	New cables have been run	0.5
60+240 to 60+480	Wreck out all facilities attached to temporary pole line.	CL&P have removed form temporary pole line.	1
5+50 to 5+300	Trench and place vault and conduit from last permanent pole to bridge abutment on each end.	Permanent pole closest to bridge abutment is in place and new bridge is in place and	2

UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273	
Utility Company:	Comcast of CT/GA/MA/NH/NY/NC/VA/VT,LLC	
Prepared By:	Dave Gerrish	Total Calenda

Schedule

The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activit stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration p required to complete the utility work activity based on historical information and production rates.

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity
5+50 to 5+300	Place risers and pull coax and fiber across new bridge through newly placed conduit.	Conduit run has full continuity
5+50 to 5+300	Perform night cut of coax and fiber cables to move traffic to permanent conduit structures.	New cables have been run
5+50 to 5+300	Wreck out all facilities attached to temporary pole line.	CL&P have removed form temporary line.

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UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273	Town:	WATERBURY
Project Description:	RECONSTRUCTION OF I-84 CITY OF WATERBURY		
CTDOT Utilities Engineer:	AMMANN & WHITNEY		
Phone:		Email:	
Utility Company:	Yankee Gas Service Company		
Prepared By:	Edward Flanagan	Date Prepared:	5/23/2014
Phone:	(203) 596-3023	Email:	flanaew@nu.com

Scope of Work

GENERAL

The following is a description of all utility work planned to be completed in conjunction with the CTDOT project. The narrative describes all work to be carried out by the utility or its contractor, including temporary and permanent work required by the project as well as any additional utility infrastructure work the utility intends on performing within the project limits during the construction of the project.

GENERAL SCOPE OF GAS MAIN WORK: (1.) Establish back-up feed from IP system on East Main Street to IP system on Harpers Ferry Rd to enable retirement of existing 200 mm steel gas main crossing on the existing culvert on Plank Road. Install 55 M of 200 mm steel gas main from Sta 70+070 to 70+125 including 200mm steel gas main to be installed on the new culvert. (2.) Relocate 200 mm steel gas main on Harpers Ferry Rd (approximately 450 M) from Sta 60+200 to Sta 60+650 includes bridge crossing.(3.) Plank Rd. from Sta 70+130 to 70+400 (270M) relocate 100 mm steel gas main and retire 270 M of 100mm steel gas main. (4.) Reidville Dr. relocate 500 M of 200mm steel gas main from Sta 10+000 to Sta 10+500 and retire 500 M of existing 200 mm steel main on old Reidville Dr. (5.) Scott Rd. Relocate 150 mm steel gas main with 200 mm steel gas main from Station 5+125 to Sta 5+333 and retire approximately 208 M of 150 mm gas main (includes bridge crossing). (6) Retire 130 M of 150mm steel main on the existing WB 25 off ramp I-84. (7) Plank Rd. East relocate 150 mm steel main approximate Sta 50+930 (L -5m) in conflict with Proposed 300 mm storm drain. (8) Relocate 100mm steel main at approximate Sta 51+048 (L-9M) in conflict with proposed retaining. (9) Plank Rd East relocate 170 M of 100mm steel main from Sta 51+050 to approximately 51+220 and retire 170M of 100mm of steel main. (10) East Main St. relocate approximately 150 M of 150 mm steel main from Sta 30+200 to Sta 30+ 350. (11) Approximately 7 service replacements and / or tie overs.

Special Considerations and Constraints

The following describes the limiting factors that must be planned for in the scheduling and performance of the utility work. For example, restrictions on cut-overs, outages, limitations on customer service interruptions (e.g. nights, weekends, holidays), seasonal and environmental shutdown periods, long lead material procurements, etc..

The State's Bridge Contractor shall provide Yankee Gas's Contractor with complete access to the Harpers Ferry Rd. and Scott Rd bridges to install the new 200mm steel gas mains. The State's Contractor shall provide Yankee's Contractor with all staging / scaffolding and a safe work area on the bridges prior to and during Yankee's Contractor installing of the gas main on the bridges. All gas main work shall be completed and activated on Harpers Ferry Rd. and Reidville Dr. before any gas existing facilities can be taken out of service on Scott Rd and East Main Street.

UTILITY WORK SCHEDULE

CTDOT Project Number:	151-273		
Utility Company:	YANKEE GAS		
Prepared By:	EDWARD FLANAGAN	Total Calendar Days:	208

Schedule

The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of calendar days required to complete the utility work activity based on historical information and production rates.

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (calendar days)
E. Main St	Establish back-up feed from IP system on E. Main St to IP system on Harpers Ferry Road	None	20
70+070 to 70+125	Retire 55 M of 150 mm stl gas main crossing existing culvert on Plank Rd	Establish Back-up feed from E. Main to Harpers Ferry Rd.	3
70+130 to 70+400	Install 270M of 100mm plastic gas main and replace 13 steel services Plank Rd. Retire existing 100mm	Establish Back-up feed from E. Main to Harpers Ferry Rd.	20
60+200 to 60+650	Cut off and abandon in place the 200mm steel gas main on Harpers Ferry Rd. Includes Bridge Crossing	Establish Back-up feed from E. Main to Harpers Ferry Rd and Scott Rd feed.	5
60+200 to 60+650	Install 200mm Steel Gas Main on Harpers Ferry Rd.	Establish Back-up feed from E. Main to Harpers Ferry Rd and Scott Rd feed.	40
	Install 200mm Steel Gas Main on Harpers Ferry Rd. Bridge	Establish Back-up feed from E. Main to Harpers Ferry Rd and Scott Rd feed.	20
10+000 to 10+500	Install 12" Steel Gas Main on Harpers Ferry Rd. from Hamilton Ave. to new Reidville Dr.	Establish Back-up feed from E. Main to Harpers Ferry Rd and Scott Rd feed.	25
10+000 to 10+500	Reidville Dr. relocate/ install 500M of 200mm steel gas main and retire 500M existing 200mm stl gas.	Maintain feed through Scott Rd.	25
5+125 to 5+333	Scott Rd cut off and abandon in place 150mm and 200mm gas main includes existing bridge crossing.	Completed gas main installations on Harpers Ferry Rd. and Reidville Dr.	5
30+200 to 30+350	East Main St. relocate 150M of 150mm steel main and install new service to Dunkin Donut.	Completed gas main installations on Harpers Ferry Rd. and Reidville Dr.	15
5+125 to 5+333	Scott Rd install 208M of 200mm gas main on Scott Rd.	Completed gas main installations on Harpers Ferry Rd. and Reidville Dr.	30

UTILITY WORK SCHEDULE

CTDOT Project Number: 151-273

Utility Company: YANKEE GAS

Prepared By: EDWARD FLANAGAN

Total Calendar Days: 45

Schedule

The following schedule identifies each major activity of utility work in sequential order to be performed by the utility or its contractor. The location of each activity of work is identified by the baseline stationing on the CTDOT plans. All activities identify the predecessor activity which must be completed before a utility work activity may progress. The duration provided is the number of calendar days required to complete the utility work activity based on historical information and production rates.

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (calendar days)
	Scott Rd install 200mm gas main on the Scott Rd. Bridge.	Complete all gas main installations on Harpers Ferry Rd. and Reidville Dr.	15
50+875 to 51+140	Install 265M of 100mm plastic main and tie-over and/or replace 5 services	none	25
50 +875 to 51+ 140	Retire 265M of 100mm steel gas main	Install 265M of 100mm plastic main and tie-over and/or replace 5 services	3
	Retire 130M of 150mm steel gas main on the existing WB 25 off Ramp I-84	None	2

NOTICE TO CONTRACTOR – HMA S1 – EXTRA ASPHALT

Item #0406169 HMA S1 - Extra Asphalt shall be produced with the same Job Mix Formula (JMF) as HMA S1, Superpave Design Level 2, with an extra 0.5% (by weight of total JMF) liquid asphalt binder added after it has been approved for use as HMA S1.

NOTICE TO CONTRACTOR – PROJECT LABOR AGREEMENT

The Contractor is hereby notified that a Project Labor Agreement (PLA) is required as part of this Contract.

The PLA has been signed by the Waterbury Building and Construction Trades Council and each individual Union is hereby made part of the Contract Documents. The Contractor will be required to sign the PLA prior to the Award of this Contract.

As a requirement of the PLA, all subcontractors (including DBE subcontractors), prior to the award of any subcontracted work for Project No. 151-273, shall be required to sign the "Acceptance of Agreement" form acknowledging that they have received a copy of the PLA, and accept and agree to be bound by the PLA for Project No. 151-273.

It shall be the responsibility of the Contractor to assure that all subcontractors (including DBE subcontractors) sign the "Acceptance of Agreement" form. The Contractor shall keep a copy of the signed form and shall also forward a copy of the signed form to the Engineer.

GENERAL

NOTICE TO CONTRACTOR – NOISE BARRIER WALL

Anywhere in the contract documents, Traffic Noise Barrier is referenced; it shall be construed to mean Noise Barrier Wall.

Anywhere in the contract documents, Traffic Noise Barrier (Retaining Wall Mounted) is referenced; it shall be construed to mean Noise Barrier Wall (Structure).

NOTICE TO CONTRACTOR – DETOUR ROADWAYS

The Contractor is hereby notified that ramp and local roadway closures with associated detours are required as follows:

- WB 23 Off-Ramp to Hamilton Avenue in Stage 1
- EB 23 On-Ramp from Hamilton Avenue in Stage 2
- WB 24 Off-Ramp to Harpers Ferry Road in Stage 2
- Plank Road across the Mad River in Stage 1
- Brookdale Lane at Plank Road in Stage 1

The length of closures of the ramps and local roads vary but the closure of the WB 23 Off-Ramp to Hamilton Avenue can not exceed 48 hours.

In addition, the City of Waterbury must be notified 14 days in advance of any closures and no closure is allowed until after the detour is in place and operational.

NOTICE TO CONTRACTOR - GENERAL PERMIT FOR STORMWATER DISCHARGE

This notice is provided to summarize the requirements of the Connecticut Department of Environmental Protection's General Permit for the Discharge of Stormwater and Dewatering Wastewaters associated with Construction Activities (Permit) issued on October 1, 2013. When construction activities will result in the disturbance of a total of 1 acre (0.4047 ha) or more of land regardless of phasing, the Connecticut Department of Transportation (Department) will incorporate a Stormwater Registration (Registration) and Stormwater Pollution Control Plan (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.

The Registration and 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 Registration and 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 Registration and SWPCP.

The District Engineer is responsible to sign the Registration and will be the permittee for all Department construction projects. For all local town/municipal projects, the District Engineer is not responsible to sign the Registration as the local town or municipality will be the signed permittee.

If the Contractor requires a modification to the SWPCP, it shall be in accordance with the 2002 Connecticut Guidelines for Soil Erosion and Sediment Control and the 2004 Connecticut Stormwater Quality Manual or as revised 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 within 30 days of the date of the Contractor's submission. 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 Permit amendment, modification, or revision unless the Engineer approves, in writing, the Contractor's request.

At a minimum, the Contractor along with qualified personnel (provided by the permittee) shall inspect the site for non stabilized areas, structural control measures, and locations where vehicles enter or exit the site at least once every seven calendar days and within twenty four hours of the end of a storm that is 0.1 inches (2.54 mm) or greater. If a potential source of pollution is identified, pollution preventive measures shall be implemented within twenty four hours and the SWPCP must be amended within three calendar days.

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.

Erosion and Sedimentation Control Provisions:
Unless specifically outlined in the Contract Plans and/or SWPCP, the Contractor is not allowed to disturb more than two (2) acres (0.8094 ha) 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 (0.8094 ha) 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* (0.8094 ha) *per discharge point*, the Contractor may disturb additional areas if and only if the previously disturbed areas are temporarily or permanently stabilized 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 to be at least two (2) acres* (0.8094 ha) *per discharge point but no more than five (5) acres (2.0235 ha) 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/temporary sedimentation basin per discharge point with a capacity to contain 134 cubic yards per acre (102.5 m^3 per 0.4047 ha) of material. The Contractor shall design and construct the temporary sedimentation trap/temporary sedimentation basin in accordance with the 2002 Connecticut Guidelines for Soil and Sediment Control. The Contractor shall provide an inspection and maintenance plan for the temporary sedimentation trap/temporary sedimentation basin as part of the amended SWPCP.

- *If the area of disturbance has a potential to reach more than five (5) acres (2.0235 ha) per discharge point*, the Contactor must submit to the Engineer a revised SWPCP for review and approval. The SWPCP must include locations of the engineered sedimentation basin per discharge point with a capacity to contain 134 cubic yards per acre (102.5 m^3 per 0.4047 ha) of material. The Contractor shall design and construct the engineered sedimentation basin in accordance with the 2004 Connecticut Stormwater Quality Manual. The Contractor shall provide an inspection and maintenance plan for the engineered sedimentation basin as part of the amended SWPCP.

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.

SECTION 1.03 – AWARD AND EXECUTION OF CONTRACT

Article 1.03.08 – Notice to Proceed and Commencement of Work

Delete Article 1.03.08 in its entirety and replace with the following:

The Notice to Proceed (NTP) shall be a two part notice to proceed consisting of the following:

NTP Part 1 - Administrative Work: Administrative Work involves establishing the field office, procurement of materials, and proceeding with shop drawings, working drawings and all other submittals and administrative work that can be initiated prior to physical Project construction.

NTP Part 2 – Construction Work: Construction Work is the start of physical Project construction:

The Contractor shall commence and proceed with the Administrative Work on the date specified in a written Notice to Proceed Part 1 issued by the Engineer to the Contractor. The date specified will be no later than 15 calendar days after the date of the execution of the Contract by the Department.

The Contractor shall commence and proceed with the Construction Work on the date specified in a written Notice to Proceed Part 2 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 except that if the expiration of said 45 calendar days occurs during the period between November 30 and April 1 of the following year, the Engineer may specify that the April 1 following said expiration shall be the date for the Contractor to proceed with the work.

If the Engineer does not issue a Notice to Proceed Part 2 for Construction Work to the Contractor within the time frame defined above, the Contractor shall have the option of canceling the Contract and its payment and performance bonds for the Project. Any failure by the Department to issue a notice to proceed, or to issue one on a timely basis, shall not, however, constitute a breach of the Contract. Neither the Contractor nor any other party may use such a failure as a basis for any claim against the Department for damages.

The Contractor shall not begin physical Project construction prior to the date specified for same by the Engineer in the Notice to Proceed, except as may be otherwise authorized by the Engineer in writing.

SECTION 1.05 - CONTROL OF THE WORK

1.05.02(2) - 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, except Steel Span Poles and Mast Arm Assemblies when applicable, 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

When these items are included in the project, the submission for Steel Span Poles and Mast Arm Assemblies shall follow the format and be sent to the "Engineer of Record" as described in the Steel Span Pole and Steel Mast Arm Assembly special provision.

Add the following Subarticle:

1.05.02(4) - Schedule of Submissions

Prior to the submission of any working, shop or erection drawings, the Contractor shall prepare and submit to the Engineer, for approval, a schedule for all proposed working and shop drawings. For projects that contain Item #0969000A - Project Coordinator as a contract item,

this information must be submitted in conformance with the requirements of that specification. For all other projects, this initial schedule should be submitted within thirty (30) days of contract award and must be submitted before the Notice to Proceed. The Contractor shall coordinate, schedule and control all submittals of working and shop drawings including those of his various subcontractors, suppliers and engineers to provide for an orderly and balanced distribution of the work.

The Contractor shall schedule the submission of shop drawings so that thirty (30) calendar days (beginning on the date of receipt) is allowed for review by the Department for routine work. For work of more complexity, the time for review by the Department will be increased in proportion to the complexity of the work. The Contractor shall adjust his schedules so that an additional fifteen (15) calendar day period is provided for each resubmittal.

It is incumbent upon the Contractor to submit his shop drawings in accordance with the approved working and shop drawing schedule to facilitate expeditious review. Voluminous submittals of shop drawings at one time are discouraged and may result in increased review time. In no case will the Department accept liability for resulting delays, added costs and related damages when the time required for approval extends beyond the approximate times shown herein when the shop drawings are not submitted in conformance with the approved schedule.

Article 1.05.02 – IMS Items: Amend as follows:

Subarticle 1.05.02 (2) is supplemented by the following:

When required by the contract documents or when ordered by the Engineer, the Contractor shall prepare and submit nine (9) sets of catalog cuts and or shop drawings for IMS including all conduit, communication, video and VMS related equipment to the Highway Operations Section for approval before fabrication or order.

Please forward to:

Mr. Harold J. Decker
Connecticut Department of Transportation
Highway Operations
2800 Berlin Turnpike
P.O. Box 317546
Newington, Connecticut 06131-7546

Article 1.05.02 - Plans, Working Drawings, and Shop Drawings shall be amended as follows:

Subarticle 1.05.02 (3): add the following:

VMS Structural Supports Shop drawings and 70’ Pole should be submitted to the following person and address:

Robert Lin, P.E.
Ammann & Whitney
2500 Westchester Avenue
Purchase, NY 10577

Each shop drawing prepared by a fabricator shall include the name and telephone number of a contact person who is familiar with the drawings and will be available to answer questions by the Engineer should any arise during the review process. Likewise, working drawing submissions shall list the name and telephone number of a contact person who is familiar with the design and will be available to answer questions by the Engineer should any arise during the review process.

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 163°CF.

Hot Mix Asphalt (HMA) – Extra Asphalt: HMA mix designed to the same job mix formula (JMF) as an HMA mix without extra asphalt, but then has an additional 0.5% (by weight of JMF) liquid asphalt binder added.

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 0.3 m 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 420 to 620 kPa 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 7.5 m- behind paving machine

Table 4.06-2: Roller Lighting

Fixture*	Quantity	Remarks
Type B (wide)	2	Aim 15.2 m- in front of and behind roller
Type B (narrow)	2	Aim 30.5 m- in front of and behind roller

OR		
Type C (flood)	2	Aim 15.2 m - in front of and behind roller
Type C (spot)	2	Aim 30.5 m - 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 1.2 m - 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 4°C 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.

Permanent Transitions: 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 56 km/h -: 3.6 m per cm - of vertical change (thickness)
b) Posted speed limit is 56 km/h - or less: 1.8 m per cm - of vertical change (thickness).
c) Bridge Overpass and underpass transition length will be 23 m - 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 56 km/h -
   (1) Leading Transitions = 1.8 m per cm - of vertical change (thickness)
   (2) Trailing Transitions = 0.7 m per cm - of vertical change (thickness)

b) Posted speed limit is 56 km/h - or less
   (1) Leading and Trailing = 0.5 m per cm - 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	+/- 10 mm -
Class 1, 2 and 12 and S0.25, S0.375, S0.5	+/- 6 mm -

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 136 to 226 ml per m^2 - for a non-milled surface and an application rate of 226 to 317 ml per m^2 - for a milled surface. For areas where both milled and un-milled surfaces occur, the tack coat shall be an application rate of 136 to 226 ml per m^2 -. 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 71 °C - 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.

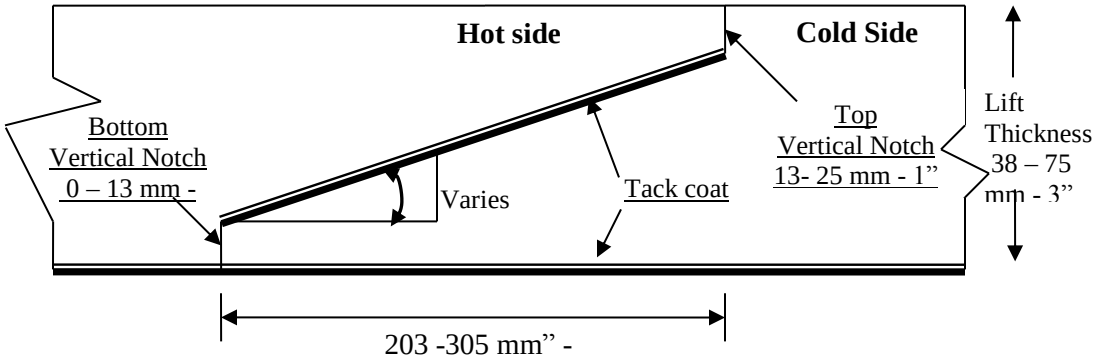
a) Smoothness- Each lift of the surface course shall not vary more than 6 mm - from a Contractor-supplied 3 m - straightedge. For all other lifts of bituminous concrete, the tolerance shall be 9 mm -. Such tolerance will apply to all paved areas.

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 38 and 75 mm -, except for S1 and Class 4 mixes. Method II Butt Joint (see figure 4.06-2) shall be used for lifts less than 38 mm - or greater than 75 mm -, 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 150 mm - 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.

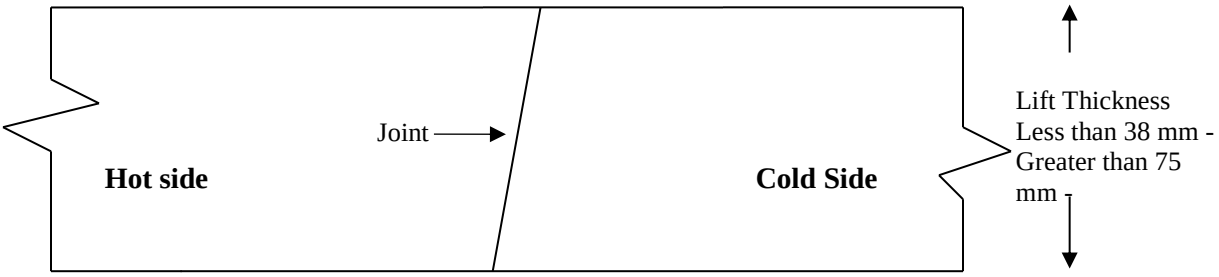
The pavement surface under the wedge joint must have an application of tack coat material. Prior to placing the completing pass (hot side), an application of tack coat must be applied to the exposed surface of the tapered section; regardless of time elapsed between paver passes. The in-place time allowance 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

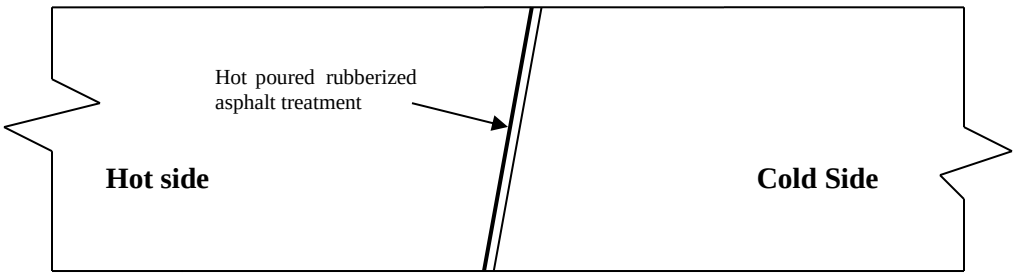


When adjoining passes are placed, the Contractor shall utilize equipment that creates a near vertical edge (refer to figure). The completing pass (hot side) shall have sufficient mixture so that the compacted thickness is not less than the previous pass (cold side). The end gate on the paver should be 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 (http://www.ct.gov/dot/lib/dot/documents/dconstruction/pat/qcp_outline_hma_placement.pdf). 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 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.

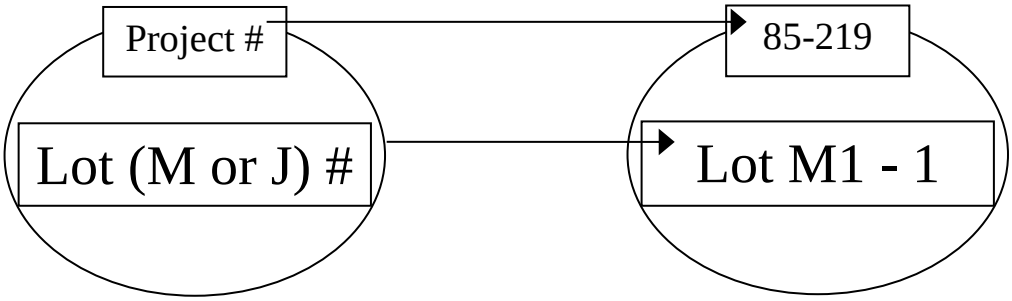
The Contractor may obtain one (1) mat core and one (1) joint core per day for process control, provided this process is detailed in the QCP. The results of these process control cores shall not be used to dispute the Department determinations from the acceptance cores. The Contractor shall submit the 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 38 mm - 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 (100 or 150 mm - diameter for S0.25, S0.375 and S0.5 mixes, 150 mm diameter for S1.0 mixtures -wet sawed) from sampling locations determined by the Engineer. 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**
≤ 152 m -	See Table 4.06-5(A or B)	See Table 4.06-5(A or B)
153 m – 457 m -	3	3
458 m – 762 m -	4	4
763 m - and greater	5	5

All material placed on structures less than or equal to 152 m - in length shall be included as part of a standard lot as follows:

TABLE 4.06-5A – TESTING REQUIREMENT FOR DENSITY LOTS ≥ 454 M TONS

Lot Type	**No. of Mat Cores**		**No. of Joint Cores**		**Target Lot Size (mTons)**
Lot Without Bridge[1]	4		4		1816 -
Lot With Bridge(s)[1][2]	4 plus	1 per structure (≤ 91 m -)	4 plus	1 per structure (≤ 91 m -)	1816 -
		2 per structure (92 m - 152 m -)		2 per structure (92 m – 152m -	

TABLE 4.06-5B – TESTING REQUIREMENT FOR DENSITY LOTS < 454 M - TONS

Lot Type	No. of Mat Cores	No. of Joint Cores	Lot Size (mTons)
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.

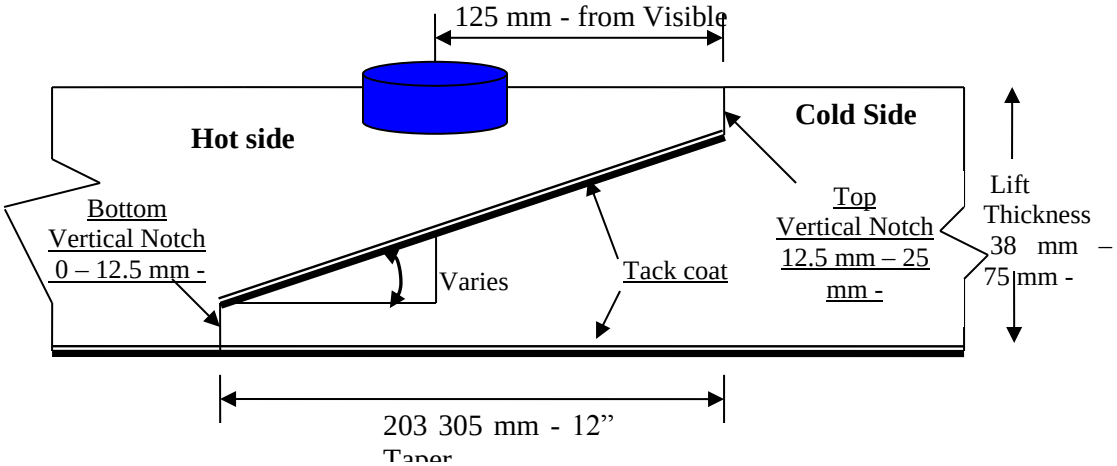
A density lot will be complete when the full designed paving width of the established lot length has been completed and shall include all longitudinal joints that exist between the curb lines regardless of date(s) paved. Quantity of material placed on structures less than or equal to 152 m - long is 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 1816 m - 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 1816 m -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 0.3 m from the edge of a paver pass. If a random number locates a core less than 0.3 m from any edge, locate the core so that the sample is 0.3 m from the edge.

Joint cores must be taken so that the center of the core is 125 mm 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 0.6 meters - 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 3 mm - 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 0.9 m - 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 38 mm - 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 = 0.00246 mton/m^2 -

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

Actual Thickness (t) = Total tons delivered / [Actual Area (m^2 -) x 0.00246 mtons/m2 -]

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}) -] x (t) x 0.00246 mtons/m^2 - = (-) mTons

Where: L = Length (m -)
(t) = Actual thickness (mm -)
W_{adj} = (Designed width (m -) + tolerance) - 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 0.00246 mtons/m^2 - = (-) Tons

Where: A = Area = {[L x (Designed width + tolerance (lift thickness) -)] -}
t_{adj} = Adjusted thickness = [(Dt + tolerance) - Actual thickness]
Dt = Designed thickness (mm -)

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= (-) mTons

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 m Tons

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

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 4.06-8 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*

*For HMA items specifying extra asphalt, the min. liquid content used in the table above shall be the min liquid content specified for a HMA Level 2 mix of the same nominal max aggregate size plus 0.5%.

e) Density Adjustment: The quantity of bituminous concrete measured for payment for a specified lift of pavement 38mm - 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 x .50) + (PA_J x .50)} / 100] X Density Lot mTons

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(a)	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)

(a) For HMA items specifying extra asphalt, subtract 0.2% from the average core result percent mat density.
(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.

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 liters 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 2 liters -. 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 2 liters -. 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 15ºC for the material furnished. The number of liters 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* or HMA S* Extra Asphalt: The furnishing and placing of bituminous concrete will be paid for at the Contract unit price per metric (m) ton for "Bituminous Concrete, Class ( )" or “HMA S*” or “PMA S*” or “HMA S* - Extra Asphalt”.

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

Density Lot: T_D X Unit Price = Est. (D)

Where: Unit Price = Contract unit price per m 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 liter - 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 ( )	mton
HMA S*	mton
PMA S*	mton
Bituminous Concrete Adjustment Cost	est.
Material for Tack Coat	l -
Material Transfer Vehicle	mton

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

SECTION 6.01 - CONCRET FOR STRUCTURES

Subarticle 6.01.03 – 6 (g): Mass Concrete Placement; ***Delete section and replace with the following:***

Mass concrete placement shall be defined as any placement, excluding underwater concrete placement, in which the concrete being cast has dimensions of 1500 mm (5 ft) or greater in each of three (3) different directions. For placements with a circular cross section, a mass concrete placement shall be defined as any placement that has a diameter of 1800 mm (6 ft) or greater and a height of 1500 mm (5 ft) or greater. For all mass concrete placements, the mix temperature shall not exceed 30°C (85°F) as measured at point of discharge into the forms.

For all mass concrete placements, the maximum temperature of the concrete (after placement) shall not exceed 70°C (158°F), and the temperature differential between the hottest point of the concrete and the exterior faces shall not exceed the allowable temperature differential limit. The thermal control period shall begin when the concrete is placed, continue though when the concrete begins to cool from its maximum temperature, and end when difference between the core concrete temperature and the average daily air temperature is less than the temperature differential as described above for three (3) consecutive days. The allowable temperature differential limit shall be determined by the Contractor as part of his Thermal Control Plan.

Thermal Control Plan

Prior to mass concrete construction, the Contractor shall submit to the Engineer for approval, a Thermal Control Plan with design calculations for each mass concrete element in conformance with the provisions in Section 1.05 and sealed by a Professional Engineer who is registered in the State of Connecticut. A thermal control plan may address one or more mass concrete elements. The Thermal Control Plan shall show complete details and determine the maximum allowable temperature differentials between the hottest point of the concrete and the exterior faces of the mass concrete element based on the design assumption that cracking as a result of heat of hydration shall not occur. The Contractor shall use a maturity based approach using ASTM C1074 in developing his Thermal Control Plan. As a minimum, the Thermal Control Plan shall include the following:

A. Mix design.
B. Duration and method of curing.
C. Procedures to control concrete temperature at time of placement.
D. Methods of controlling temperature differentials.
E. Temperature sensor types and locations.
F. Temperature monitoring and recording system.
G. Field measures to ensure conformance with the maximum concrete temperature and temperature differential requirements.

The Thermal Control Plan shall be updated if the concrete mix design changes, or any of the sources of concrete materials change. For purposes of this requirement, minor adjustment of admixture dosages will not be considered a mix design change.

Materials

Supplementary cementitious material (SCM) may be substituted into the specified concrete mixes. When the SCM is ground granulated blast-furnace slag (GGBFS), the amount of SCM shall be 50 to 75 percent by mass of the total cementitious material used in the mix. When the SCM is other than GGBFS, the SCM content shall be from 25 percent to 35 percent by mass of the total cementitious material used in the mix. For the purposes of this substitution requirement, Class C fly ash, silica fume, and metakaolin shall not be considered a SCM.

Construction

Placement of mass concrete shall not occur until the contractor's thermal control plan is approved. During concrete placement activities and the thermal control period, the concrete shall be protected from the damaging effects of hot and cold weather conditions. Prior to mass concrete placement, an engineer for the Contractor who is registered as a Professional Engineer in the State of Connecticut shall inspect and test the temperature monitoring and recording system. The Contractor's registered engineer shall be present at the jobsite when the mass concrete operation is in progress and shall report to the Engineer in writing on a daily basis the progress of the operation. A copy of the daily report shall be available at the jobsite.

The temperature monitoring and recording system for mass concrete shall consist of temperature sensors connected to a data acquisition system with an internet connection that is capable of storing and wireless downloading data to a computer. Temperature sensors shall be located such that the maximum temperature difference within a mass concrete element can be monitored. For pier caps and footings, concrete temperatures shall be monitored at the core or predicted hottest location, 1 outer face and the top surface (3 minimum). For columns and abutment stems, concrete temperatures shall be monitored at the core or predicted hottest location and 1 outer face (2 minimum). Temperature sensors at the surface and corner locations shall be no further than 2 to 3 inches below/inside the surface of the concrete.

A redundant set of sensors shall be installed near the primary set. Provisions shall be made for recording the redundant set, but records of the redundant sensors need not be made if the primary set is operational. Temperature readings shall be automatically recorded on an hourly or more frequent basis. The temperature recording may be discontinued when thermal control is complete and there are no mass concrete elements to be cast adjacent. Data shall be printed and submitted to the Engineer daily.

Methods of concrete consolidation shall prevent damage to the temperature monitoring and recording system. Wiring from temperature sensors cast into the concrete shall be protected to prevent movement. Wire runs shall be kept as short as possible. The ends of the temperature sensors shall not come into contact with either a support or concrete form, or bar reinforcing steel.

When any equipment used in the temperature control and monitoring and recording system fails during the mass concrete construction operation, the Contractor shall take immediate measures to correct the situation as specified in the Thermal Control Plan. Failure to conform to the temperature requirements will be cause for rejection of the concrete.

Acceptance
Mass concrete shall conform to the concrete acceptance criteria and the following temperature requirements:
A. The thermal control period is complete.
B. The maximum temperature differential between the core and surface temperatures of the mass concrete element did not exceed the maximum temperature differential limit as determined in the Thermal Control Plan.

If the Contractor fails to conform to any of the temperature requirements above, he shall take immediate action to retard further growth of the internal temperatures and the temperature differential. The Contractor shall revise the previously accepted Thermal Control Plan to ensure compliance on future placements. No mass concrete shall be placed until the Engineer has approved the revised Thermal Control Plan.

When mass concrete temperatures or temperature differentials are exceeded the contractor shall provide all analyses and test results deemed necessary by the Engineer for determining the structural integrity and durability of the mass concrete element, to the satisfaction of the Engineer. The Engineer may, at his sole discretion, direct that all or a portion of the damaged or unacceptable concrete be removed and replaced without additional compensation. Full compensation for conforming to the above requirements shall be considered as included in the contract prices paid for the various contract items of work involved and no additional compensation will be allowed therefore.

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 4.75 mm sieve when tested according to ASTM D 5821. The amount of aggregate particles of the coarse aggregate blend retained on the 4.75 mm 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 2.36 mm 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 2.36 mm 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 9.5 mm 95% Passing the 4.75 mm 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 2.36 mm 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	Terms defined in Section M.04.01-2c.

		C 295	

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 9.5 mm 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 25°C; rotational viscosity at 35ºC and 165ºC 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(δ) 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°C 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 27°C 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 23 kilogram sample of the RAP to be incorporated into the recycled mixture.
2. A 12 kilogram 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
9.5 mm	100
4.75 mm	35-100
0.075 mm	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 28 square meters, 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 18°C. 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 1.5 meters during the first 48 hours prior to its use.

i. Class 5A mixture shall have 9.5 mm to 12.5 mm inch polypropylene fibers that have been approved by the Engineer added at a rate of 3 kilograms per metric ton of mixture.
ii. Class 5B mixture shall have 6.3 mm polyester fibers that have been approved by the Engineer added at the rate of 1.25 kilograms per metric 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 660 N 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 1.2 m during the first 48 hours. (f) As determined by AASHTO T 245(M). (g) The percent passing the 0.075 mm 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 19 mm sieve. (i) Mixtures finer than condition (h) above. (j) Class 5 mixture shall contain no fibers. Class 5A mixture shall have 9.5 to 12.5 mm polypropylene fibers that have been previously accepted by the Engineer added at a minimum rate of 2.7 kg pounds per metric ton of mixture. Class 5B mixture shall have 6.3 mm polyester fibers that have been previously accepted by the Engineer added at the minimum rate of 1.25 kg per metric 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 (mm)	Percent Passing (%)								
0.075	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
0.30	6 – 26	8 – 26	10 - 30	5 - 18	10 - 40				4
0.60	10 - 32	16 - 36	20 - 40		20 - 60	2 - 15	2 – 15	2 - 15	5
2.36	28 - 50	40 - 64	40 - 70	20 - 40	60 - 95	10 - 45	10 – 45	10 - 45	6
4.75	40 - 65	55 - 80	65 - 87	30 - 55	80 - 95	40 - 100	40 – 100	40 - 100	7
6.3									
9.5	60 - 82	90 - 100	95 - 100	42 - 66	98 - 100	100	100	100	8
12.5	70 - 100	100	100		100				8
19.0	90 - 100			60 - 80					8
25.0	100								
50.0				100					
Additionally, the fraction of material retained between any two consecutive sieves shall not be less than 4%									
Mixture Temperature									
Binder	163°C maximum					60-85° C			
Aggregate	138-177° C					38-79° C			
Mixtures	129-163° C				135-163°C	49-79° C			4 °C
Mixture Properties									
VOIDS - %	3.0 – 6.0 (a)	2.0 – 5.0 (b)	0 – 4.0		0 - 5.0 (a)				
Stability (f) Newtons min.	5300 (c)	4500	4500		4500				
FLOW (f) mm	2 - 4	2 - 4	2 - 4		2 - 4				
VMA % - min.	15(h) :16 (i)								

GENERAL

3. Superpave Design Method – S0.25, S0.375, S0.5, and S1, including "extra asphalt" items

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.

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 0.075 mm 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.

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.

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 0.075 mm 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. (7) For HMA S1 – Extra Asphalt, VMA and VA below are targets before adding the extra asphalt

	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*	
mm	Min (%)	Max (%)	*Max (%)*	*Min (%)*	Min (%)	Max (%)	*Min (%)*	*Max (%)*	Min (%)	Max (%)	*Min (%)*	*Max (%)*	Min (%)	Max (%)	*Min (%)*	*Max (%)*
50.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
37.5	-	-	-	-	-	-	-	-	-	-	-	-	100	-	-	-
25.0	-	-	-	-	-	-	-	-	-	-	-	-	90	100	-	-
19.0	-	-	-	-	-	-	-	-	100	-	-	-	-	90	-	-
12.5	100	-	-	-	100	-	-	-	90	100	-	-	-	-	-	-
9.5	97	100	-	-	90	100	-	-	-	90	-	-	-	-	-	-
4.75	-	90	-	-	-	90	-	-	-	-	-	-	-	-	*39.5*	*39.5*
2.36	32	67	*47.2*	*47.2*	32	67	*47.2*	*47.2*	28	58	*39.1*	*39.1*	19	45	*26.8*	*30.8*
1.18	-	-	*31.6*	*37.6*	-	-	*31.6*	*37.6*	-	-	*25.6*	*31.6*	-	-	*18.1*	*24.1*
0.6	-	-	*23.5*	*27.5*	-	-	*23.5*	*27.5*	-	-	*19.1*	*23.1*	-	-	*13.6*	*17.6*
0.3	-	-	*18.7*	*18.7*	-	-	*18.7*	*18.7*	-	-	*15.5*	*15.5*	-	-	*11.4*	*11.4*
0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0.075	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 (Note 7)			
VA (%)	4.0 ± 1				4.0 ± 1				4.0 ± 1				4.0 ± 1 (Note 7)			
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)	138 – 177°C				138 – 177°C				138 – 177°C				138 – 177°C			
Mix Temp(6)	129 – 163°C				129 – 163°C				129 – 163°C				129 – 163°C			
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 100 mm of the anticipated top surface, the layer may be considered to be below 100 mm 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 2.36 mm sieve.	Criteria presented as maximum Percent by mass of flat or elongated particles of materials retained on the 4.75 mm sieve, determined at 3:1 ratio.	Criteria presented as minimum values for fine aggregate passing the 2.36 mm 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 (a)			Voids Filled with Asphalt (VFA) Based on Nominal mix size – inch (a)			
	(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 1: Level 1 for use by Towns and Municipalities ONLY.**

(a) NOTE 2: For HMA/WMA mixes with extra asphalt, limits apply before adding extra asphalt.

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 – Extra Asphalt	2	5.0
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 metric tons (lot)	Number of Sub Lots/Tests
0 to 140	0, Unless requested by the Engineer
141 to 550	1
551 to 1,100	2
1,091 to 1,650	3
1,651 or greater	1 per 550 metric 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 0.075 mm 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) 150°C 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)
mm	Min(%)	Max(%)	Min(%)	Max(%)	Min(%)	Max(%)	Min(%)	Max(%)	±Tol
50.0	-	-	-	-	-	-	-	-	
37.5	-	-	-	-	-	-	100	-	
25.0	-	-	-	-	-	-	90	100	
19.0	-	-	-	-	100	-	-	90	
12.5	100	-	100	-	90	100	-	-	
9.5	97	100	90	100	-	90	-	-	
4.75	-	90	-	90	-	-	-	-	
2.36	32	67	32	67	28	58	19	45	
1.18	-	-	-	-	-	-	-	-	
0.075	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 (a)		1.0
VA (%)	4.0		4.0		4.0		4.0 (a)		1.0
Gmm	JMF value		JMF value		JMF value		JMF value		0.030
Agg. Temp (5)	138 - 177°C		138 - 177°C		138 - 177°C		138 - 177°C		
Mix Temp (6)	129 - 163°C (1)		129 - 163°C (1)		129 - 163°C (1)		129 - 163°C (1)		
Prod. TSR	N/A		N/A		≥80%		N/A		
T-283	N/A		N/A		Minimal as determined by		N/A		

Stripping			the Engineer		

(a) For HMA S1 – Extra Asphalt, VMA to be designed to 13.0% and Va to be designed to 4% before adding the extra 0.5% (by weight of total JMF) asphalt binder

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-Extra Asphalt	2	5.0
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 (**C**omposite **A**ggregate **C**orrection **F**actor **M**ethod **(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 ± 5ºC (300 ± 9º F) to a constant weight. RAP samples are to be oven dried at a maximum temperature of 110 ± 5ºC (230 ± 9º 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	**Volumetric Calculations of VMA and Correction Factor** 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.* $A_{cf} = (Pb_a \text{ from annual JMF submittal}) \times (100 - Pb_t) / 100$ 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.

ITEM #0000905A – TOPSOILING

Description: This item shall consist of preparing the ground surface for topsoil application, supplying materials from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the Engineer.

Materials:

A. **Topsoil:** Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches (50mm) or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sods and herbaceous growth such as grass and weeds are not to be removed but shall be thoroughly broken up and intermixed with the soil during handling operations. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the association of official agricultural chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% or more than 80% of the material passing the 200 mesh sieve as determined by the wash test in accordance with ASTM C 117. The topsoil shall be free and clear of any invasive species.

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

B. **Inspection and Tests:** Within 10 days following acceptance of the bid, the Engineer shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph A above.

The topsoil must be free of seeds and roots of invasive species and inspected and approved by the Connecticut Department of Transportation Office of Environmental Planning (CT DOT OEP) prior to its application.

Each source must be inspected at least 4 months prior to excavation during the months of May through September and determined by the CT DOT OEP to be free from seeds and roots of invasive species. Each off-site source must be stock piled at least 4 months prior to application for inspection by CT DOT OEP during the months of May through September and determined by the CT DOT OEP to be free from seeds and roots of invasive species.

In order to avoid spreading or propagation of invasive species present within the project limits the first 12 inches (300mm) of the topsoil collected from the on-site sources shall not be allowed to be applied within the project for the purpose of topsoiling.

Construction Methods:

A. **General:** Areas to be topsoiled shall be shown on the plans. Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the Engineer before the various operations are started.

B. **Preparing the Ground Surface:** Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the Engineer, to a minimum depth of 2 inches (50 mm) to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches (50 mm) in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and properly compacted condition to prevent, insofar as practical, the formation of low places or pockets where water will stand.

C. **Obtaining Topsoil:** Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the Engineer. Heavy sod or other cover, which cannot be incorporated into the topsoil by disking or other means shall be removed.

When suitable topsoil is secured off site, the Contractor shall locate and obtain the supply, subject to the approval of the Engineer. The topsoil source site shall be free and clear of any invasive species. The Contractor shall notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be re-handled and placed without additional compensation.

D. **Placing Topsoil:** The topsoil shall be evenly spread on the prepared areas to a uniform depth of 3 inches (75 mm) after compaction, unless otherwise shown on the plans or

stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches (50 mm) or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. After spreading is completed, the topsoil shall be compacted by rolling with a cultipacker or by other means approved by the Engineer. The compacted topsoil surface shall conform to the required lines, grades, and cross sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

Method of Measurement: Topsoil obtained off the site shall be measured by the number of cubic yards of topsoil measured in its final position.

Basis of Payment: Payment will be made at the contract unit price per cubic yard (cubic meters) for topsoiling (obtained off the site). This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Pay Item	Pay Unit
Topsoiling	C.Y. (cu. m.)

Testing Materials:

ASTM C 117 Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing

ITEM #0020765A - GUANO ABATEMENT

Description:

Work under this item shall include the abatement of accumulations of pigeon, bat, bird or other rodent/animal guano and associated work by persons who are knowledgeable, qualified, and trained in the abatement of guano and the subsequent cleaning of the affected environment.

These Specifications govern all work activities that disturb guano. All activities shall be performed in accordance with, but not limited to, the current revision of the OSHA General Duty Clause 29 CFR 1910 Section 5(a)(1), OSHA Respiratory Protection Standard 29 CFR 1910.134, OSHA Construction Standards 29 CFR 1926 and applicable Industry Standards and Guidelines on Guano/Microbial Remediation, such as; ACGIH *Bioaerosols: Assessment and Control*, OSHA SHIB 03-10-10 *A Brief Guide to Mold in the Work Place*, and NIOSH Publication 97-146 *Histoplasmosis: Protecting Workers at Risk.*

The guano abatement work shall include the removal and disposal of all guano accumulations as identified on the Contract Plans and Specifications or as directed by the Engineer.

Deviations from these Specifications require the written approval of the Engineer.

Materials:

All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description.

No damaged or deteriorating materials shall be used. If material becomes contaminated with guano, the material shall be decontaminated or disposed of as guano waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating four (4) or six (6) mil thickness.

Six (6) mil polyethylene disposable bags.

Tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

Cleaning detergents, both non-toxic and biodegradable.

Spray equipment must be capable of mixing necessary chemical agents with water, generating sufficient pressure and volume; and equipped with adequate hose length to access all necessary work areas.

Sanders, grinders, wire brushes and needle-gun type removal equipment shall be equipped with a High Efficiency Particulate Air (HEPA) filtered vacuum dust collection system.

Containers for storage, transportation and disposal of guano waste material shall be impermeable and both air and watertight.

Any planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable federal, state and local regulations.

Air filtration devices and vacuum units shall be equipped with HEPA filters.

Construction Methods:

(1) Pre-Abatement Submittals and Notices

(a) Fifteen (15) working days prior to the commencement of guano abatement work, the Contractor shall submit to the Engineer for review and acceptance and/or acknowledgment of the following:

1. Documentation dated within the previous twelve (12) months, certifying that all employees have received hazard communication training and understand the use and limits of respiratory equipment to be used; on an initial and annual basis.

2. Documentation dated within the previous twelve (12) months, from a physician certifying that all employees who may be exposed to airborne guano and mold spores in excess of background level have been provided with an opportunity to be medically monitored to determine whether they are physically capable of working while wearing the respirator required without suffering adverse health affects. Employees shall also be informed of the specific types of respirators they shall be required to wear and the work he/she will be required to perform as well as special workplace conditions such as high temperature, high humidity and chemical contaminants to which he/she may be exposed.

3. Documentation dated within the previous twelve (12) months, of respiratory fit testing for all employees who must don a tight-fitting face piece respirator in order to perform guano abatement activities. This fit testing shall be in accordance with qualitative procedures as detailed in 29 CFR 1910.134.

4. Project time schedule for each phase of work.

5. Name and qualifications of the OSHA Competent Person for the guano abatement activities, shall have a minimum of three years working experience as an environmental abatement site supervisor, shall be capable of identifying existing

guano hazards and shall have the authority to implement corrective measures to eliminate such hazards. The OSHA Competent Person shall be on-site at all times guano abatement is occurring, shall comply with applicable Federal, State and Local regulations which mandate work practices, and shall be capable of performing the work of this contract.

(b) No abatement shall commence until a copy of all required submittals have been received and found acceptable to the Engineer. Those employees added to the Contractor's original list will be allowed to perform work only upon submittal to, and receipt of, all required paperwork by the Engineer.

(2) Guano Abatement Provisions:

(a) General Requirements

The Abatement Contractor/Subcontractor shall have an OSHA Competent Person on site and in control on the job site at all times during abatement work.

All labor, materials, tools, equipment, services, testing, insurance (with specific coverage for work on guano/spores), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations, industry standards and codes, and these Specifications shall be provided by the Contractor. The Contractor shall be prepared to work all shifts and weekends throughout the course of this project as directed by the Engineer.

Prior to beginning work, the Contractor shall perform a visual survey of each work area and review conditions at the site for safety reasons. In addition, the Contractor shall instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

The Contractor shall:

Shut down and lock out/tag out electrical power, including all receptacles and light fixtures, when feasible. The use or isolation of electrical power will be coordinated with all other ongoing uses of electrical power at the site.

Coordinate all power and fire alarm isolation with the appropriate representatives.

When necessary, provide temporary power and adequate lighting and ensure safe installation of electrical equipment, including ground fault protection and power cables, in compliance with applicable electrical codes and OSHA requirements. The Contractor is responsible for proper connection and installation of electrical wiring.

If sufficient electrical service is unavailable, the Contractor may need to supply electrical power to the site by fuel operated generator(s). Electrical power supply shall be sufficient for all equipment required for this project in operation throughout the duration of the project.

Water service may not be available at the site. Contractor shall supply sufficient water for each shift to operate the decontamination shower units as well as to maintain the work areas adequately wet.

Ladders and/or scaffolds shall be in compliance with OSHA requirements, and of adequate length, strength and sufficient quantity to support the scope of work. Use of ladders/scaffolds shall be in conformance with OSHA 29 CFR 1926 Subpart L and X requirements.

Work performed at heights exceeding six feet (6') shall be performed in accordance with the OSHA Fall Protection Standard 29 CFR 1926 Subpart M including the use of fall arrest systems as applicable.

Any data provided to the Contractor regarding guano accumulations identified throughout the structure(s) is for informational purposes only. Under no circumstances shall this information be the sole means used by the Contractor for determining the presence and location of all guano accumulations. Prior to commencement of work, the **Contractor shall verify all field conditions and quantities affecting performance/completion of the work** as described in these Specifications in accordance with OSHA, USEPA, USDOT, DEP standards. Compliance with the applicable requirements is solely the responsibility of the Contractor.

The Engineer will provide a Project Monitor to oversee the activities of the Contractor. No abatement work shall be performed until the Project Monitor is on-site. Environmental sampling may be conducted as deemed necessary by the Project Monitor.

Warning signs shall be posted at each entrance to the work area which clearly indicates the area has been regulated as a MICROBIAL REMEDIATION WORK AREA – AUTHORIZED PERSONNEL ONLY.

(b) Worker Decontamination Enclosure System

The Contractor shall establish contiguous to the Regulated Work Area, a Worker Decontamination Enclosure System consisting of Equipment Room and Clean Room in series, as detailed below. Access to the Regulated Area shall only be through this enclosure.

Access between rooms in the Worker Decontamination Enclosure System shall be through airlocks. Other effective designs are permissible. The Clean Room and Equipment Room located within the Worker Decontamination Enclosure, shall be contiguously connected with taped airtight edges, thus ensuring the sole source of airflow originates from outside the regulated areas, once a negative pressure differential within Interior Regulated Areas is established.

The Clean Room shall be adequately sized to accommodate workers and shall be equipped with a suitable number of hooks, lockers, shelves, etc., for workers to store personal articles and

clothing. Changing areas of the Clean Room shall be suitably screened from areas occupied by the public.

The Equipment Room shall be of sufficient capacity to accommodate the number of workers. The Equipment Room shall be utilized by personnel to remove protective clothing, decontaminate through the use of HEPA vacuums and a wash facility, and clean off sealed waste containers ready for removal from the work area. No worker or other person shall leave a Regulated Area without decontaminating.

(c) Alternate work area containment requirements for exterior abatement procedures

In lieu of the establishment of a negative pressure enclosure (NPE) system guano accumulations will be removed from exterior work areas within an outdoor Regulated Area(s). The regulated work areas will be established by the use of appropriately labeled barrier tape and postings, as well as source containment, poly drop cloths and local HEPA exhaust ventilation. A remote personnel decontamination unit will also be required.

(e) Personnel Protection

The Contractor shall utilize all appropriate engineering controls and safety and protective equipment while performing the work in accordance with applicable standards and guidelines.

Abatement workers should have received hazard communication awareness training on safe work practices associated with guano/microbial abatement, and health effects of guano/microbial spore exposure, be medically approved to perform such work and have received fit testing for respirator use.

Abatement workers conducting the cleaning/removal and all personnel entering the work areas will be required to wear personal protective equipment including the following minimum. The Contractors Competent Person shall ultimately make the exposure/hazard assessment judgement on whether upgraded PPE is required.

1. Negative Pressure Respirators equipped with N-95 filter cartridges
2. Disposable coveralls with a hood
3. Eye protection
4. Appropriate gloves

Respiratory protection shall be provided and shall meet the requirements of OSHA as required in 29 CFR 1910.134. A formal respiratory protection program must be implemented in accordance with 29 CFR 1910.134. The Contractor shall provide respirators from among those approved as being acceptable for protection by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part ll.

All other necessary personnel protective equipment (i.e. hardhat, work boots, safety glasses, hearing protection, etc.) required to perform the abatement work activities, as deemed necessary by the Competent Person, shall conform to all applicable federal, state and local regulations.

All other qualified and authorized persons entering into a Regulated Area (i.e. Project Monitor, Regulatory Agency Representative) shall adhere to the requirements of personnel protection as stated in this section.

Contractor shall ensure that all workers and authorized persons who enter and leave the work area use a personnel decontamination system.

Contractor shall ensure HEPA filtered local exhaust ventilation is provided in all areas where extensive guano accumulations are to be cleaned/removed to reduce the potential for airborne exposure to spores.

Non-abatement workers shall be kept out of the immediate areas where abatement is ongoing.

(f) Removal and Cleaning Methods

The general cleaning/removal procedures specified herein are to be used as a guideline throughout the project. Deviations from specified methods of removal/cleaning must be approved in writing by the Engineer prior to their implementation.

The following details the extent of each phase of operation designated for this project. Phase areas may be combined or divided at the direction of the Engineer. Proceed through the sequencing of the work phases under the direction of the Engineer.

The following scope of work for Guano Abatement applies to the following Bridges:

- **Bridge No. 01226, I-84, Harper Ferry Overpass, Waterbury**
- **Bridge No. 01228, I-84, Scott Road Overpass, Waterbury**
- **Bridge No. 06284, I-84 East, Exit 25 Ramp over Mud River, Waterbury**

Prior to demolition impact which may cause worker exposure to airborne fungal spores, using trained and appropriately protected staff, remove and dispose of all accumulations of guano, feathers, carcasses, etc. as directed by the Engineer. Clean the areas where removal occurs using biodegradable/non-toxic detergent solutions and HEPA vacuuming. Exterior regulated area(s) shall be established at the perimeter of the work area(s), and access shall be controlled by the Contractor. Utilize dust suppression methods such as misting (not soaking) materials prior to abatement. Poly drop cloths should be used as appropriate to protect objects in direct proximity to the work areas from contamination, and prevent the release of contamination/debris to outside areas. After cleaning the area(s) should be left dry and visibly free from contamination and debris. Utilize damp wiping and HEPA filtered vacuuming techniques for final area cleanup. A remote personnel decontamination unit shall also be utilized. Waste generated from the cleaning process should be removed from the work space in sealed plastic bags to prevent dispersal of spores to non-affected work spaces and areas occupied by non-protected personnel, and shall be disposed of as general bulky C&D waste debris. Removal shall be undertaken in accordance with

Industry Guidelines. Care should be exercised during guano removal/cleaning to not disturb or release any underlying lead paint which may be present. ***Contractor shall be responsible for the erection and safe maintenance of any and all necessary apparatus/equipment to gain access to the work areas and perform the required abatement.***

Contractor shall wet mist all materials/accumulations/surfaces scheduled for removal/cleaning prior to commencing work to minimize airborne dust/spore generation and use damp methods throughout the removal/cleanup process.

Contaminated materials, accumulations and debris that are to be removed must be removed with as little disturbance as possible.

The Contractor shall promptly place the removed material in disposal containers (six (6) mil polyethylene bags, fiber drums, etc.) as it is removed. Large components removed intact may be wrapped in two (2) layers of six (6) mil polyethylene sheeting secured with tape. As the disposal containers are filled, the Contractor shall promptly seal the containers and clean the containers before removal from the work area. Bags shall be securely sealed to prevent accidental opening and leakage by taping in gooseneck fashion. Materials with sharp-edged components (e.g. nails, screws, metal lath, tin sheeting) which could tear polyethylene bags and sheeting shall be placed in clean drums and sealed with locking ring tops. All waste containers shall be leak-tight, (typically consisting of two layers of 6 mil poly (or bags)). Containers shall be decontaminated by wet cleaning and HEPA vacuuming within the decontamination area prior to exiting the regulated area. On site storage of waste containers shall be as dictated and allowed by the Engineer within the extent of construction operations. On site storage of waste containers in public areas, outside of construction containment areas shall not be allowed.

Following material/accumulation removal, Contractor shall thoroughly clean the work area. Cleaning of surfaces and content items, shall utilize wet/damp wiping coupled with a non-toxic, biodegradable detergent wash. Following cleaning, the areas shall be dried and HEPA vacuumed to remove all associated dirt and debris.

The use of biocides, including chlorine bleach, is not recommended during guano/microbial abatement. Biocides are toxic to humans and may cause damage to underlying building substrates. Any use of biocides, fungicides, disinfectants or encapsulants can be done only with the written approval of the Engineer.
After cleaning, the Competent Person and Project Monitor shall perform a post remediation visual inspection of each work area to ensure remediation is complete, that no dust or debris remains on surfaces in the work areas as the result of removal/cleaning operations and the areas have been dried. All surfaces within the Regulated Work Areas, including but not limited to ledges, beams, and hidden locations shall be inspected for visible residue. Evidence of guano/microbial accumulations/contamination and/or debris identified during this inspection will necessitate further cleaning as heretofore specified. The area shall be re-cleaned at the Contractor's expense, until the standard of cleaning is achieved.

If at any time, the Project Monitor should suspect contamination of areas outside the Regulated Area, the Contractor shall immediately stop all abatement work and take steps to decontaminate these areas and eliminate causes of such contamination.

(g) Quality Assurance/Verification

At a minimum, the affected areas shall be free of visible guano accumulations and debris, free of moldy odors and be left dry.

Surface and airborne types and levels of microbial spores may be tested by the Project Monitor upon completion of the cleaning and sanitizing to assure that the affected areas have been returned to a level equivalent to non-affected/ambient areas. Where samples are collected, acceptable results shall be considered levels less than background (interior non-affected and/or ambient) areas for all microbial genera with similar microbial types and rank order and which do not indicate amplification. Any samples collected shall be analyzed at a laboratory accredited by the AIHA EMPAT program.

The Engineers on-site Project Monitor will verify compliance with these specifications, conduct post-abatement work area inspections and/or collect post abatement samples, photographs, and/or videos of the cleaned surfaces/work areas as deemed necessary.

If any areas fail inspection/testing, the failed area shall be recleaned by the Contractor and retested at no cost to the Engineer.

(h) Post Abatement Work Area Deregulation

The Contractor shall remove all remaining polyethylene, including critical barriers, and Decontamination Enclosure Systems leaving any utilized negative air filtration devices in operation as long as feasible. HEPA vacuum and/or wet wipe any visible residue which is uncovered during this process.

A final visual inspection of the work area shall be conducted by the Competent Person and the Project Monitor to ensure that all visible accumulations of suspect materials have been removed and that no equipment or materials associated with the abatement project remain.

The Contractor shall restore all work areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the Engineer.

(i) Waste Disposal

Waste generated from the removal of guano, while an environmental heath hazard, is not classified as a biological waste or hazardous waste. All waste materials generated during abatement shall be disposed of as bulky C&D waste in accordance with CTDEP Solid Waste Management requirements. Contractor shall supply to the Engineer completed shipping papers

for each load of waste transported for disposal, indicating the solid waste landfill name and location and quantity of waste disposed of.

(3) Project Closeout Data:

The Contractors site supervisor shall keep a logbook to document daily site activity. The log book shall document the preparation tasks, schedule, engineering controls utilized, abatement work conducted, daily lists of employees on site, exposure/hazard assessment judgements, negative pressure manometric measurement readings, PPE utilized, waste shipping papers, etc.

The Contractor will submit the original log book and any other related documentation to the Engineer within 30 days of completion of work.

Final payment to the Contractor shall not be approved without submission of the reporting materials.

Method of Measurement:

The quantity of guano abatement shall be the actual number of cubic feet removed for disposal, completed and accepted, within the lines of the work area as shown on the plans or as ordered by the Engineer.

Basis of Payment:

The work will be paid for at the contract unit price per cubic foot for "Guano Abatement", completed, which price shall include the specialty services of the Guano Removal Contractor including: labor, materials, equipment, insurance, submittals, personal protective equipment, temporary enclosures, apparatus/equipment necessary for work area access, utility costs, incidentals, fees and labor incidental to the removal, transport and disposal of guano, including close out documentation.

Final payment for guano abatement will not be made until all the project closeout data submittals have been completed and provided to the Engineer. Once the completed package has been received in its entirety, the Engineer will make the final payment to the Contractor.

Pay Item	Pay Unit
Guano Abatement	Cubic Meter

ITEM #0020801A – ASBESTOS ABATEMENT

Description:

Work under this item shall include the abatement of asbestos containing materials (ACM) and associated work by persons who are knowledgeable, qualified, trained and licensed in the removal, treatment, handling, and disposal of ACM and the subsequent cleaning of the affected environment. ACM shall include material composed of any type of asbestos in amounts greater than one percent (1%) by weight. The Contractor performing this work shall possess a valid Asbestos Abatement Contractor license issued by the Connecticut Department of Public Health (CTDPH).

These Specifications govern all work activities that disturb asbestos containing materials. All activities shall be performed in accordance with, but not limited to, the current revision of the OSHA General Industry Standard for Asbestos (29 CFR 1926.1001), the OSHA Asbestos in Construction Regulations (29 CFR 1926.1101), the USEPA Asbestos National Emission Standards for Hazardous Air Pollutants (NESHAP) Regulations (40 CFR Part 61 Subpart M), the CTDPH Standards for Asbestos Abatement, Licensure and Training (19a-332a-1 through 16, 20-440-1 through 9 & 20-441), and the CTDEEP Special Waste Disposal Regulations (22a-209-8(i)).

The asbestos abatement work shall include the removal and disposal of all ACM as identified on the Contract Plans and Specifications prior to the planned renovation/demolition project.

Deviations from these Specifications require the written approval of the Engineer.

The Contractor may elect to utilize an Alternative Work Practice (AWP), if approved by the CTDPH and the Engineer prior to the initiation of the abatement activities. An AWP is a variance from certain CTDPH asbestos regulatory requirements, which must provide the equivalent or a greater measure of asbestos emission control than the standard work practices prescribed by the CTDPH.

Materials:

All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description.

No damaged or deteriorating materials shall be used. If material becomes contaminated with asbestos, the material shall be decontaminated or disposed of as asbestos-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating four (4) or six (6) mil thickness.

Six (6) mil polyethylene disposable bags shall have pre-printed OSHA/EPA/DOT labels and shall be transparent.

Tape (or equivalent) capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

Surfactant is a chemical wetting agent added to water to improve penetration and shall consist of fifty (50) percent polyoxyethylene ether and fifty (50) percent polyoxyethylene ester, or equivalent. The surfactant shall be mixed with water to provide a concentration one (1) ounce surfactant to five (5) gallons of water, or as directed by the manufacturer.

Spray equipment must be capable of mixing necessary chemical agents with water, generating sufficient pressure and volume; and equipped with adequate hose length to access all necessary work areas.

Sanders, grinders, wire brushes and needle-gun type removal equipment shall be equipped with a High Efficiency Particulate Air (HEPA) filtered vacuum dust collection system.

Containers for storage, transportation and disposal of asbestos containing waste material shall be impermeable and both air and watertight.

Labels and warning signs shall conform to OSHA 29 CFR 1926.1101, USEPA 40 CFR Part 61.152, and USDOT 49 CFR Part 172 as appropriate.

Encapsulant, a material used to chemically entrap asbestos fibers to prevent these fibers from becoming airborne, shall be of the type which has been approved by the Engineer. Use shall be in accordance with manufacturer's printed technical data. The encapsulant shall be clear and must be compatible with new materials being installed, if any.

Glovebag assembly shall be manufactured of six (6) mil transparent polyethylene or PVC with two (2) inward projecting long sleeve gloves, an internal pouch for tools, and an attached labeled receptacle for waste.

Mastic removal chemicals shall be low odor and non-citrus based, with a flash point in excess of 140° F.

Any planking, bracing, shoring, barricades and/or temporary sheet piling, necessary to appropriately perform work activities shall conform to all applicable federal, state and local regulations.

Air filtration devices and vacuum units shall be equipped with HEPA filters.

Construction Methods:

(1) Pre-Abatement Submittals and Notices

(a) The Contractor shall submit, in accordance with CTDPH Standard 19a-332a-3, proper notification using the prescribed form, to the Commissioner, State of Connecticut, Department of Public Health not fewer than ten (10) days prior to the commencement of work as follows:

1. **The asbestos to be removed is exterior NESHAP Category II Non-Friable ACM, and it is not expected that the abatement procedures will render the Category II asbestos friable; thereby not categorizing it as NESHAP Regulated ACM (RACM); therefore not defining the removal as a CTDPH "abatement"; and as such the CT licensed Asbestos Abatement Contractor will not be required to file an Asbestos Abatement notification so long as no more than 10 linear feet (LF)/25 square feet (SF) of ACM is rendered friable.**

(b) Fifteen (15) working days prior to the commencement of asbestos abatement work, the Contractor shall submit to the Engineer for review and acceptance and/or acknowledgment of the following:

1. Permits and licenses for the removal, transport, and disposal of asbestos-containing or contaminated materials, including a CTDPH valid asbestos removal contractor's license.

2. Documentation dated within the previous twelve (12) months, certifying that all employees have received USEPA Model Accreditation Plan approved asbestos worker/supervisor training in the proper handling of materials that contain asbestos; understand the health implications and risks involved, including the illnesses possible from exposure to airborne asbestos fibers; understands the use and limits of respiratory equipment to be used; and understands the results of monitoring of airborne quantities of asbestos as related to health and respiratory equipment as indicated in 29 CFR 1926.1101 on an initial and annual basis, and copies of all employees CTDPH asbestos worker and/or supervisor licenses.

3. Documentation from the Contractor, typed on company letterhead and signed by the Contractor, certifying that all employees listed therein have received the following:

    a. medical monitoring within the previous twelve (12) months, as required in 29 CFR 1926.1101;
    b. respirator fit testing within the previous twelve (12) months as detailed in 29 CFR 1910.134 (for all employees who must also don a tight-fitting face piece respirator).

4. Copies of the EPA/State-approved certificates for the proposed asbestos landfill.

(c) No abatement shall commence until a copy of all required submittals have been received and found acceptable to the Engineer. Those employees added to the Contractor's original list will be allowed to perform work only upon submittal to, and receipt of, all required paperwork by the Engineer.

(2) Asbestos Abatement Provisions:

(a) General Requirements

The Abatement Contractor/Subcontractor shall possess a valid State of Connecticut Asbestos Contractor License. Should any portion of the work be subcontracted, the subcontractor must also possess a valid State of Connecticut Asbestos Contractor License. The Asbestos Abatement Site Supervisor employed by the Contractor shall be in control on the job site at all times during asbestos abatement work. All employees of the Contractor who shall perform work (i.e. Asbestos Abatement Site Supervisor, Asbestos Abatement Worker) shall be properly certified/licensed by the State of Connecticut to perform such duties.

All labor, materials, tools, equipment, services, testing, insurance (with specific coverage for work on asbestos), and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations, industry standards and codes, and these Specifications shall be provided by the Contractor. The Contractor shall be prepared to work all shifts and weekends throughout the course of this project.

Prior to beginning work, the Engineer and Contractor shall perform a visual survey of each work area and review conditions at the site for safety reasons. In addition, the Contractor shall instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

The Contractor shall:

Shut down and lock out electrical power, including all receptacles and light fixtures, when feasible. The use or isolation of electrical power will be coordinated with all other ongoing uses of electrical power at the site.

When necessary, provide temporary power and adequate lighting and ensure safe installation of electrical equipment, including ground fault protection and power cables, in compliance with applicable electrical codes and OSHA requirements. The Contractor is responsible for proper connection and installation of electrical wiring.

Water service may not be available at the site. Contractor shall supply sufficient water for each shift to operate the decontamination shower units as well as to maintain the work areas adequately wet.

Ladders and/or scaffolds shall be in compliance with OSHA requirements, and of adequate length, strength and sufficient quantity to support the scope of work. Use of ladders/scaffolds shall be in conformance with OSHA 29 CFR 1926 Subpart L and X requirements.

Work performed at heights exceeding six feet (6') shall be performed in accordance with the OSHA Fall Protection Standard 29 CFR 1926 Subpart M including the use of fall arrest systems as applicable.

Data provided regarding asbestos sampling conducted throughout the structure(s) is for informational purposes only. Under no circumstances shall this information be the sole means used by the Contractor for determining the presence and location of all asbestos containing materials. The Contractor shall verify all field conditions affecting performance of the work as described in these Specifications in accordance with OSHA, USEPA, USDOT, DEP standards. Compliance with the applicable requirements is solely the responsibility of the Contractor.

The Engineer will provide a Project Monitor to oversee the activities of the Contractor. No asbestos work shall be performed until the Project Monitor is on-site. Pre-abatement, during abatement and post-abatement air sampling will be conducted as deemed necessary by the Project Monitor. Waste stream testing will be performed, as necessary, by the Project Monitor prior to waste disposal.

(b) Set-Up

The Contractor shall establish contiguous to the Regulated Area, a Worker Decontamination Enclosure System consisting of Equipment Room, Shower Room and Clean Room in series, as detailed below. Access to the Regulated Area shall only be through this enclosure.

Access between rooms in the Worker Decontamination Enclosure System shall be through airlocks. Other effective designs are permissible. The Clean Room, Shower Room and Equipment Room located within the Worker Decontamination Enclosure, shall be contiguously connected with taped airtight edges, thus ensuring the sole source of airflow originates from outside the regulated areas, once the negative pressure differential within the Regulated Area is established.

The Clean Room shall be adequately sized to accommodate workers and shall be equipped with a suitable number of hooks, lockers, shelves, etc., for workers to store personal articles and clothing. Changing areas of the Clean Room shall be suitably screened from areas occupied by the public.

The Shower Room shall be of sufficient capacity to accommodate the number of workers. One shower stall shall be provided for each eight (8) workers. Showers shall be equipped with hot and cold or warm running water through the use of electric hot water heaters supplied by the Contractor. No worker or other person shall leave a Regulated Area without showering. Shower water shall be collected and filtered using best available technology and dumped down an

approved sanitary drain. Shower stalls and plumbing shall include sufficient hose length and drain system or an acceptable alternate.

The Contractor shall ensure that no personnel or equipment be permitted to leave the Regulated Area until proper decontamination procedures (including HEPA vacuuming, wet wiping and showering) to remove all asbestos debris have occurred. No asbestos-contaminated materials or persons shall enter the Clean Room.

Post warning signs meeting the specifications of OSHA 29 CFR 1910.1001 and 29 CFR 1926.1101 at each Regulated Area. In addition, signs shall be posted at all approaches to Regulated Areas so that an employee or building occupant may read the sign and take the necessary protective steps before entering the area. Additional signs may require posting following construction of workplace enclosure barriers.

(c) **Alternate set up requirements for exterior non-friable asbestos abatement procedures**

In lieu of the establishment of a negative pressure enclosure (NPE) system as described by CTDPH Sections 19a-332a-5(c), 5(d), 5(e), and 5(h), non-friable ACM will be removed from exterior work areas within an outdoor Regulated Area(s). The regulated work area will be established by the use of appropriately labeled barrier tape and postings in compliance with CTDPH 19a-332a-5(a) as well as OSHA 29 CFR 1926.1101. A remote personnel decontamination unit as specified in Section 19a-332a-6 will be required. This method shall only be utilized provided exposure assessment air sampling data collected during the removal of the exterior non-friable materials indicates that the exposure levels during removal of such materials do not exceed 0.1 asbestos f/cc. Should exposure assessment air sampling data exceed this level, and engineering efforts to reduce the airborne fiber levels not be successful in reducing the levels to less than 0.1 f/cc, removal shall occur within these areas under full containment conditions.

(d) Personnel Protection

The Contractor shall utilize all appropriate engineering controls and safety and protective equipment while performing the work in accordance with OSHA, USEPA, USDOT, CTDEEP and CTDPH regulations.

The Contractor shall provide and require all workers to wear protective clothing in the Regulated Areas where asbestos fiber concentrations may reasonably be expected to exceed the OSHA established Permissible Exposure Limits (PEL) or where asbestos contamination exists. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings.

Respiratory protection shall be provided and shall meet the requirements of OSHA as required in 29 CFR 1910.134, and 29 CFR 1926.1101 as well as the requirements of the CTDPH regulations. A formal respiratory protection program must be implemented in accordance with 29 CFR 1926.1101 and 29 CFR 1910.134. The Contractor shall provide respirators from among

those approved as being acceptable for protection by the National Institute for Occupational Safety and Health (NIOSH) under the provisions of 30 CFR Part ll.

All other necessary personnel protective equipment (i.e. hardhat, work boots, safety glasses, hearing protection, etc.) required to perform the asbestos abatement work activities shall conform to all applicable federal, state and local regulations.

All other qualified and authorized persons entering into a Regulated Area (i.e. Project Monitor, Regulatory Agency Representative) shall adhere to the requirements of personnel protection as stated in this section.

(e) Asbestos Abatement Procedures

The Asbestos Abatement Site Supervisor, as the OSHA Competent Person shall be at the site at all times.

The Contractor shall not begin abatement work until authorized by the Project Monitor, following a pre-abatement visual inspection.

All workers and authorized persons shall enter and leave the Regulated Area through the Worker Decontamination Enclosure System, leaving contaminated protective clothing in the Equipment Room for reuse or disposal of as asbestos contaminated waste. No one shall eat, drink, smoke, chew gum or tobacco, or apply cosmetics while in a Regulated Area.

The following details the extent of each phase of operation designated for this project. Phase areas may be combined or divided at the direction of the Engineer. Proceed through the sequencing of the work phases under the direction of the Engineer.

Phase 1 - Bridge No. 01224, I-84 over Mad River, Waterbury

Phase 1 includes the removal of:

- **Black asphalt expansion joint material (EJ5) – located at expansion joints of central pier and on east and west abutments/wing walls.**

A regulated area(s) shall be established at the perimeter of the work area(s), and access shall be controlled by the Contractor. A remote personnel decontamination unit shall be utilized. Removal shall be undertaken in accordance with OSHA Class II and USEPA Asbestos NESHAP requirements.

Phase 2 - Bridge No. 01226, I-84 Harper Ferry Overpass, Waterbury

Phase 2 includes the removal of:

- **White brittle caulk around original bridge metal railing support base (BRC1) – located on sixteen (16) railing/concrete parapet interface.**

- **Black asphalt expansion joint material (EJ3) – west side of bridge at wing wall expansions.**

A regulated area(s) shall be established at the perimeter of the work area(s), and access shall be controlled by the Contractor. A remote personnel decontamination unit shall be utilized. Removal shall be undertaken in accordance with OSHA Class II and USEPA Asbestos NESHAP requirements.

Phase 3 - Bridge No. 01228, I-84 Scott Road Overpass, Waterbury

Phase 3 includes the removal of:

- **Light grey brittle caulk on top of expansion joint/abutment (EC2) – located at northeast abutment/wing wall expansion joint.**

- **Black tar coating/dark brown fibrous insulation (PC2) – on 8" metal pipe on underside of bridge.**

- **Transite pipes (TP1) – eight (8) transite pipes on the underside of the bridge.**

- **Tan brittle caulk around metal railway support base (BRC2) – located on all railing/concrete parapet interface.**

A regulated area(s) shall be established at the perimeter of the work area(s), and access shall be controlled by the Contractor. A remote personnel decontamination unit shall be utilized. Removal shall be undertaken in accordance with OSHA Class II and USEPA Asbestos NESHAP requirements.

Phase 4 - Bridge No. 04321, I-84 Hamilton Avenue Overpass, Waterbury

Phase 4 includes the removal of:

- **Black asphalt expansion joint material (EJ6) – located on the west side of bridge on concrete parapet wall sections.**

A regulated area(s) shall be established at the perimeter of the work area(s), and access shall be controlled by the Contractor. A remote personnel decontamination unit shall be utilized. Removal shall be undertaken in accordance with OSHA Class II and USEPA Asbestos NESHAP requirements.

During removal, the Contractor shall spray asbestos materials with amended water using airless spray equipment capable of providing a "mist" application to reduce the release of airborne fibers. Spray equipment shall be capable of mixing wetting agent with water and capable of generating sufficient pressure and volume. Hose length shall be sufficient to reach all of the Regulated Area. Do not "flood" the area with hose type water supply equipment with the potential to create water releases from the regulated area.

The Contractor shall continue to spray the asbestos materials with amended water, as necessary, throughout removal activities to ensure the asbestos materials remain adequately wet. The asbestos materials shall not be allowed to dry out.

In order to minimize airborne asbestos concentrations inside the Regulated Area, the Contractor shall remove the adequately wetted asbestos in manageable sections. In addition, asbestos materials removed from any elevated level shall be carefully lowered to the floor or ground.

The Contractor shall promptly place the adequately wet asbestos material in disposal containers (six (6) mil polyethylene bags/fiber drum/poly-lined dumpsters, etc.) as it is removed. Large components removed intact may be wrapped in two (2) layers of six (6) mil polyethylene sheeting secured with tape. As the disposal containers are filled, the Contractor shall promptly seal the containers, apply caution labels and clean the containers before transportation to the equipment decontamination area. Bags shall be securely sealed to prevent accidental opening and leakage by taping in gooseneck fashion. Small components and asbestos-containing waste with sharp-edged components (e.g. nails, screws, metal lath, tin sheeting) which could tear polyethylene bags and sheeting shall be placed in clean drums and sealed with locking ring tops. All waste containers shall be leak-tight, (typically consisting of two layers of 6 mil poly (or bags)), and shall be properly labeled and placarded with OSHA Danger labels, DOT shipping labels, markings and placards and USEPA NESHAP generators labels. Containers shall be decontaminated by wet cleaning and HEPA vacuuming within the equipment decontamination area prior to exiting the regulated area. Wet clean each container thoroughly before moving to Holding Area.

If at any time during asbestos removal, the Project Monitor should suspect contamination of areas outside the Regulated Area, the Contractor shall immediately stop all abatement work and take steps to decontaminate these areas and eliminate causes of such contamination. Unprotected individuals shall be prohibited from entering contaminated areas until air sampling and/or visual inspections determine decontamination.

After completion of abatement work, all surfaces from which asbestos has been removed shall be wet brushed, using a nylon brush, wet wiped and sponged or cleaned by an equivalent method to remove all visible material (wire brushes are not permitted). During this work the surfaces being cleaned shall be kept wet. Cleaning shall also include the use of HEPA filtered vacuum equipment.

The Contractor shall also remove and containerize all visible accumulations of asbestos-containing and/or asbestos-contaminated debris which may have splattered or collected on the polyethylene engineering controls/barriers.

Once the Regulated Area surfaces have dried, the Project Monitor shall perform a thorough post abatement visual inspection utilizing protocols from the ASTM Standard E1368-90 *Standard Practice for Visual Inspection of Asbestos Abatement Projects*. All surfaces within the Regulated Area, including but not limited to ledges, beams, and hidden locations shall be inspected for visible residue. Evidence of asbestos contamination identified during this inspection will necessitate further cleaning as heretofore specified. The area shall be re-cleaned at the Contractor's expense, until the standard of cleaning is achieved.

Once the area has received a satisfactory post-abatement visual inspection, any equipment, tools or materials not required for completion of the work, shall be removed by the Contractor from the Regulated Area.

(f) Air Monitoring Requirements

1. The Contractor shall:

    a. Provide air monitoring equipment including sample filter cassettes of the type and quantity required to properly monitor operations and personnel exposure surveillance throughout the duration of the project.

    b. Conduct personnel exposure assessment air sampling, as necessary, to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.1101. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours and shall be available for review until the job is complete.

2. The Project Monitor, acting as the representative of the Engineer during abatement activities, will:

    a. Collect air samples in accordance with the current revision of the NIOSH 7400 Method of Air Sampling for Airborne Asbestos Fibers while overseeing the activities of the Abatement Contractor. Frequency and duration of the air sampling during abatement will be representative of the actual conditions at the abatement site. The size and configuration of the asbestos project will be a factor in the number of samples required to monitor the abatement activities and shall be determined by the Project Monitor. The following schedule of samples may be collected by the Project Monitor:

        1. Pre-Abatement (Optional)
            a. Background areas

b. Area(s) adjacent to Work Area(s)
c. Work Area(s)

2. During Abatement (Optional)
   a. At the exhaust of air filtering device
   b. Within Regulated Area(s)
   c. Area(s) adjacent to Regulated Areas(s) (exterior to critical barriers)
   d. At the Decontamination Enclosure System

Abatement Activity	Pre-Abatement	During Abatement	Post-Abatement
Exterior Friable/Non-Friable	---	PCM	---

If air samples collected outside of the Regulated Area during abatement activities indicate airborne fiber concentrations greater than original background levels, or greater than 0.1 f/cc, as determined by Phase Contrast Microscopy, whichever is larger, an examination of the Regulated Area perimeter shall be conducted and the integrity of barriers shall be restored. Cleanup of surfaces outside the Regulated Area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming abatement activities.

(g) Post Abatement Work Area Deregulation

The Contractor shall remove all remaining polyethylene, including critical barriers, and Decontamination Enclosure Systems. HEPA vacuum and/or wet wipe any visible residue which is uncovered during this process. All waste generated during this disassembly process shall be discarded as ACM waste.

A final visual inspection of the work area shall be conducted by the Competent Person and the Project Monitor to ensure that all visible accumulations of suspect materials have been removed and that no equipment or materials associated with the abatement project remain.

The Contractor shall restore all work areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the Engineer.

(h) Waste Disposal

Unless otherwise specified, all removed materials and debris resulting from execution of this project shall become the responsibility of the Contractor and removed from the premises. Materials not scheduled for reuse shall be removed from the site and disposed of in accordance with all applicable Federal, State and Local requirements.

Waste removal dumpsters and cargo areas of transport vehicles shall be lined with a layer of six (6) mil polyethylene sheeting to prevent contamination from leaking or spilled containers. Floor sheeting shall be installed first, and shall be extended up sidewalls 12-inches. Wall sheeting shall overlap floor sheeting 24-inches and shall be taped into place.

OSHA "Danger" signs must be attached to vehicles used to transport asbestos-containing waste prior to loading ACM waste. The signs must be posted so that they are plainly visible.

Waste haulers and disposal facilities utilized shall match those indicated on the submitted CTDPH notification.

Ensure all waste containers (bags, drums, etc.) are properly packed, sealed and labeled with USEPA NESHAP generator labels, OSHA danger labels and DOT shipping labels. For each shipment of ACM waste, the Contractor shall complete an EPA-approved asbestos waste shipment record.

Authorized representatives signing waste shipment records on behalf of the generator must have USDOT Shipper Certification training in accordance with HMR 49 CFR Parts 171-180.

Transport vehicles hauling ACM waste shall have appropriate USDOT placards visible on all four (4) sides of the vehicle.

The Contractor shall dispose of asbestos-containing and/or asbestos contaminated material at an EPA authorized site and must be in compliance with the requirements of the Special Waste Provisions of the Office of Solid Waste Management, Department of Environmental Protection, State of Connecticut, or other designated agency having jurisdiction over solid waste disposal.

Any asbestos-containing and/or asbestos-contaminated waste materials which also contain other hazardous contaminants shall be disposed of in accordance with the EPA's Resource Conservation and Recovery Act (RCRA), CTDEEP and ConnDOT requirements. Materials may be required to be stored on-site and tested by the Project Monitor to determine proper waste disposal requirements.

(i) Project Closeout Data:

1. Provide the Engineer, within 30 days of completion of asbestos abatement, a compliance package; which shall include, but not be limited to, the following:

    a. Asbestos Abatement Site Supervisor job log;
    b. OSHA personnel air sampling data;
    c. Completed waste shipment records.

The Contractor shall submit the original completed waste shipment records to the Engineer.

Method of Measurement:

No measurement will be made for the work in this Section. The completed work shall be paid as a lump sum.

Basis of Payment:

The lump sum bid price for this item shall include the specialty services of the Asbestos Removal Contractor including: labor, materials, equipment, insurance, permits, notifications, submittals, personal air sampling, personal protection equipment, temporary enclosures, utility costs, incidentals, fees and labor incidental to the removal, transport and disposal of ACM, including close out documentation.

Final payment for asbestos abatement will not be made until all the project closeout data submittals have been completed (including waste shipment record(s) signed by an authorized disposal facility representative) and provided to the Engineer. Once the completed package has been received in its entirety, the Engineer will make the final payment to the Contractor.

Pay Item	Pay Unit
Asbestos Abatement	Lump Sum

ITEM #0020903A – LEAD COMPLIANCE FOR MISCELLANEOUS EXTERIOR TASKS

Description:

Work under this item shall include the special handling measures and work practices required for miscellaneous exterior tasks that impact materials containing or covered by lead paint. Lead paint includes paint found to contain **any** detectable amount of lead by Atomic Absorption Spectrophotometry (AAS) or X-Ray Fluorescence (XRF). Examples of typical miscellaneous exterior tasks includes; work impacting signs, guiderails, minor bridge rehabilitation, catenary structures, canopy structures, spot/localized paint removal, etc.

All activities shall be performed in accordance with the OSHA Lead in Construction Regulations (29 CFR 1926.62), the USEPA RCRA Hazardous Waste Regulations (40 CFR Parts 260 through 274), and the CTDEEP Hazardous Waste Regulations (RCSA 22a-209-1 and 22a-449(c)).

All activities shall be performed by individuals with appropriate levels of OSHA lead awareness and hazard communication training and shall supervised by the Contractors Competent Person on the job site at all times. The Contractors Competent Person is one who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Deviations from these Specifications require the written approval of the Engineer.

Materials:

All materials shall be delivered to the job site in the original packages, containers, or bundles bearing the name of the manufacturer, the brand name and product technical description, with MSDS sheets as applicable.

No damaged or deteriorating materials shall be used. If material becomes contaminated with lead, the material shall be decontaminated or disposed of as lead-containing waste material. The cost to decontaminate and dispose of this material shall be at the expense of the Contractor.

The following material requirements are to be met if to be used during the work:

Fire retardant polyethylene sheet shall be in roll size to minimize the frequency of joints, with factory label indicating minimum six (6) mil thickness.

Polyethylene disposable bags shall be minimum six (6) mils thick.

Tape (or equivalent) product capable of sealing joints in adjacent polyethylene sheets and for the attachment of polyethylene sheets to finished or unfinished surfaces must be capable of adhering under both dry and wet conditions.

Cleaning Agents and detergent shall be lead specific, such as TriSodium Phosphate (TSP).

Chemical strippers and chemical neutralizers shall be compatible with the substrate as well as with each other. Such chemical stripper shall contain less than 50% Volatile Organic Compounds (VOCs) by weight in accordance with RCSA 22a-174-40 Table 40-1.

Labels and warning signs shall conform to 29 CFR 1926.62, 40 CFR 260 through 274 and 49 CFR 172 as appropriate.

Air filtration devices and vacuum units shall be equipped with High-Efficiency Particulate Air (HEPA) filters.

Construction Methods:

(1) Pre-Abatement Submittals and Notices

A. Prior to the start of **any** work on a contiguous per site basis that will generate hazardous lead waste above conditionally exempt small quantities (greater than 100 kg/month or greater than 1000 kg at any time), the Contractor shall obtain from the Engineer on a contiguous per site basis a temporary EPA Hazardous Waste Generators ID number, unless otherwise directed by the Engineer.

B. Fifteen (15) working days prior to beginning work that impacts lead paint, the Contractor shall submit the following to the Engineer:

1. Work plan for work impacting lead paint including engineering controls, methods of containment of debris and work practices to be employed, as needed, to minimize employee exposure and prevent the spread of lead contamination outside the Regulated Area.

2. Copies of all employee certificates, dated within the previous twelve (12) months, relating to OSHA lead awareness and hazard communication training and training in the use of lead-safe work practices. SSPC training programs may be accepted as meeting these requirements if it can be demonstrated that such training addressed all required topics.

   This information shall be updated and resubmitted annually, or as information changes, for the duration of the activities impacting lead to verify continued compliance.

3. Name and qualifications of Contractor's OSHA Competent Person under 29 CFR 1926.62.

4. Documentation from the Contractor, typed on company letterhead and signed by the Contractor, certifying that all employees listed therein have received the following:

   a. medical monitoring within the previous twelve (12) months, as required in 29 CFR 1926.62;
   b. biological monitoring within the previous six (6) months, as required in 29 CFR 1926.62;
   c. respirator fit testing within the previous twelve (12) months, as required in 29 CFR 1910.134 (for those who don a tight-fitting face piece respirator)

   This information shall be updated and resubmitted annually, or as information changes, for the duration of the activities impacting lead to verify continued compliance.

5. Names of the proposed non-hazardous construction and demolition (C&D) lead debris bulky waste disposal facility (CTDEEP-permitted Solid Waste landfill).

6. Names of the proposed concrete, brick, stone batch processing/recycling facility.

7. Names of the proposed scrap metal recycling facilities. The Contractor shall submit to the Engineer all documentation necessary to demonstrate the selected facility is able to accept lead-painted scrap metal.

8. Names of the proposed hazardous waste disposal facility (selected from the Department approved list provided herein), and copies of each facilities acceptance criteria and sampling frequency requirements.

9. Copies of the proposed hazardous waste transporters current USDOT Certificate of Registration for Hazardous Materials Transport, and the proposed transporters current Hazardous Waste Transporter Permits for the State of Connecticut and the waste destination State.

10. Negative exposure assessments conducted within the previous 12 months documenting that employee exposure to lead for each task is below the OSHA Action Level of 30 $\mu g/m^3$. If a negative exposure assessment has not been conducted, the Contractor shall submit its air monitoring program for the work tasks as part of the Work Plan. Until a negative exposure assessment is developed for each task impacting lead paint, the Contractor shall ensure that all workers and authorized persons entering the Regulated Area wear protective clothing and respirators in accordance with OSHA 29 CFR 1926.62.

No activity shall commence until all required submittals have been received and found acceptable to the Engineer. Those employees added to the Contractor's original list will be allowed to perform work only upon submittal of acceptable documentation to, and review by, the Engineer.

Contractor shall provide the Engineer with a minimum of 48 hours notice in advance of scheduling, changing or canceling work activities.

(2) Lead Abatement Provisions

A. General Requirements:

All employees of the Contractor who perform work impacting lead paint shall be properly trained to perform such duties. In addition, the Contractor shall instruct all workers in all aspects of personnel protection, work procedures, emergency evacuation procedures and use of equipment including procedures unique to this project.

Contractor shall provide all labor, materials, tools, equipment, services, testing, and incidentals which are necessary or required to perform the work in accordance with applicable governmental regulations, industry standards and codes, and these Specifications.

Prior to beginning work, the Engineer and Contractor shall perform a visual survey of each work area and review conditions.

As necessary, the Contractor shall:

> Shut down and lock out electrical power, including all receptacles and light fixtures, where feasible. The use or isolation of electrical power will be coordinated with all other ongoing uses of electrical power at the site.

If adequate electrical supply is not available at the site, the Contractor shall supply temporary power. Such temporary power shall be sufficient to provide adequate lighting and power the Contractor’s equipment. The Contractor is responsible for proper connection and installation of electrical wiring and shall ensure safe installation of electrical equipment in compliance with applicable electrical codes and OSHA requirements.

If water is not available at the site for the Contractor’s use, the Contractor shall supply sufficient water for each shift to operate the wash facility/decontamination shower units in addition to the water needed at the work area.

The Engineer may provide a Project Monitor to monitor compliance of the Contractor and protect the interests of the Department. In such cases, no activity impacting lead paint shall be performed until the Project Monitor is on-site. Where no Project Monitor will be provided, Contractor shall proceed at the direction of the Engineer. Environmental sampling, including ambient air sampling, TCLP waste stream sampling, and dust wipe sampling, will be conducted

by the State as it deems necessary throughout the project. Air monitoring to comply with the Contractor's obligations under OSHA remains solely responsibility of the Contractor.

If at any time, procedures for engineering, work practice, administrative controls or other topics are anticipated to deviate from those documented in the submitted and accepted Lead Work Plan, the Contractor shall submit a modification of its existing plan for review and acceptance by the Engineer prior to implementing the change.

If air samples collected outside of the Regulated Area during activities impacting lead paint indicate airborne lead concentrations greater than original background levels or 30 ug/m^3, whichever is larger, or if at any time visible emissions of lead paint extend out from the Regulated Area, an examination of the Regulated Area shall be conducted and the cause of such emissions corrected. Cleanup of surfaces outside the Regulated Area using HEPA vacuum equipment or wet cleaning techniques shall be done prior to resuming work.

Work outside the initial designated area(s) will not be paid for by the Engineer. The Contractor will be responsible for all costs incurred from these activities including repair of any damage.

B. Regulated Area

The Contractor shall establish a Regulated Area through the use of appropriate barrier tape or other means to control unauthorized access into the area where activities impacting lead paint are occurring. Warning signs meeting the requirements of 29 CFR 1926.62 shall be posted at all approaches to Regulated Areas. These signs shall read:

WARNING
LEAD WORK AREA
POISON
NO SMOKING OR EATING

The Contractor shall implement appropriate engineering controls such as poly drop cloths, local exhaust ventilation, wet dust suppression methods, etc. as necessary, and as approved by the Engineer, to prevent the spread of lead contamination beyond the Regulated Area in accordance with the Contractor's approved work plan. Should the previously submitted work plan prove to be insufficient to contain the contamination, the Contractor shall modify its plan and submit it for review by the Engineer.

C. Wash Facilities:

The Contractor shall provide handwash facilities in compliance with 29 CFR 1926.51(f) and 29 CFR 1926.62 <u>regardless of airborne lead exposure</u>.

If employee exposure to airborne lead exceeds the OSHA Permissible Exposure Limit of 50 micrograms per cubic meter ($\mu g/m^3$), shower rooms must be provided. The Shower Room shall

be of sufficient capacity to accommodate the number of workers. One shower stall shall be provided for each eight (8) workers. Showers shall be equipped with hot and cold or warm running water. Shower water shall be collected and filtered using best available technology and disposed of in accordance with all Federal, State and local laws, regulations and ordinances.

D. Personal Protection:

The Contractor shall initially determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of 30 $\mu g/m^3$. Assessments shall be based on initial air monitoring results as well as other relevant information. The Contractor may rely on historical air monitoring data obtained within the past 12 months under workplace conditions closely resembling the process, type of material, control methods, work practices and environmental conditions used and prevailing in the Contractors current operations to satisfy the exposure assessment requirements. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.

Until a negative exposure assessment is developed for each task impacting lead paint, the Contractor shall ensure that all workers and authorized person entering the Regulated Area wear protective clothing and respirators in accordance with OSHA 29 CFR 1926.62. Protective clothing shall include impervious coveralls with elastic wrists and ankles, head covering, gloves and foot coverings. Sufficient quantities shall be provided to last throughout the duration of the project.

Protective clothing provided by the Contractor and used during chemical removal operations shall be impervious to caustic materials. Gloves provided by the Contractor and used during chemical removal shall be of neoprene composition with glove extenders.

Respiratory protective equipment shall be provided and selection shall conform to 42 CFR Part 84, 29 CFR Part 1910.134, and 29 CFR Part 1926.62. A formal respiratory protection program must be implemented in accordance with 29 CFR Part 1926.62 and Part 1910.134.

E. Air Monitoring Requirements

The Contractor shall:

1. Provide air monitoring equipment including sample filter cassettes of the type and quantity required to properly monitor operations and personnel exposure surveillance throughout the duration of the project.

2. Conduct initial exposure monitoring to determine if any employee performing construction tasks impacting lead paint may be exposed to lead at or above the OSHA Action Level of 30 micrograms per cubic meter. Monitoring shall continue as specified in the OSHA standard until a negative exposure assessment is developed.

3. Conduct personnel exposure assessment air sampling, as necessary, to assure that workers are using appropriate respiratory protection in accordance with OSHA Standard 1926.62. Documentation of air sampling results must be recorded at the work site within twenty-four (24) hours and shall be available for review until the job is complete.

F. Lead Abatement Procedures

The Contractor's Competent Person shall be at the job site at all times during work impacting lead.

Work impacting lead paint shall not begin until authorized by the Engineer, following a pre-work visual inspection by the Project Monitor or Engineer to verify existing conditions.

Any activity impacting lead painted surfaces shall be performed in a manner which minimizes the spread of lead dust contamination and generation of airborne lead.

The Contractor shall conduct exposure assessments for all tasks which impact lead paint in accordance with 29 CFR 1926.62(d) and shall implement appropriate personal protective equipment until negative exposure assessments are developed.

All work impacting the materials identified below shall be conducted within an established Regulated Area with a remote wash facility/decontamination system in accordance with "C. Wash Facilities" and the OSHA Lead in Construction Standard. In accordance with 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.

The Contractor shall ensure proper entry and exit procedures for workers and authorized persons who enter and leave the Regulated Area. All workers and authorized persons shall leave the Regulated Area and proceed directly to the wash or shower facilities where they will HEPA vacuum gross debris from work suit, remove and dispose of work suit, wash and dry face and hands, and vacuum clothes. Lead chips and dust must not be removed by blowing or shaking of clothing. Wash water shall be collected, filtered, and disposed of in accordance with Federal, State and local water discharge standards. Any permit required for such discharge shall be the responsibility of the Contractor.

No one shall eat, drink, smoke, chew gum or tobacco, or apply cosmetics while in the Regulated Area.

Data from the limited lead testing performed by the Engineer is documented in the reports listed in the "Notice to Contractor – Hazardous Materials Investigations" or is presented herein. Under no circumstances shall this information be the sole means used by the Contractor for determining the extent of lead painted materials. The Contractor shall be responsible for verification of all

field conditions affecting performance of the work as described in these Specifications in accordance with OSHA, USEPA, USDOT and CTDEEP standards. Compliance with the applicable requirements is solely the responsibility of the Contractor.

The following details the extent of each phase of operation designated for this project. Phase areas may be combined or divided at the direction of the Engineer. Proceed through the sequencing of the work phases under the direction of the Engineer.

Bridge No. 01224, I-84 over Mad River, Waterbury

- **Lead paint was identified on the painted steel/metal surfaces of Bridge No. 01224. XRF readings showed the paint to be lead based.**

- **No lead paint was identified on the painted concrete surfaces on the abutments of Bridge No. 01224. XRF readings did not identified detectable lead.**

Girders, Bearings, Rockers, Cross Beams, Beam Ends, etc.	**Metal**	**Grey**	**2.5-18.6 mg/cm^2**
Abutment walls	**Concrete**	**Grey**	**0.0 mg/cm^2**

- **TCLP waste stream sampling/analysis of the paint associated with the steel/metal bridge components of Bridge No. 01224 characterized the paint waste as RCRA Hazardous waste.**

Paint debris	**280 mg/l**

- **Since the painted concrete surfaces on the abutments of Bridge No. 01224 were not identified as having detectable amounts of lead, any projected waste paint debris stream is characterized as Non-Hazardous for lead.**

- **Since the painted concrete surfaces on the abutments of Bridge No. 01224 were not identified as having detectable amounts of lead, the concrete can be recycled at the Contractor's previously submitted recycling facility.**

Bridge No. 01226, I-84, Harper Ferry Overpass, Waterbury

- **Lead paint was identified on the painted steel/metal surfaces of Bridge No. 01226. XRF readings showed the paint to be lead based.**

- **No lead paint was identified on the painted concrete surfaces on the abutments of Bridge No. 01226. XRF readings did not identified detectable lead.**

Girders, Bearings, Rockers, Cross Beams, Beam Ends, Railings etc.	**Metal**	**Blue**	**0.1-13.8 mg/cm^2**

Railings	**Metal**	**Silver**	**3.2-3.9 mg/cm^2**
Abutment walls	**Concrete**	**Tan**	**0.0 mg/cm^2**

- **TCLP waste stream sampling/analysis of the paint associated with the steel/metal bridge components of Bridge No. 01226 characterized the paint waste as <u>RCRA Hazardous waste</u>.**

Paint debris	**400 mg/l**

- **Since the painted concrete surfaces on the abutments of Bridge No. 01226 were not identified as having detectable amounts of lead, any projected waste paint debris stream is characterized as <u>Non-Hazardous</u> for lead.**

- **Since the painted concrete surfaces on the abutments of Bridge No. 01226 were not identified as having detectable amounts of lead, the concrete can be recycled at the Contractor's previously submitted recycling facility.**

<u>Bridge No. 01228, I-84, Scott Road Overpass, Waterbury</u>

- **Lead paint was identified on the painted steel/metal surfaces of Bridge No. 01228. XRF readings showed the paint to be lead based.**

- **No lead paint was identified on the painted concrete surfaces on the abutments of Bridge No. 01228. XRF readings did not identified detectable lead.**

Girders, Bearings, Rockers, Cross Beams, Beam Ends, Railings etc.	**Metal**	**Grey**	**3.2-24.9 mg/cm^2**
Railings	**Metal**	**Silver**	**2.4-12.7 mg/cm^2**
Abutment walls	**Concrete**	**Tan**	**0.0 mg/cm^2**

- **TCLP waste stream sampling/analysis of the paint associated with the steel/metal bridge components of Bridge No. 01228 characterized the paint waste as <u>RCRA Hazardous waste</u>.**

Paint debris	**660 mg/l**

- **Since the painted concrete surfaces on the abutments of Bridge No. 01228 were not identified as having detectable amounts of lead, any projected waste paint debris stream is characterized as <u>Non-Hazardous</u> for lead.**

- **Since the painted concrete surfaces on the abutments of Bridge No. 01228 were not identified as having detectable amounts of lead, the concrete can be recycled at the Contractor's previously submitted recycling facility.**

Bridge No. 04321, I-84, Hamilton Avenue Overpass, Waterbury

- **Lead paint was identified on the painted metal railing of Bridge No. 04321. XRF readings showed the paint to be lead based.**

- **The painted metal surfaces of the structural steel and metal pipes on the underside of Bridge No. 04321 were inaccessible and therefore not sampled. The surfaces are assumed to have lead paint.**

Railings	**Metal**	**Silver**	**1.6-4.5 mg/cm^2**

- **Any paint waste generated from the painted metal surfaces of the structural steel, metal pipes and/or railings at Bridge No. 04321 are assumed to be RCRA hazardous waste.**

Bridge No. 06284, I-84 Interchange, Danbury

- **No lead paint was identified on the painted steel/metal surfaces of Bridge No. 06284. XRF readings and AAS results identified no detectable lead.**

Girders, Bearings, Cross Beams, Beam Ends, etc.	**Metal**	**Blue**	**0.0 mg/cm^2 ND<0.10% by weight**

- **Since the painted steel/metal surfaces of Bridge No. 06284 were not identified as having detectable amounts of lead, any projected waste paint debris stream is characterized as Non-Hazardous for lead.**

While conducting work to demolish the bridges, where it is necessary to impact the painted steel/metal surfaces, the Contractor shall either:

a. **Remove the paint to be impacted prior to impacting the steel/metal in accordance with OSHA Lead in Construction Standard 29CFR 1926.62, or**

b. **Impact the steel/metal using mechanical means with the paint in place in accordance with OSHA Lead in Construction Standard 29CFR 1926.62.**

The Contractor shall submit a Work Plan to ConnDOT outlining the exact procedures that will be used to perform the work, contain the spread of lead debris and protect the

employees performing the required renovation work impacting the lead paint. No work shall be started by the Contractor until the Work Plan is approved by the Engineer.

All work impacting the lead paint materials shall be conducted within an established Regulated Area with a remote wash facility/decontamination system in accordance with "C. Wash Facilities" and the OSHA Lead in Construction Standard. In accordance with 29 CFR 1926.62, engineering controls and work practices shall be utilized to prevent the spread of lead dust and debris beyond the Regulated Area and limit the generation of airborne lead. All wastes containing lead paint shall be properly contained and secured for storage, transportation and disposal.

On Bridge Nos. 01224, 01226, and 01228, the Engineer has previously characterized the projected paint waste stream associated with the steel/metal bridge components as RCRA Hazardous waste. If the paint is removed from the metal, the paint shall be handled and disposed of in accordance with USEPA/CTDEEP Hazardous Waste Regulations as described under this Item 0020903A.

On Bridge No. 06284, the painted steel/metal surfaces were not identified as having detectable amounts of lead. Any projected waste paint debris stream is characterized as Non-Hazardous for lead and shall be disposed of as C&D bulky waste at the Contractor's previously submitted facility.

On Bridge No. 04321, the paint waste is presently presumed to be hazardous waste. Should the paint be removed from the components, the Engineer will conduct TCLP testing or mass balance calculations on a representative sample of the lead paint waste materials to confirm if it is classified as a RCRA/CTDEEP hazardous waste or as non-hazardous C&D waste. Should the waste material be determined to be hazardous, it shall be handled and disposed of in accordance with USEPA/CTDEEP Hazardous Waste Regulations as described under this Item 0020903A. If the waste material is determined to be non-hazardous, it shall be disposed of as non-hazardous C&D bulky waste at the Contractor's previously submitted facility.

All steel and metal components generated from the miscellaneous exterior work tasks (painted or not) shall be segregated and recycled as scrap metal. The recycling of scrap metal (regardless of lead paint concentration) is exempt from USEPA RCRA and CTDEEP Hazardous Waste Regulation.

Should lead contamination be discovered outside of the Regulated Area, the Contractor shall immediately stop all work in the Regulated Area, eliminate causes of such contamination and take steps to decontaminate non-work areas.

Special Requirements:

1. Demolition/Renovation:

a. Demolish/renovate in a manner which minimizes the spread of lead contamination and generation of lead dust.
b. Implement dust suppression controls, such as misters, local exhaust ventilation, etc. to minimize the generation of airborne lead dust.
c. Segregate work areas from non-work areas through the use or barrier tape, drop cloths, etc.
d. Clean up immediately after renovation/demolition has been completed

2. Chemical Removal:

a. Apply chemical stripper in quantities and for durations specified by manufacturer.
b. Where necessary, scrape lead paint from surface down to required level of removal (i.e. stabilized surface, bare substrate with no trace of residual pigment, etc.). Use sanding, hand scraping, and dental picks to supplement chemical methods as necessary.

c. Apply neutralizer compatible with substrate and chemical agent to substrate following removal in accordance with manufacturer's instructions.
d. Protect adjacent surfaces from damage from chemical removal.
e. Maintain a portable eyewash station in the work area.
f. Wear respirators that will protect workers from chemical vapors.
g. Do not apply caustic agents to aluminum surfaces.

3. Mechanical Paint Removal:

a. Provide sanders, grinders, rotary wire brushes, or needle gun removers equipped with a HEPA filtered vacuum dust collection system. Cowling on the dust collection system for orbital-type tools must be capable of maintaining a continuous tight seal with the surface being abated. Cowling on the dust collection system for reciprocating-type tools shall promote an effective vacuum flow of loosened dust and debris. Inflexible cowlings may be used on flat surfaces only. Flexible contoured cowlings are required for curved or irregular surfaces.
b. Provide HEPA vacuums that are high performance designed to provide maximum static lift and maximum vacuum system flow at the actual operating vacuum condition with the shroud in use. The HEPA vacuum shall be equipped with a pivoting vacuum head.
c. Remove lead paint from surface down to required level of removal (i.e. stabilized surface, bare substrate with no trace of residual pigment, etc.). Use chemical methods, hand scraping, and dental picks to supplement abrasive removal methods as necessary.
d. Protect adjacent surfaces from damage from abrasive removal techniques.
e. “Sandblasting” type removal techniques shall not be allowed.

4. Component Removal/Replacement:

a. Wet down components which are to be removed to reduce the amount of dust generated during the removal process.
b. Remove components utilizing hand tools, and follow appropriate safety procedures during removal. Remove the components by approved methods which will provide the least disturbance to the substrate material. Do not damage adjacent surfaces.
c. Clean up immediately after component removals have been completed. Remove any dust located behind the component removed.

G. Prohibited Removal Methods:

The use of heat guns in excess of 700 degrees Fahrenheit to remove lead paint is prohibited.

The use of sand, steel grit, air, CO_2, baking soda, or any other blasting media to remove lead or lead paint without the use of a HEPA ventilated contained negative pressure enclosure is prohibited.

Power/pressure washing shall not be used to remove lead paint.

Compressed air shall not be utilized to remove lead paint.

Chemical strippers containing Methylene Chloride are prohibited. Any chemical stripping may be prohibited on a project by project basis.

Power tool assisted grinding, sanding, cutting, or wire brushing of lead paint without the use of cowled HEPA vacuum dust collection systems is prohibited.

Lead paint burning, busting of rivets painted with lead paint, welding of materials painted with lead paint, and torch cutting of materials painted with lead paint is prohibited. Where cutting, welding, busting, or torch cutting of materials is required, lead paint in the affected area must be removed first.

Chemical stripping of coatings from bridge components is generally prohibited unless specifically allowed on a project by project basis.

H. Clean-up and Visual Inspection:

The Contractor shall remove and containerize all lead waste material and visible accumulations of debris, paint chips and associated items.

During clean-up the Contractor shall utilize rags and sponges wetted with lead-specific detergent and water as well as HEPA filtered vacuum equipment.

The Engineer will conduct a visual inspection of the work areas in order to document that all surfaces have been maintained as free as practicable of accumulations of lead in accordance with 29 CFR 1926.62(h). If visible accumulations of waste, debris, lead paint chips or dust are found in the work area, the Contractor shall repeat the cleaning, at the Contractor's expense, until the area is in compliance. The visual inspection will detect incomplete work, damage caused by the abatement activity, and inadequate clean up of the work site.

I. Post-Work Regulated Area Deregulation:

Following an acceptable visual inspection, any engineering controls implemented may be removed.

A final visual inspection of the work area shall be conducted by the Competent Person and the Project Monitor or Engineer to ensure that all visible accumulations of suspect materials have been removed and that no equipment or materials associated with the lead paint removal remain. If this final visual inspection is acceptable, the Contractor will reopen the Regulated Area and remove all signage.

The Contractor shall restore all work areas and auxiliary areas utilized during work to conditions equal to or better than original. Any damage caused during the performance of the work activity shall be repaired by the Contractor at no additional expense to the State.

J. Waste Disposal/Recycling:

Non-metallic building debris waste materials tested and found to be non-hazardous Construction and Demolition (C&D) bulky waste shall be disposed of properly at a CTDEEP approved Solid Waste landfill as described under this Item 0020903A.

Metallic debris shall be segregated and recycled as scrap metal at an approved metal recycling facility.

Concrete, brick, etc. coated with <u>any amount of lead paint</u> cannot be crushed, recycled or buried on-site to minimize waste disposal unless tested and found to meet the RSR GA/Residential standards.

Hazardous lead debris shall be disposed of as described under this Item 0020903A.

The Contractor shall comply with the latest requirements of the USEPA RCRA Hazardous Waste Regulations 40 CFR 260-274 and the DEEP Hazardous/Solid Waste Management Standards 22a-449(c).

Hazardous lead debris shall be transported from the Project by a licensed hazardous waste transporter approved by the Department and disposed of at an EPA-permitted and Department-approved hazardous waste landfill within 90 days from the date of generation.

The Contractor must use one or more of the following Department-approved disposal facilities for the disposal of hazardous waste:

Clean Earth of North Jersey, Inc., (CENJ) 115 Jacobus Avenue, South Kearny, NJ 07105 Phone: (973) 344-4004; Fax: (973) 344-8652	Clean Harbors Environmental Services, Inc. 2247 South Highway 71, Kimball, NE 69145 Phone: (308) 235-8212; Fax: (308) 235-4307
Clean Harbors of Braintree, Inc. 1 Hill Avenue, Braintree, MA 02184 Phone: (781) 380-7134; Fax: (781) 380-7193	Cycle Chem (General Chemical Corp.) 217 South First Street, Elizabeth, NJ 07206 Phone: (908) 355-5800; Fax (908) 355-0562
EnviroSafe Corporation Northeast (former Jones Environmental Services (NE), Inc.) 263 Howard Street, Lowell, MA 01852 Phone: (978) 453-7772; Fax: (978) 453-7775	Environmental Quality Detroit, Inc. 1923 Frederick Street, Detroit, MI 48211 Phone: (800) 495-6059; Fax: (313) 923-3375
Republic Environmental Systems 2869 Sandstone Drive, Hatfield, PA 19440 Phone: (215) 822-8995; Fax: (215) 997-1293	Chemical Waste Management of New York 1550 Balmer Rd., Model City, NY 14107 Phone: (800) 843-3604; Fax: (716) 754-0211
Environmental Quality Company: Wayne Disposal Facility 49350 North I-94 Service Drive Belleville, MI 48111 Phone: (800) 592-5489; Fax: (800) 592-5329	Northland Environmental, Inc. (PSC Environmental Systems) 275 Allens Avenue, Providence, RI 02905 Phone: (401) 781-6340; Fax: (401) 781-9710

The apparent low bidder shall submit in writing, within fourteen days after Bid opening, (1) a letter listing the names of the hazardous waste disposal facilities (from the above list) that the bidder, if it is awarded the Contract, will use to receive hazardous material from this Project, and (2) a copy of each facility's acceptance criteria and sampling frequency requirements.

Any other Contractor which the Department may subsequently designate as the apparent low bidder shall make the aforementioned submissions within fourteen (14) days from the date on which the Department notifies the Contractor that it has become the apparent low bidder. If, however, the Department deems it is necessary for such a subsequent-designated Contractor to make said submissions within a shorter period of time, the Contractor shall make those submissions within the time designated by the Department.

Failure to comply with all of the above requirements may result in the rejection of the bid.

No facility may be substituted for the one(s) designated in the Contractor's submittal without the Engineer's prior approval. If the material cannot be accepted by any of the Contractor's designated facilities, the Department will supply the Contractor with the name(s) of other acceptable facilities.

Prior to the generation of any hazardous waste, the Contractor shall notify the Engineer of its selected hazardous waste transporter and disposal facility. The Contractor must submit to the Engineer (1) the transporter's current US DOT Certificate of Registration and (2) the

transporter's current Hazardous Waste Transporter Permits for the State of Connecticut, the hazardous waste destination state and any other applicable states. The Engineer will then obtain on a contiguous per site basis a temporary EPA Generators ID number for the site that he will forward to the Contractor. Any changes in transporter or facility shall be immediately forwarded to the Engineer for review.

Handling, storage, transportation and disposal of hazardous waste materials generated as a result of execution of this project shall comply with all Federal, State and Local regulations including the USEPA RCRA Hazardous Waste Regulations (40 CFR Parts 260-271), the CTDEEP Hazardous Waste Regulations (22a-209 and 22a-449(c)), and the USDOT Hazardous Materials Regulations (49 CFR Part 171-180).

All debris shall be contained and collected daily or more frequently as directed by the Engineer, due to debris buildup. Debris shall be removed by HEPA vacuum collection. Such debris and paint chips shall be stored in leak-proof storage containers in the secured storage site, or as directed by the Engineer. The storage containers and storage locations shall be reviewed by the Engineer and shall be located in areas not subject to ponding. Storage containers shall be placed on pallets and closed and covered with tarps at all times except during placement, sampling and disposal of the debris.

Hazardous waste materials are to be properly packed and labeled for transport by the Contractor is accordance with EPA, CTDEEP and USDOT regulations. The disposal of debris characterized as hazardous waste shall be completed within 90 calendar days of the date on which it began to be accumulated in the lined containers. Storage of containers shall be in accordance with current DEEP/EPA procedures.

The Contractor shall label hazardous waste storage containers with a 6-inch square, yellow, weatherproof, Hazardous Waste sticker in accordance with USDOT regulations.

Materials other than direct paint related debris which are incidental to the paint removal work activities (tarps, poly, plywood, PPE, gloves, decontamination materials, etc.) which may be contaminated with lead, shall be stored separately from the direct paint debris, and shall be sampled by the Engineer for waste disposal characterization testing. Such materials characterized as hazardous shall be handled/disposed of as described herein, while materials characterized as non-hazardous shall be disposed of as non-hazardous CTDEEP Solid Waste.

Direct paint related debris materials not previously sampled and characterized for disposal, which may be originally presumed to be hazardous waste, shall also be stored separately and sampled by the Engineer for ultimate waste disposal characterization testing and handled/disposed of based on that testing.

Project construction waste materials unrelated to the paint removal operations shall NOT be combined/stored with paint debris waste and/or incidental paint removal materials as they are not lead contaminated and shall NOT be disposed of as hazardous waste. The Engineer's on-site Inspectors shall conduct inspections to verify materials remain segregated.

The Contractor shall obtain and complete all paperwork necessary to arrange for material disposal, including disposal facility waste profile sheets. It is solely the Contractor's responsibility to co-ordinate the disposal of hazardous materials with its selected treatment/recycling/disposal facility(s). Upon receipt of the final approval from the facility, the Contractor shall arrange for the loading, transport and treatment/recycling/disposal of the materials in accordance with all Federal and State regulations. **No claim will be considered based on the failure of the Contractor's disposal facility(s) to meet the Contractor's production rate or for the Contractor's failure to select sufficient facilities to meet its production rate.**

The Contractor shall process the hazardous waste such that the material conforms with the requirements of the selected treatment/disposal facility, including but not limited to specified size and dimension. Refusal on the part of the treatment/disposal facility to accept said material solely on the basis of non-conformance of the material to the facility's physical requirements is the responsibility of the Contractor and no claim for extra work shall be accepted for reprocessing of said materials to meet these requirements.

All DOT shipping documents, including the Uniform Hazardous Waste Manifests utilized to accompany the transportation of the hazardous waste material shall be prepared by the Contractor and reviewed/signed by an authorized agent representing ConnDOT, as Generator, for each load of hazardous material that is packed to leave the site. The Contractor shall not sign manifests on behalf of the State as Generator. The Contractor shall forward the appropriate original copies of all manifests to the Engineer the same day the material leaves the Project site.

Materials not related to lead paint removal and/or characterized as non-hazardous waste shall NOT be shipped for hazardous waste disposal in accordance with USEPA RCRA hazardous waste minimization requirements.

A load-specific certificate of disposal, signed by the authorized agent representing the waste disposal facility, shall be obtained by the Contractor and promptly delivered to the Engineer for each load.

In addition to all pertinent Federal, State and local laws or regulatory agency polices, the Contractor shall adhere to the following precautions during the transport of hazardous materials off-site:

- All vehicles departing the site are to be properly logged to show the vehicle identification, driver's name, time of departure, destination, and approximate volume, and contents of materials carried. Vehicles shall display the proper USDOT placards for the type and quantity of waste;
- No materials shall leave the site unless a disposal facility willing to accept all of the material being transported has agreed to accept the type and quantity of waste;
- Documentation must be maintained indicating that all applicable laws have been satisfied and that the materials have been successfully transported and received at the

disposal facility; and,

- The Contractor shall segregate the waste streams (i.e. concrete, wood, etc.) as directed by the receiving disposal facility.

Any spillage of debris during disposal operations during loading, transport and unloading shall be cleaned up in accordance with EPA 40 CFR 265 Subparts C & D, at the Contractor's expense.

The Contractor is liable for any fines, costs or remediation costs incurred as a result of their failure to be in compliance with this Item and all Federal, State and Local laws.

K. Project Closeout Data:

Provide the Engineer, within thirty (30) days of completion of the project site work, a compliance package; which shall include, but not be limited to, the following:

1. Competent persons (supervisor) job log;
2. OSHA-compliant personnel air sampling data;
3. Completed waste shipment papers for non-hazardous lead construction and demolition (C&D) waste disposal or recycling and scrap metal recycling.
4. Copies of completed Hazardous Waste Manifests (signed by authorized disposal facility representative).

Method of Measurement:

The completed work shall be paid as a lump sum. This item will include all noted services, equipment, facilities, testing and other associated work for up to three (3) ConnDOT project representatives. Services provided to any ConnDOT project representatives in excess of three (3) representatives will be measured for payment in accordance with Article 1.09.04 – "Extra and Cost-Plus Work."

Basis of Payment:

The lump sum price bid for this item shall include: services, materials, equipment, all permits, notifications, submittals, personal air sampling, personal protection equipment, temporary enclosures, incidentals, fees and labor incidental to activities impacting lead removal, treatment and handling of lead contaminated materials, and the transport and disposal of any hazardous and/or non-hazardous lead construction and demolition (C&D) bulky waste.

Final payment will not be made until all project closeout data submittals have been completed and provided to the Engineer. Once the completed package has been received in its entirety and accepted by the Engineer, final payment will be made to the Contractor.

Pay Item	Pay Unit
Lead Compliance for	

Miscellaneous Exterior Tasks	Lump Sum

END OF SECTION

ITEM #0202315A - DISPOSAL OF CONTROLLED MATERIALS

Description:

Work under this item shall consist of the loading, transportation and final off-site disposal/ recycling/treatment of controlled materials (excluding dewatering fluids) stored at the Waste Stockpile Areas (WSAs) that have been determined to be contaminated with regulated substances at non-hazardous levels. Contamination previously documented to exist on the site can be found in the reports listed in the "Notice to Contractor – Environmental Investigations". The controlled materials, after proper characterization by the Engineer, shall be taken from the WSAs, loaded, transported to and treated/recycled/disposed of at a permitted treatment/recycle/disposal facility listed herein.

The Contractor must use one or more of the following Department-approved treatment/recycle/disposal facilities for the disposal of non-hazardous materials:

	Northampton Landfill 170 Glendale Road Florence, MA 01062 413-498-0099
ESMI of New York 304 Towpath Road Fort Edward, New York 12828 (800) 511-3764; Peter Hanson	Waste Management of New Hampshire P.O. Box 27065 97 Rochester Neck Road Gonic, NH 03839 (603) 330-2170; Ellen Bellio
Ted Ondrick Company, LLC 58 Industrial Road Chicopee, MA 01020 (413) 592-2566; Alan Desrosiers	ESMI of New Hampshire 67 International Drive Loudon, NH 03307 (603) 783-0228; Stephen Raper
The Southbridge Recycling and Disposal Park 165 Barefoot Road Southbridge, MA 508-765-9723	South Hadley Landfill, LLC 12 Industrial Drive South Hadley, MA 01075 413-535-3095
Waste Management – Chicopee Sanitary Landfill 161 New Lombard Road Chicopee, MA 01020 413-534-8741	Waste Management – Granby Sanitary Landfill 11 New Ludlow Road Granby, MA 01033 413-467-3200

Moretown Landfill 187 Palisades Park Waterbury, VT 05676 802-244-1100 x 226	Allied Waste Niagra Fall Landfill, LLC 5600 Niagra Falls Blvd. Niagra, NY 14304 716-285-3398; David Hanson
Clean Earth of Philadelphia 3201 S. 61 Street Philadelphia, PA 19153 215-724-5520; Mike Kelly	Clean Earth of Carteret 24 Middlesex Avenue Carteret, NJ 07008 732-541-8909; Cheryl Coffee
Cranston Sanitary Landfill 1690 Pontiac Avenue Cranston, RI 02920 413-552-3688; Paul Mahoney	

Construction Methods:

A. Submittals

The apparent low bidder shall submit in writing, within fourteen days after Bid opening, (1) a letter listing the names of the treatment/recycle/disposal facilities (from the list above) which the bidder, if it is awarded the Contract, will use to receive controlled material from this Project, (2) a copy of the attached "Disposal Facility Material Acceptance Certification" form from each facility, which shall be signed by an authorized representative of each treatment/recycle/disposal facility, and (3) a copy of the facility acceptance criteria and facility sampling frequency requirements from each facility.

Any other Contractor which the Department may subsequently designate as the apparent low bidder shall make the aforementioned submissions within fourteen (14) days from the date on which the Department notifies the Contractor that it has become the apparent low bidder. If, however, the Department deems it is necessary for such a subsequent-designated Contractor to make said submissions within a shorter period of time, the Contractor shall make those submissions within the time designated by the Department.

Failure to comply with all of the above requirements may result in the rejection of the bid.

No facility may be substituted for the one(s) designated in the Contractor's submittal without the Engineer's prior approval. If the material cannot be accepted by any of the Contractor's designated facilities, the Department will supply the Contractor with the name(s) of other acceptable facilities.

Disposal Facility Materials Acceptance Certification

Project Number _____

Project Location_____

Facility Name_____ Telephone_____

Facility Address_____ Fax_____

_____

_____

The Contractor has supplied the analytical data contained in the report concerning the site investigation performed by the Designer. I have personally reviewed this data and intend to accept the following:

Controlled materials as described in Item # 0202315A Disposal of Controlled Materials for the subject Project at a cost of $_____ per metric ton for treatment/disposal and an additional $_____ per metric ton for transportation from the Project to the facility (if applicable).

This intent to accept the material will be subject to and dependent upon the facility's subsequent evaluation of waste characterization determination documentation to be provided to the Contractor by the Engineer.

Authorized Facility
Representative_____/_____
Printed/Typed Name Title

_____/_____
Signature Date

Note: The facility shall attach the acceptance criteria and facility sampling frequency requirements to this document.

DO NOT ALTER FORM IN ANY WAY. FORM MUST BE COMPLETED IN ENTIRETY.

B. Material Disposal

The Engineer will sample materials stored at the WSAs at a frequency established by the selected treatment/recycling/disposal facilities. The Contractor shall designate to the Engineer which facility it intends to use prior to samples being taken. The Contractor is hereby notified that laboratory turnaround time is expected to be fifteen (15) working days. Turnaround time is the period of time beginning when the Contractor notifies the Engineer which facility it intends to use and that the bin within the WSAs is full and ready for sampling and ending with the Contractor's receipt of the laboratory analytical results. Any change of intended treatment/recycling/disposal facility may prompt the need to resample and will therefore restart the time required for laboratory turnaround. The laboratory will furnish such results to the Engineer. Upon receipt, the Engineer will make available to the Contractor the results of the final waste characterization determinations. **No delay claim will be considered based upon the Contractor's failure to accommodate the laboratory turnaround time as identified above.**

The Contractor shall obtain and complete all paperwork necessary to arrange for material disposal (such as disposal facility waste profile sheets). It is solely the Contractor's responsibility to co-ordinate the disposal of controlled materials with its selected treatment/recycling/disposal facility(s). Upon receipt of the final approval from the facility, the Contractor shall arrange for the loading, transport and treatment/recycling/disposal of the materials in accordance with all Federal and State regulations. **No claim will be considered based on the failure of the Contractor's selected disposal facility(s) to meet the Contractor's production rate or for the Contractor's failure to select sufficient facilities to meet its production rate.**

All manifests or bills of lading utilized to accompany the transportation of the material shall be prepared by the Contractor and signed by an authorized Department representative, as Generator, for each truck load of material that leaves the site. The Contractor shall forward the appropriate original copies of all manifests or bills of lading to the Engineer the same day the material leaves the Project.

A load-specific certificate of treatment/recycling/disposal, signed by the authorized agent representing the disposal facility, shall be obtained by the Contractor and promptly delivered to the Engineer for each load.

C. Material Transportation

In addition to all pertinent Federal, State and local laws or regulatory agency polices, the Contractor shall adhere to the following precautions during the transport of controlled materials off-site:

· Transported controlled materials are to be covered sufficiently to preclude the loss of material during transport prior to leaving the site and are to remain covered until the arrival at the selected treatment/recycling/disposal facility.

- All vehicles departing the site are to be properly logged to show the vehicle identification, driver's name, time of departure, destination, and approximate volume, and contents of materials carried.

- No materials shall leave the site unless a treatment/recycling/disposal facility willing to accept all of the material being transported has agreed to accept the type and quantity of waste.

D. Equipment Decontamination

All equipment shall be provided to the work site free of gross contamination. The Engineer may prohibit from the site any equipment that in his opinion has not been thoroughly decontaminated prior to arrival. Any decontamination of the Contractor's equipment prior to arrival at the site shall be at the expense of the Contractor. The Contractor is prohibited from decontaminating equipment on the Project that has not been thoroughly decontaminated prior to arrival.

The Contractor shall furnish labor, materials, tools and equipment for decontamination of all equipment and supplies that are used to handle Controlled Materials. Decontamination shall be conducted at an area designated by the Engineer and shall be required prior to equipment and supplies leaving the Project, between stages of the work, and between work in different AORRs and the AOEC.

The Contractor shall use dry decontamination procedures. Residuals from dry decontamination activities shall be collected and managed as Controlled Materials. If the results from dry methods are unsatisfactory to the Engineer, the Contractor shall modify decontamination procedures as required.

The Contractor shall be responsible for the collection and treatment/recycling/disposal of any liquid wastes that may be generated by its decontamination activities in accordance with applicable regulations.

Method of Measurement:

The work of "DISPOSAL OF CONTROLLED MATERIALS" will be measured for payment as the actual net weight in metric tons of material delivered to the treatment/recycling/disposal facility. Such determinations shall be made by measuring each hauling vehicle on the certified permanent scales at the treatment/recycling/disposal facility. Total weight will be the summation of weight bills issued by the facility specific to this Project. Excess excavations made by the Contractor beyond the payment limits specified in Specification Sections 2.02, 2.03, 2.05, 2.06, or the Contract Special Provisions for foundation excavation (as appropriate) will not be measured for payment and the Contractor assumes responsibility for all costs associated with the appropriate handling, management and disposal of this material.

The disposal of excavated materials, originally anticipated to be controlled materials, but determined by characterization sampling not to contain concentrations of regulated chemicals (i.e. non-polluted, clean fill, or natural soil) will not be measured for payment under this item but will be considered as surplus excavated materials and will be paid in accordance with Article 1.04.05.

Equipment decontamination, the collection of residuals, and the collection and disposal of liquids generated during equipment decontamination activities will not be measured separately for payment.

Basis of Payment:

This work will be paid for at the Contract unit price, which shall include the loading and transportation of controlled materials from the WSAs to the treatment/recycling/disposal facility; the fees paid to the facility for treatment/recycling/disposal; the preparation of all related paperwork; and all equipment, materials, tools, and labor incidental to this work. **This unit price will be applicable to all of the listed disposal facilities and will not change for the duration of the Project.**

This price shall also include equipment decontamination; the collection of residuals generated during decontamination and placement of such material in the WSAs; and the collection and disposal of liquids generated during equipment decontamination activities.

Pay Item	Pay Unit
Disposal of Controlled Materials	t

ITEM #0202652A – DRILLED ROCK DRAINS

Description:

This item shall consist of furnishing equipment, labor, materials, and performing all work necessary for drilling near horizontal inclined drain holes into the face of completed rock cuts at locations described herein. The locations include rock cuts adjacent to I-84 eastbound at the east end of the project, and along the Reidville Drive rock cut.

Construction Methods:

Using an appropriate drilling rig and drilling methods, the Contractor shall install a single line of drain holes at the toe of rock cuts along the right side of Reidville Drive between STA. RD 10+000 and 10+400, and along the right side of EB I-84 between STA. WB 4+480 (EB 4+516) and WB 4+880 (EB 5+906). Rock drains shall be drilled after completion of the final rock cut face. The line of drain holes shall be located at 1.5 meters above the toe of the cut, and installed on a 3m horizontal spacing along the roadway alignment, perpendicular to the roadway alignment. Drain holes shall be at least 50-mm dia. And 6-m long measured from the final rock cut face. Drain holes shall be inclined 10 degrees from horizontal, and shall slope downward towards the rock cut face. The drains are intended to relieve hydrostatic pressures in joints and fractures within the rock.

If the drilling methods generate dust, it must be controlled so as not to be an environmental or traffic hazard.

Method of Measurement:

The work will be measured for payment as the number of meters of rock drain installed. No additional payment shall be made for rock drains greater than 6m long unless previously approved by the engineer.

Method of Payment:

The work will be paid at the unit rate per meter of “Installed Drilled Rock Drains”.

ITEM #0217003A – PRELOAD FILL

Description:

Work under this item shall consist of design, lateral support, maintenance settlement platforms, and monitoring of measurements for preloading of embankment within limits shown on the plans.

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

Construction Methods:

The Eastbound and Westbound I-84 highway embankments and the Exit 24 Eastbound Off Ramp within the limits of the former Scovill Pond shall be preloaded to the final heights and limits shown on the plans.

Design of the preload shall consider the presence of fill and soft alluvial deposits within the former Scovill Pond, and include provisions to ensure stability. The design shall include appropriate measures to provide a stable preload, such as staged construction, geogrid reinforcement, or other necessary measures. Engineering analyses that demonstrate satisfactory stability of the preload shall be prepared by a Professional Engineer registered in Connecticut. These analyses shall be submitted to the Department prior to construction.

Temporary lateral support of the preload will be required along the right (south) side of the Exit 24 Eastbound Off-Ramp, adjacent to the Mad River, along the left (north) side of the Exit 24 Eastbound Off-Ramp, and may also be necessary in other areas. Temporary lateral support shall consist of a temporary mechanical stabilized earth (MSE) wall, geogrid steepened earth slope, or other appropriate temporary lateral support system. Design of the temporary lateral support system shall consider the presence of the fill and soft alluvial deposits.

Settlement platforms shall be constructed in accordance with the standard settlement platform detail and placed at the following locations to monitor settlement of the preload. Settlement platforms shall be placed prior to the start of preload fill placement and raised by adding pipe sections as necessary as fill height increases.

Locations of Settlement Platforms

Platform No.	Line & Station	Approximate Offset (m)
E24-1	E24 11+160	Centerline
E24-2	E24 11+180	Centerline
E24-3	E24 11+200	Centerline
E24-4	E24 11+220	Centerline
E24-5	E24 11+240	Centerline
E24-6	E24 11+260	Centerline
E24-7	E24 11+280	Centerline
I-84 EB-1	I-84 EB 2+140	Centerline
I-84 EB-2	I-84 EB 2+180	Centerline
I-84 EB-3	I-84 EB 2+220	Centerline
I-84 EB-4	I-84 EB 2+260	Centerline
I-84 EB-5	I-84 EB 2+300	Centerline

Settlement shall be monitored during and following placement of the preload by making optical survey measurements on the settlement platforms. The accuracy of survey measurements shall be 1 mm. Optical survey measurements shall be made prior to the start of preload placement, daily during placement of the preload, and weekly after completion of filling. Measurements shall be provided to the Engineer on a daily basis.

Preloads shall remain in place for a minimum two-month time period, starting when preloads have reached the final height. After completion of the two-month time period, the preload may be removed if survey measurements indicate there has been less than 6 mm of settlement during a 3-week time period. The preload time period shall be extended as necessary until this criteria is achieved.

At completion of required settlement, preload shall be removed down to the bottom of proposed subgrade in the vicinity of I-84 and down to existing ground in the vicinity of retaining walls 113 and 114 as shown on the plans, or as otherwise ordered by the Engineer.

Method of Measurement:

Preload Fill will not be measured for payment and will be paid for on a lump sum basis, complete and accepted.

Basis of Payment:

This item shall be paid for at the contract lump sum price for "Preload Fill", which shall include design, lateral support system, maintenance, settlement platforms and monitoring measurements of the preload.

Placement of embankment for the preloading shall be measured and paid as earth excavation. Removal of embankment as specified shall be separately measured and paid as earth excavation.

ITEM #0406268A - MILLING OF HOT MIX ASPHALT (HMA) – (OVER 100 MM TO 200 MM)

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 (9.1 meter minimum), non-contact ski (6.1 meter minimum), or mobile string line (9.1 meter 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 16 mm apart. The forward speed of the milling machine shall be limited to no more than 13.5 meter/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 152 meters 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 3 meter 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 9.5 mm. The variation of the top of any ridge to the bottom of the groove adjacent to that ridge shall not exceed 9.5 mm. 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 76 meter 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 +/- 12.5 mm 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 25 mm exposed to traffic as a result of milling. All structures within the roadway that are exposed to traffic and greater than 25 mm 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 25 mm to 63 mm 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 63 mm 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 meters 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.

The depth of removal will be calculated by taking a measurement at a minimum every 76 meter per each pass of the milling machine, or as directed by the Engineer. The average depth of each section will determine which payment item is applicable.

Basis of Payment: This work will be paid for at the contract unit price per square meter for "Milling of HMA (0 to 100 mm) (greater than 100 mm to 200 mm) (greater than 200 mm)". 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
Milling of Hot Mix Asphalt (HMA) – (over 100 mm to 200 mm)	Sq.M

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: HMA x $\frac{PG\%}{100}$ x [(*Period Price - 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% = $\underline{4.5}$
    For Superpave 37.5mm (1.5 inch), Superpave 25.0mm (1.0 inch), HMA S1, PMA S1, and Class 4

  - PG % = $\underline{5.0}$
    For Superpave 12.5mm (0.50 inch), HMA S0.5, PMA S.05, HMA S1-Extra Asphalt and Class 1.

- PG % = 6.0
  For Superpave 9.5mm (0.375 inch), HMA S0.375, PMA S0.375, Superpave 6.25mm (0.25 inch), HMA S0.25, PMA 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 #0503151A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 1)

ITEM #0503153A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 3)

ITEM #0503156A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 6)

ITEM #0503157A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 7)

ITEM #0503179A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 9)

ITEM #0503186A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 10)

ITEM #0503187A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 11)

ITEM #0503197A – REMOVAL OF SUPERSTRUCTURE (SITE NO. 13)

Work under this item shall conform to the requirements of Section 5.03 amended as follows:

5.03.01—Description: Delete the first two paragraphs and replace with the following:

Work under this item shall consist of the removal and satisfactory disposal of the superstructure. Those items to be removed and disposed of shall include, but not be limited to, steel beams, diaphragms, concrete deck, curbs parapets, bituminous wearing surface, metal bridge rail and bearings as shown on the plans or as directed by the Engineer.

Work under this item shall also consist of removing, containing, and collecting existing paint from all areas of steel superstructures where the Contractor will use flame cutting, arc gouging, or welding for the superstructure demolition, because of the possible presence of lead in the existing paint. The lead removal is required to comply with OSHA Regulation Nos. 1926.353, 1926.354, and 1926.62. Additional information on lead removal and definitions of the terms used within this special provision may be obtained from the latest edition of the "SSPC 6 Guide for Containing Debris Generated During Pain Removal Operations."

Work under this item also consists of storage of the paint debris collected under this item.

5.03.03 – Construction Methods: Add the following:

1. Amount of Paint Removal: Prior to applying the heat of welding equipment to localized areas of steel superstructures, the existing paint shall be removed to a minimum of 150 mm from wherever the heat will be applied, and as directed by the Engineer.

2. Methods of Paint Removal: Where required, the existing paint shall be removed by chemical stripping, needle guns with vacuum attachments, or by any of the closed abrasive blast cleaning techniques described in SSPC Guide 6. Open abrasive blast cleaning will not be permitted. All of the debris resulting from the paint removal operations shall be contained, collected, and stored in leak-proof storage containers placed on wooden pallets. A test patch shall be done on the existing steel to demonstrate the Contractor's proposed methods of paint removal to the satisfaction of the Engineer.

The Contractor is advised that chemical paint removers may require several days and multiple applications to completely remove the existing paint, especially in temperatures below 18°C.

The Contractor is also advised that chemical paint strippers may not be effective in removing some paints.

3. Removal of Superstructure: All work shall proceed as directed by and to the satisfaction of the Engineer in accordance with the details shown on the plans and the requirements of the Special Provisions "Maintenance and Protection of Traffic" and "Prosecution and Progress," contained elsewhere in these Specifications.

Material that is not specified for salvage shall become the property of the Contractor and shall be removed and disposed of by him.

Material designated for salvage shall be removed by methods that shall not cause damage to the salvaged material.

The removal shall not result in damage to any permanent construction (new or existing) or to adjoining property. If any damage does occur it shall be repaired by the Contractor to the satisfaction of the Engineer at no additional expense to the State.

The Contractor shall prepare and submit to the Engineer for review working drawings, computations, and written procedures for the removal of the existing deck and beams to the Engineer for review in accordance with Article 1.05.02. The working drawings and computations shall be signed and sealed by an Engineer registered in the State of Connecticut. Acceptance of the Contractor's plans shall not be considered as relieving the Contractor of any responsibility.

5.03.04 – Method of Measurement: Delete the entire article and replace with the following:

This work, being paid for on a lump sum basis, will not be measured for payment.

ITEM #0503151A
ITEM #0503153A
ITEM #0503156A
ITEM #0503157A
ITEM #0503179A
ITEM #0503186A
ITEM #0503187A
ITEM #0503197A

5.03.05 – Basis of Payment: Delete the second and third paragraphs and replace with the following:

This work will be paid for at the contract lump sum price for "Removal of Superstructure (Site No.)", for the site number specified, which price shall include the removal and disposal of the superstructure components, the containment, sawcutting, removal, collection, and storage of paint debris as herein described, and all equipment, tools and labor incidental thereto.

Disposal of lead based debris and chemical stripper residue shall be paid for under item "Lead Compliance for Miscellaneous Exterior Tasks".

ITEM #0503151A
ITEM #0503153A
ITEM #0503156A
ITEM #0503157A
ITEM #0503179A
ITEM #0503186A
ITEM #0503187A
ITEM #0503197A

ITEM #0507005A – ABANDON CATCH BASIN/MANHOLE

Description:

This work shall consist of abandoning existing catch basins and manholes in accordance with these specifications and the contract documents.

Materials:

None

Construction Details:

Plug the existing pipe connections with brick or concrete block masonry or with Class "A" Concrete or any engineer-approved commercial grade of concrete. Unless the plans show otherwise, remove the walls of the structures as follows:

1. Within the roadbed, to a depth at least 600mm below the subgrade.

2. Outside the roadbed, to a depth at least 600mm feet below the finished grade.

3. At any location, to the extent required to avoid interfering with the work.

Connect existing pipes with new pipe through the structures - do not damage pipes that are to remain. Seal the existing inlet and outlet pipes with precast vitrified or concrete stoppers or with masonry of a type and thickness to fill the inlet or outlet pipe.

After connecting or sealing the existing pipes and removing the walls to the required depth, backfill the remaining voids with flowable fill. All items requiring removal shall become the property of the Contractor and shall be removed from the work site to the satisfaction of the Engineer.

Method of Measurement:

The work will be measured for payment for each catch basin and manhole abandoned at the locations specified in the contract documents.

Basis of Payment:

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

Pay Item	Pay Unit
Abandon Catch Basin/Manhole	EA.

ITEM #0507171A - HYDRODYNAMIC SEPARATOR (SITE NO. 1)
ITEM #0507172A - HYDRODYNAMIC SEPARATOR (SITE NO. 2)
ITEM #0507173A - HYDRODYNAMIC SEPARATOR (SITE NO. 3)
ITEM #0507174A - HYDRODYNAMIC SEPARATOR (SITE NO. 4)
ITEM #0507175A - HYDRODYNAMIC SEPARATOR (SITE NO. 5)
ITEM #0507176A - HYDRODYNAMIC SEPARATOR (SITE NO. 6)
ITEM #0507177A - HYDRODYNAMIC SEPARATOR (SITE NO. 7)
ITEM #0507178A - HYDRODYNAMIC SEPARATOR (SITE NO. 8)

Description: Hydrodynamic separators are proprietary devices manufactured for stormwater treatment. The hydrodynamic separator shall be a precast concrete structure and include an internal chamber with features that induce a swirling, circular, or spiraling flow pattern in the stormwater flow that separate and trap sediment and pollutants in a chamber that can be accessed for later removal.

This item will consist of furnishing and construction of a hydrodynamic separator, a flow diversion structure, manholes and pipes in the location, grades, treatment capacity and to the dimensions and details shown on the contract drawings, and in accordance with these specifications or as directed by the Engineer. The work also includes the preparation of hydraulic design calculations for the hydrodynamic separator(s) and flow diversion structure(s) as specified herein.

The hydrodynamic separator shall be assembled and installed in strict compliance with the Manufacturer's instructions unless otherwise directed by these specifications or by the Engineer. Internal flow controls / diversion components, external appurtenances, concrete manhole riser sections, manhole frames and covers, reinforcing, threaded inserts, lifting and seating fixtures, non-shrink grout, and all other necessary materials and equipment to complete the work shall be included.

This item shall also include the cleaning of the hydrodynamic separator of all sediment and debris every 90 days, or as needed, from when they are put into service, until final acceptance of the project.

Approved Products and Manufacturer Information: Proprietary hydrodynamic separators currently approved by the Department are listed in Table 1 "**CONNDOT LIST OF APPROVED HYDRODYNAMIC SEPARATORS**". Company contact information is provided for convenience. *As the company information frequently changes, the Department is not responsible for its accuracy.*

The Engineer will reject any proposed hydrodynamic separator that is not listed in Table 1.

The listed products have been approved for use on Department projects based on only a general review of the product's construction, function and treatment capabilities. **Therefore, the approved list shall not be construed to mean that all products appearing on the list are suitable to any specific project site or drainage design.**

Performance: The stormwater treatment performance of the selected hydrodynamic separator shall be based on the water quality flow (WQF) as defined and calculated in accordance with the Department's current version of the Drainage Manual.

The hydrodynamic separator shall be designed to treat the entire WQF as indicated on the contract drawings or specifications, without bypass, either through the separator's internal components or at the flow diversion structure.

TABLE 1 – CONNDOT LIST OF APPROVED HYDRODYNAMIC SEPARATORS

HYDRODYNAMIC SEPARATOR PRODUCT NAME	COMPANY INFORMATION
Downstream Defender	Hydro International 94 Hutchins Drive Portland, Maine 04102 (207) 756-6200 http://www.hydrointernational.biz/us/index_us.php
FloGard Dual-Vortex Hydrodynamic Separator	KriStar Enterprises, Inc. 4020 Riverclub Drive Cumming, Georgia 30041 (770)-889-4338 http://www.kristar.com/
High Efficiency CDS	Contech Stormwater Solutions 200 Enterprise Drive Scarborough, Maine 04074 (800)-925-5240 http://www.contech-cpi.com/stormwater/13
Vortechs	
Vortsentry	
Hydroguard	Hydroworks, LLC 525Boulevard Kenilworth, NJ 07033 (888)-290-7900 / (908)-272-4411 http://www.hydroworks.org/
Stormceptor OSR	Rinker Materials – Stormceptor 69 Neck Road Westfield, MA 01085 (800)-909-7763 / (413) 246-7144 www.rinkerstormceptor.com
Stormceptor STC	
V2B1	Environment 21 8713 Read Road, P.O. Box 55 East Pembroke, New York 14056-0055 (800)-809-2801 / (585)-815-4700 www.env21.com

Hydrodynamic separator systems and models that have been pre-approved for use on Department projects and their corresponding maximum allowable WQF's for stormwater treatment are shown in **Table 2**, "**PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS**". The Engineer will reject any proposed hydrodynamic separator system/model that is not listed in Table 2.

For more severe storm events that produce flows up to and including the drainage design flow (DDF) and which result in flows greater than the WQF being directed to the hydrodynamic separator from the flow diversion structure, the hydrodynamic separator shall be capable of conveying the portion of the DDF directed to it without surcharging the upstream storm drainage system and re-suspending previously trapped sediment.

The WQF to be treated and the portion of the DDF directed to the hydrodynamic separator when the drainage system is operating at its design flow are shown on the Hydrodynamic Separator

Design Data Sheets (Form A - Design). A separate form for each hydrodynamic separator site on the project is attached to this specification.

Sediment Storage Capacity: Settleable solids shall accumulate in a location within the hydrodynamic separator structure that is accessible for cleaning and maintenance but not susceptible to resuspension. Direct access through openings in the precast concrete unit shall be provided to the sediment storage chamber and all other chambers to facilitate maintenance.

The standard sediment storage capacities for Department pre-approved hydrodynamic separator systems/models are shown in **Table 3**, "**STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS***"*. The sediment storage capacities listed in Table 3 are values based on standard structure dimensions and anticipated maintenance requirements.

Some standard hydrodynamic separator models may be modified as determined by the Manufacturer to increase the sediment storage capacity. When a modification is proposed by increasing the depth of the standard structure, the sediment storage capacity of the proposed structure shall be determined in accordance with **Table 4, "SEDIMENT STORAGE CAPACITY CALCULATION"**.

The Contractor shall be responsible for verifying the standard sediment storage capacity of the hydrodynamic separator unit(s) and coordinating any proposed modifications to increase sediment storage capacity with the Manufacturer(s). All proposed modifications and revised sediment storage capacity determinations shall be clearly documented in the working drawing submission to the Department.

The minimum sediment storage capacities required for each hydrodynamic separator site on the project are shown on the Hydrodynamic Separator Design Data Sheets (Form A – Design) attached to this specification.

Hydraulic Design: The Contractor shall prepare or have prepared a hydraulic grade line (HGL) analysis for an evaluation of the selected hydrodynamic separator and the design of the flow diversion structure as described in this section. The HGL analysis shall be performed for both the WQF and the DDF. The analysis shall be consistent with the methodology described in Section 11.12 of the Department's Drainage Manual.

Head loss coefficients, to be used in the HGL analysis, shall be determined in accordance with Section 11.12.6 for all structures except the hydrodynamic separator, which shall be obtained from the Manufacturer. Documentation shall be submitted demonstrating how the coefficient was derived either through calculation and/or testing data. A benching factor of 1.0 shall be applied to the flow diversion structure.

The HGL analysis (or portion of) that was performed for the design of the storm drainage systems and preparation of the construction plans, including the design of the flow diversion structure and evaluation of a "generic" hydrodynamic separator, is shown on the Hydrodynamic Separator Design Data Forms (Form A – Design) attached to this specification.

TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS

Maximum WQF (cfs)	Product Model								
	Downstream Defender	*Flogard*	*High Eff. CDS*	*Hydroguard*	*Stormceptor OSR*	*Stormceptor STC*	*Vortechs*	*Vortsentry*	*V2B1*
0.4	4-ft	DVS-36	2015-4G; 2015-4	HG 4	065	450	1000	VS30	2
0.5	4-ft	DVS-36	2015-4G; 2015-4	HG 4	065	900	1000	VS30	2
0.6	4-ft	DVS-36	2015-4G; 2015-4	HG 4	065	900	1000	VS40	2
0.7	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	900	1000	VS40	2
0.8	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	900	1000	VS40	2
0.9	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	1200	1000	VS40	3
1.0	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	1800	1000	VS40	3
1.1	4-ft	DVS-48	2015-4G; 2015-4	HG 4	140	1800	1000	VS40	4
1.2	6-ft	DVS-48	2015	HG 5	140	2400	1000	VS50	4
1.3	6-ft	DVS-60	2015	HG 5	140	2400	1000	VS50	4
1.4	6-ft	DVS-60	2015	HG 5	140	2400	2000	VS50	4
1.5	6-ft	DVS-60	2020	HG 5	140	2400	2000	VS50	6
1.6	6-ft	DVS-60	2020	HG 5	140	2400	2000	VS50	6
1.7	6-ft	DVS-60	2020	HG 5	250	2400	2000	VS50	6
1.8	6-ft	DVS-60	2020	HG 6	250	2400	2000	VS50	7
1.9	6-ft	DVS-60	2020	HG 6	250	3600	2000	VS60	7
2.0	6-ft	DVS-60	2020	HG 6	250	3600	2000	VS60	7
2.1	6-ft	DVS-60	2020	HG 6	250	3600	2000	VS60	9
2.2	6-ft	DVS-72	2025	HG 6	250	3600	2000	VS60	8
2.3	6-ft	DVS-72	3020, 3020-D	HG 6	250	3600	2000	VS60	8
2.4	6-ft	DVS-72	3035; 3035-D	HG 6	250	4800	2000	VS60	8
2.5	6-ft	DVS-72	3035; 3035-D	HG 6	250	4800	3000	VS60	10
2.6	6-ft	DVS-72	3035; 3035-D	HG 6	250	4800	3000	VS60	11
2.7	6-ft	DVS-72	3035; 3035-D	HG 7	250	4800	3000	VS60	11
2.8	6-ft	DVS-72	3035; 3035-D	HG 7	250	4800	3000	VS70	11
2.9	6-ft	DVS-72	3035; 3035-D	HG 7	250	4800	3000	VS70	12
3.0	6-ft	DVS-72	3035; 3035-D	HG 7	390	4800	3000	VS70	12

TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Maximum WQF (cfs)	Product Model								
	Downstream Defender	*Flogard*	*High Eff. CDS*	*Hydroguard*	*Stormceptor OSR*	*Stormceptor STC*	*Vortechs*	*Vortsentry*	*V2B1*
3.1	8-ft	DVS-72	3035; 3035-D	HG 7	390	4800	3000	VS70	12
3.2	8-ft	DVS-72	3035; 3035-D	HG 7	390	4800	3000	VS70	12
3.3	8-ft	DVS-72	3035; 3035-D	HG 7	390	4800	3000	VS70	14
3.4	8-ft	DVS-72	3035; 3035-D	HG 7	390	6000	3000	VS70	14
3.5	8-ft	DVS-72	3030; 3030-DV, 3030-D; 4030-D	HG 7	390	6000	3000	VS70	14
3.6	8-ft	DVS-72	4030	HG 7	390	6000	3000	VS70	14
3.7	8-ft	DVS-84	4030	HG 8	390	6000	3000	VS70	14
3.8	8-ft	DVS-84	4030	HG 8	390	6000	4000	VS70	13
3.9	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS70	15
4.0	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	15
4.1	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	15
4.2	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	16
4.3	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	16
4.4	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	16
4.5	8-ft	DVS-84	4030	HG 8	390	7200	4000	VS80	16
4.6	8-ft	DVS-84	5640-D	HG 8	390	7200	4000	VS80	17
4.7	8-ft	DVS-84	5640-D	HG 8	390	7200	4000	VS80	17
4.8	8-ft	DVS-84	5640-D	HG 8	390	7200	4000	VS80	17
4.9	8-ft	DVS-84	5640-D	HG 8	390	11000s	4000	VS80	17
5.0	8-ft	DVS-84	5640-D	HG 9	390	11000s	4000	VS80	19
5.2	8-ft	DVS-84	4040-D	HG 9	390	11000s	4000	VS80	20
5.4	8-ft	DVS-96	4040-D	HG 9	390	11000s	4000	VS100	20
5.5	8-ft	DVS-96	4045-D	HG 9	390	11000s	5000	VS100	18
5.6	8-ft	DVS-96	4045-D	HG 9	560	11000s	5000	VS100	18
6.0	8-ft	DVS-96	4040	HG 9	560	11000s	5000	VS100	18
6.1	8-ft	DVS-96	4040	HG 9	560	11000s	5000	VS100	21

TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Maximum WQF (cfs)	Product Model								
	Downstream Defender	*Flogard*	*High Eff. CDS*	*Hydroguard*	*Stormceptor OSR*	*Stormceptor STC*	*Vortechs*	*Vortsentry*	*V2B1*
6.3	8-ft	DVS-96	4040	HG 9	560	11000s	5000	VS100	25
6.4	10-ft	DVS-96	4040	HG 9	560	11000s	5000	VS100	25
6.5	10-ft	DVS-96	4040	HG 10	560	11000s	5000	VS100	25
6.9	10-ft	DVS-96	4040	HG 10	560	11000s	5000	VS100	25
7.0	10-ft	DVS-96	4040	HG 10	560	11000s	5000	VS100	22
7.1	10-ft	DVS-96	5042-D	HG 10	560	11000s	5000	VS100	22
7.2	10-ft	DVS-96	5042-D	HG 10	560	13000s	5000	VS100	22
7.3	10-ft	DVS-96	4045	HG 10	560	13000s	5000	VS100	22
7.5	10-ft	DVS-96	5653-D	HG 10	560	13000s	7000	VS100	22
7.7	10-ft	DVS-120	5653-D	HG 10	560	13000s	7000	VS100	22
7.8	10-ft	DVS-120	5653-D	HG 10	560	13000s	7000	VS100	50
7.9	10-ft	DVS-120	5653-D	HG 10	780	13000s	7000	VS100	50
8.0	10-ft	DVS-120	5658-D	HG 10	780	13000s	7000	VS100	50
8.2	10-ft	DVS-120	5658-D	HG 10	780	16000s	7000	VS100	50
8.5	10-ft	DVS-120	5658-D	HG 12	780	16000s	7000	VS100	50
8.6	10-ft	DVS-120	5658-D	HG 12	780	16000s	7000	VS100	50
8.9	10-ft	DVS-120	5678-D	HG 12	780	16000s	7000	VS100	50
9.0	10-ft	DVS-120	5678-D	HG 12	780	16000s	7000	VS120	50
9.2	10-ft	DVS-120	5678-D	HG 12	780	16000s	7000	VS120	50
9.5	10-ft	DVS-120	5050-DV	HG 12	780	16000s	7000	VS120	50
9.6	10-ft	DVS-120	5050-DV	HG 12	780	16000s	7000	VS120	50
10.0	10-ft	DVS-120	5050-DV	HG 12	780	16000s	9000	VS120	50
10.1	10-ft	DVS-120	5050-DV	HG 12	780	16000s	9000	VS120	50
10.5	10-ft	DVS-120	5050-DV	HG 12	780		9000	VS120	50
10.9	10-ft	DVS-120	5050-DV	HG 12	780		9000	VS120	50
11.0	10-ft	DVS-120	7070-DV	HG 12	780		9000	VS120	50
11.2	10-ft	DVS-120	7070-DV	HG 12	1125		9000	VS120	50

TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Maximum WQF (cfs)	Product Model								
	Downstream Defender	*Flogard*	*High Eff. CDS*	*Hydroguard*	*Stormceptor OSR*	*Stormceptor STC*	*Vortechs*	*Vortsentry*	*V2B1*
11.5		DVS-120	7070-DV	HG 12	1125		9000	VS120	50
11.8		DVS-120	7070-DV	HG 12	1125		9000	VS120	50
11.9		DVS-120	7070-DV	HG 12	1125		9000	VS120	60
12.0		DVS-120	7070-DV	HG 12	1125		9000	VS120	60
12.1		DVS-120	7070-DV	HG 12	1125		9000	VS120	60
12.5		DVS-120	7070-DV	HG 12	1125		11000	VS120	60
13.0		DVS-120	7070-DV		1125		11000	VS120	60
13.5		DVS-120	7070-DV		1125		11000	VS120	60
13.6		DVS-120	7070-DV		1125		11000	VS120	60
14.0		DVS-144	7070-DV		1125		11000	VS120	60
14.5		DVS-144	7070-DV		1125		11000		60
14.9		DVS-144	7070-DV		1125		11000		60
15.0		DVS-144	7070-DV		1125		16000		60
15.5		DVS-144	7070-DV		1125		16000		60
15.7		DVS-144	7070-DV		1125		16000		60
16.0		DVS-144	7070-DV				16000		60
16.5		DVS-144	7070-DV				16000		60
17.0		DVS-144	7070-DV				16000		
17.5		DVS-144	7070-DV				16000		
18.0		DVS-144	7070-DV				16000		
18.5		DVS-144	7070-DV				16000		
19.0		DVS-144	7070-DV				16000		
19.7		DVS-144	7070-DV				16000		
20.0		DVS-144	10060-DV				16000		
21.5		DVS-144	10060-DV				16000		
22.3		DVS-144	10060-DV				1319		
25.0			10060-DV				1319		
25.2			10060-DV				1319		

TABLE 2 - PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Maximum WQF (cfs)	Product Model								
	Downstream Defender	*Flogard*	*High Eff. CDS*	*Hydroguard*	*Stormceptor OSR*	*Stormceptor STC*	*Vortechs*	*Vortsentry*	*V2B1*
27.6			10060-DV				1421		
29.3			10080-DV				1421		
30.0			10080-DV				1522		
31.2			10080-DV				1522		
33.6			100100-DV				1522		
35.0			100100-DV				1624		
38.2			100100-DV				1624		
40.0			100100-DV				1726		
43.2			100100-DV				1726		
49.3			100100-DV						

TABLE 3 - STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS

Sediment Storage (cubic yards)	**Product Model**								
	Downstream Defender	*Flogard*	*High Eff. CDS*	*Hydroguard*	*Stormceptor OSR*	*Stormceptor STC*	*Vortechs*	*Vortsentry*	*V2B1*
0.3		DVS-36					1000		
0.5	4-ft								
0.6							2000		
0.7		DVS-48		HG 4					
0.8					065	450		VS30	2; 3
0.9			2015-4G; 2015-4						
1.0 (minimum)							3000		
1.1					140	900			
1.2				HG 5					
1.3		DVS-60							
1.4							4000	VS40	
1.5			2015; 2020; 2025						
1.6									4
1.7				HG 6					
1.8	6-ft					1200			
1.9							5000		
2.0									
2.1									
2.2		DVS-72						VS50	
2.3				HG 7					
2.4									6; 7
2.5							7000		
2.6			3020, 3020-D; 3030, 3030-DV, 3030-D; 3035, 3035-D						
2.9					250	2400			

TABLE 3 - STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Sediment Storage (cubic yards)	Product Model								
	Downstream Defender	*Flogard*	*High Eff. CDS*	*Hydroguard*	*Stormceptor OSR*	*Stormceptor STC*	*Vortechs*	*Vortsentry*	*V2B1*
3.0				HG 8					
3.1							9000	VS60	
3.2									8; 9
3.3						1800			
3.4									
3.5		DVS-84							
3.6									
3.7	8-ft		5640-D						
3.8				HG 9					
3.9							11000		
4.0									
4.2									10; 11; 12
4.3			4030-D; 4040-D; 4045-D					VS70	
4.5									
4.6									
4.7									13
5.0				HG 10					
5.1									
5.3		DVS-96	5042-DV; 5050-DV						
5.5									
5.6			4030; 4040; 4045; 5653-D; 5658-D; 5678-D				16000	VS80	
5.7									
6.0						3600			
6.5									

TABLE 3 - STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Sediment Storage (cubic yards)	Product Model								
	Downstream Defender	*Flogard*	*High Eff. CDS*	*Hydroguard*	*Stormceptor OSR*	*Stormceptor STC*	*Vortechs*	*Vortsentry*	*V2B1*
6.6							1319		
6.9									
7.0									
7.1									
7.2									
7.3									14; 15; 16; 17; 18
7.5				HG 12					
7.6							1421		
7.7									
8.0									
8.3									
8.4			7070-DV						
8.6						4800			
8.7	10-ft				390		1522	VS100	
9.0									
9.5									
9.6									
9.9							1624		
10.0									
10.3		DVS-120							
10.5									19; 20
11.0									
11.2							1726		
11.3						6000			
11.5									21; 22
11.8									

TABLE 3 - STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS (continued)

Sediment Storage (cubic yards)	Product Model								
	Downstream Defender	*Flogard*	*High Eff. CDS*	*Hydroguard*	*Stormceptor OSR*	*Stormceptor STC*	*Vortechs*	*Vortsentry*	*V2B1*
12.0									
12.6								VS120	25
12.9					560				
13.0									
13.4						7200			
15.0									
17.5					780				
17.8		DVS-144	10060-DV;10080-DV; 100100-DV						
20.0									
22.3									50
25.0									
25.8					1125				
26.1						11000s			
26.2									
30.0									
34.1						13000s			
34.9									60
35.0									
38.7									
40.0									
40.7						16000s			

TABLE 4 - SEDIMENT STORAGE CAPACITY CALCULATION

Product	Sediment Storage Capacity (Volume) Calculation (cubic feet)
Downstream Defender	Inside Diameter (ft^2) of Structure x Distance (ft) from Bottom of Benching Skirt to Inside Floor of Structure
FloGard® Dual-Vortex	Inside Diameter (ft^2) of Structure x 1/2 Distance (ft) from Bottom of Vortex Tube to Inside Floor of Structure
High Efficiency CDS	Inside Diameter (ft^2) of Structure x Depth (ft) of Solids Storage Sump
Hydroguard	Inside Diameter (ft^2) of Structure x 1/2 Depth (ft) Below Outer Baffle Wall
Stormceptor STC	Inside Diameter (ft^2) of Structure x 1/2 Depth (ft) Below Drop Tee Inlet Pipe
Stormceptor OSR	Inside Diameter (ft^2) of Structure x 1/2 Depth (ft) Below Drop Tee Inlet Pipe
Vortechs	Inside Diameter (ft^2) of Grit Chamber x 1/2 Depth (ft) Below Opening in Swirl Wall
Vortsentry	Inside Diameter (ft^2) of Structure x Depth (ft) of Sediment Storage Sump
V2B1	Inside Diameter (ft^2) of Structure (D1) x 1/2 Depth (ft) Below Pipe Invert
Note: 1 cubic foot = 0.037 cubic yard or 1 cubic yard = 27 cubic feet	

Since the selected hydrodynamic separator and associated connecting pipes and structures may be different in type, configuration and performance than the one assumed in the design phase of the project, the hydraulic calculations performed for the drainage design must be replicated and revised to reflect any adjustments necessary to the drainage design for installation of the selected system, such as different flow-line elevations, head loss coefficient, pipe sizes, etc. The selected hydrodynamic separator shall be designed so as not to change the drainage system upstream of the flow diversion structure or to increase the HGL elevation upstream of the flow diversion structure. Any modifications necessary to the overall drainage design as a result of the Contractor selected hydrodynamic separator shall be the responsibility of the Contractor.

The new HGL analysis must demonstrate the following conditions:

1. The hydrodynamic separator can treat the WQF with no bypass. The HGL elevation at the flow diversion structure for the WQF shall be below the weir elevation and/or elevation of flow bypass that is listed in the design data form or shown in the plans, so that all of the WQF is directed to the hydrodynamic separator for treatment. The HGL elevation in the hydrodynamic separator at the WQF shall be below the elevation of internal bypass so that all of the WQF is treated by the system.

2. When the drainage system is operating at the DDF, the hydraulic computations must show that the HGL elevation at the flow diversion structure is lower than or equal to the HGL elevation shown on Form A for the DDF and the HGL elevation in the hydrodynamic separator must be a minimum of one foot below the top (ground) elevation of the structure. A HGL elevation in the flow diversion structure for the DDF which is higher than the corresponding HGL elevation shown on Form A may be approved by the Engineer only if hydraulic computations are submitted showing that the higher HGL elevation will provide a minimum of one foot of freeboard below the top (ground) elevation of the flow diversion structure and the upstream drainage structures, satisfying the design criteria stated in the Connecticut Department of Transportation Drainage Manual. To demonstrate compliance, the hydraulic analysis shall be extended to a point upstream in the drainage system that is not influenced by the proposed changes and where the results converge with the previous design analysis. In such a case, the Contractor shall request a copy of the design analysis from the Department. A freeboard less than one foot may be accepted by the Engineer on a case by case basis provided that a justification of the reason has been included with the HGL analysis.

3. When the drainage system is operating at the DDF, the resulting HGL elevation and flow split at the flow diversion structure has been designed such that the portion of the DDF directed to the hydrodynamic separator does not exceed the maximum flow shown on the Hydrodynamic Separator Design Data Sheets (Form A - Design). Documentation, however, must be provided that the flow in excess of the WQF can pass through the device without washout of the previously captured sediment or the device is equipped with an internal bypass to route the excess flow around the treatment chamber.

Upon conclusion of the HGL analysis, the Hydrodynamic Separator Design Data Sheets (Form B – Contractor Proposal) shall be completed by entering the HGL analysis data and other required information.

Hydrodynamic Separator Selection: To ensure compliance with the special provision, the selection process of a proprietary hydrodynamic separator for installation on a Department project is outlined by the following steps:

1. First, select the available product(s) from Table 2 (**PERFORMANCE MATRIX FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS**) that meet or exceed the WQF treatment specified on the Hydrodynamic Separator Design Data Sheets (Form A - Design) attached to this specification. **The Engineer shall reject any proposed hydrodynamic separator system/model that is not listed in Table 2.**

2. Using Table 3 (**STANDARD SEDIMENT STORAGE CAPACITY FOR CONNDOT APPROVED HYDRODYNAMIC SEPARATORS**), check whether the initially selected product(s) in Step 1, meet or exceed the minimum sediment storage requirement specified on the Hydrodynamic Separator Design Data Sheets (Form A - Design). In some cases, the required sediment storage capacity will govern the model size required for the project. In lieu of selecting a larger model to accommodate the sediment storage requirement, the Contractor may submit working drawings as recommended by the Manufacturer, showing how a standard model has been modified to satisfy the sediment storage requirement. When a modification is proposed by increasing the depth of the standard structure, **Table 4 (SEDIMENT STORAGE CAPACITY CALCULATION)** shall be utilized to determine the sediment storage capacity of the proposed structure.

3. **Hydrodynamic separator system/models pre-approval by the Department shall not be construed to mean that all products appearing on Tables 2 and 3 are suitable to any specific project site or drainage design.** The Contractor shall verify the constructability of the selected hydrodynamic separator in relation to dimensional, structural, geotechnical and right-of-way constraints at each installation site. If revisions to the drainage design, including the system layout, are required to accommodate the selected separator, the Contractor shall provide working drawings showing the revised layout, including the position of the hydrodynamic separator and the number, positions and types of connecting structures, the design of the flow diversion structure, and any other components of the system within the pay limits. The working drawings shall be prepared in sufficient detail to perform a hydraulic analysis and confirm that the layout will fit the constraints of each site.

4. Upon determination that the WQF, sediment storage and constructability requirements have been met, the Contractor shall prepare or have prepared, a HGL analysis in accordance with the hydraulic requirements of this special provision, that includes the selected hydrodynamic separator and any revisions to the drainage design needed for the installation.

5. The Hydrodynamic Separator Design Data Sheets (Form B – Contractor Proposal) shall be completed and signed by a professional engineer licensed by the State of Connecticut.

6. *Acceptance of the computations by the Engineer must be obtained by the Contractor prior to the purchase or installation of any units.*

Materials: Materials utilized to fabricate, construct and install the precast concrete hydrodynamic separator including but not limited to precast concrete units, brick, concrete masonry units, manhole frames and covers shall meet the requirements specified in the Standard Specifications, Form 816, Article M.08.02, except that the 28 day compressive strength specified in Subarticle M.08.02-4, shall be a minimum of 4000 psi (27.6 MPa).

The Contractor shall provide a Materials Certificate in accordance with 1.06.07 for each unit delivered to the project. Upon request, the Contractor shall also provide Certified Test Reports for the fine and coarse aggregates and all cementitious materials, and the concrete mix design indicating the weight of each component, used in the construction of the precast units for review. The structures shall not be shipped until released by the Contractor's Quality Control Manager or designee.

The wall and slabs of the precast concrete units shall be designed to sustain HS20-44 (MS18) loading requirements.

Manholes and Catch Basins shall conform to Section 5.07 of Form 816.

Granular fill shall conform to the requirements of Article M.02.01 of Form 816.

Non-shrink grout shall conform to the requirements of Subarticle M.03 of Form 816.

Drainage pipe, sealant and gaskets shall conform to the requirements of Article M.08.01 of Form 816.

Mortar shall conform to the requirements of Article M.11.04 of Form 816.

Sealant used for the hydrodynamic separator unit(s) shall be resistant to oil and other hydrocarbons and conform to the requirements of ASTM C-443.

Working Drawings: Working drawings in accordance with Article 1.05.02 – 2 shall be required for the system selected by the Contractor. The working drawings shall include the HGL analysis and all other computations in strict accordance with the "Hydraulic Design" section of this special provision, including a completed Form B – Contractor Proposal.

If revisions to the layout of the system within the payment limits of this item are required to accommodate the selected separator, the working drawings shall also include plans that show the required revisions. These plans shall show the revised position of the hydrodynamic separator unit(s), and all revisions to connecting structures, pipes, elevations, and details, including the design within the flow diversion structure. The revised plans shall also include the pay limit showing all the components of the system that are included in this lump sum pay item.

Working drawings shall also show details for construction, reinforcing joints, internal and external components, any cast-in-place appurtenances, locations and elevations of pipe openings, access manhole locations and elevations, and type / method of sealing pipe entrances.

Working drawings for each hydrodynamic separator on the project shall have all appropriate vertical dimensions referenced with elevations that are consistent with the project plans. In addition to any other structural, material or installation requirements, the working drawings shall clearly indicate the following information:

1. The elevation and flow rate when internal flow bypass would occur within the device.

2. The location, dimensions and volume (capacity) of the sediment storage area within the device.

The working drawings shall be sealed by a professional engineer licensed in the state where the devices are manufactured and that said engineer shall certify the device meets the minimum requirements of the ConnDOT Standards.

The working drawing submission by the Contractor shall consist of the following documents:

1. Working drawings for each hydrodynamic separator proposed for installation on the project.

2. Hydraulic design calculations including the head loss documentation and completed Hydrodynamic Separator Design Data Sheets (Form B – Contractor Proposal) with professional engineer signature for each hydrodynamic separator.

3. Copies of the pertinent construction plan, profile, cross section and detail sheets that have been annotated with any proposed drainage revisions that are required for the installation of the proposed hydrodynamic separator(s). If no changes are required, the submittal shall note same.

4. An Operations and Maintenance Manual for each hydrodynamic separator describing operations, inspection, maintenance procedures and any applicable warranty information.

Acceptance of the working drawing submission by the Engineer must be obtained by the Contractor prior to the fabrication of each hydrodynamic separator and diversion structure.

Construction Methods: The Contractor shall inspect the hydrodynamic separator and any accessory equipment upon delivery for general appearance, dimensions, soundness or damage in a manner acceptable to the Engineer. If any defects or damage are identified by the inspection, the unit shall be rejected by the Contractor and a new undamaged hydrodynamic separator shall be supplied. Any required adjustments of the separator shall be completed in accordance with Manufacturer's recommendations. A Manufacturer's representative and the Engineer will inspect the hydrodynamic separator before installation.

The Contractor shall install the hydrodynamic separator structure in accordance with the Manufacturer's recommendations unless otherwise directed by this specification or by the Engineer. The hydrodynamic separator shall be installed plumb, level and aligned both vertically and horizontally with the inlet and outlet piping. The hydrodynamic separator shall be placed on a compacted granular fill base in accordance with the Manufacturer's specifications or a minimum thickness of 6" (150mm) whichever is larger. Anchoring systems shall be installed, where needed, to resist buoyancy forces. Care shall be taken not to damage the hydrodynamic separator during backfill and compaction.

Pipe openings in the hydrodynamic separator shall be sized to accept pipes of the specified size(s) and material(s) as shown on the contract drawings and shall be sealed by the Contractor in accordance with the requirements of this specification. The inlet and outlet pipe connections shall be watertight. The hydrodynamic separator shall be tested for leakage according to the Manufacturer's specifications and to the satisfaction of the Engineer. Any leaks must be found and corrected to the satisfaction of the Engineer prior to acceptance of the structure.

Access openings with manhole frames and covers shall be provided to all chambers of the hydrodynamic separator. The access openings and pipe openings shall be detailed on the working drawings to be submitted by the Contractor for review and acceptance by the Engineer.

All connecting structures and pipes included within the payment limits for this work shall be constructed in accordance with the applicable requirements of Article 5.07.03 and Article 6.51.03.

Method of Measurement: Design, construction, furnishing, installation and cleaning of the hydrodynamic separator, the flow diversion structure, manholes and pipes as shown on the contract drawings, including all internal and external appurtenances and materials used, will be paid for on a lump sum basis per site.

Basis of Payment: This work will be paid for at the contract lump sum for "HYDRODYNAMIC SEPARATOR", complete in place, which price shall include all work within the pay limits shown on the contract drawings for hydrodynamic separator. If revisions to the layout of the system within the payment limits for this item are required to accommodate the selected separator, the lump sum price shall also include all additional or revised connecting structures and pipes. The contract lump sum shall include, but not be limited to, the following:

1. Design, preparation, revisions of working drawings and hydraulic computations.

2. Concrete and reinforcing steel, sealant, cement, mortar, flexible rubber sleeves, internal and external components, brick and masonry, frames and covers used to construct access manholes.

3. Flow diversion structure, manholes and pipes as shown on the contract drawings, or as revised and shown on submitted working drawings accepted by the Engineer.

4. Structure excavation, back fill, and disposal of surplus material.

5. Compacted granular fill.

6. Trench excavation and bedding material.

7. Cleaning of the Hydrodynamic Separator, flow diversion structure, manholes and pipes as shown on the contract drawings (of all debris every 90 days, or as needed), during the duration of the project, shall also be included in the price of this item.

8. The Operations and Maintenance Manual for each hydrodynamic separator.

The price shall include but not be limited to all materials, testing, equipment, tools and labor incidental thereto.

Attachments: For each Site No. 1 (Outfall No. 5) through 8 (Outfall No. 71) the following documents are attached to this specification:

1. Hydrodynamic Separator Design Data Sheets (Form A – Design), Sheets 1 & 2 of 2.

2. Hydrodynamic Separator Design Data Sheets (Form B – Contractor Proposal), Sheets 1 & 2 of 2 (blank), to be completed and submitted with the working drawings.

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM A - DESIGN) - Site No. 1 - Outfall No. 5

Project No	***151-273***	Route No.	***I-84 WB***	Prepared By:	*tjb*	Date:	*June 2014*
Town	***Waterbury, CT***	Location/Station	***Outfall No. 5***	Checked By:		Date:	
				Company:	***Ammann & Whitney***		

HYDROLOGIC DATA

Drainage Area (**Hectares**)	***1.530***
Percent Impervious Area %	***100%***
Time of Concentration (min.)	***10***
Drainage Design Flow (**cms**)	***0.540***
Drainage Design Frequency (yr)	***10***
Water Quality Flow (**cms**)	***0.111***

HYDRODYNAMIC SEPARATOR (HDS)

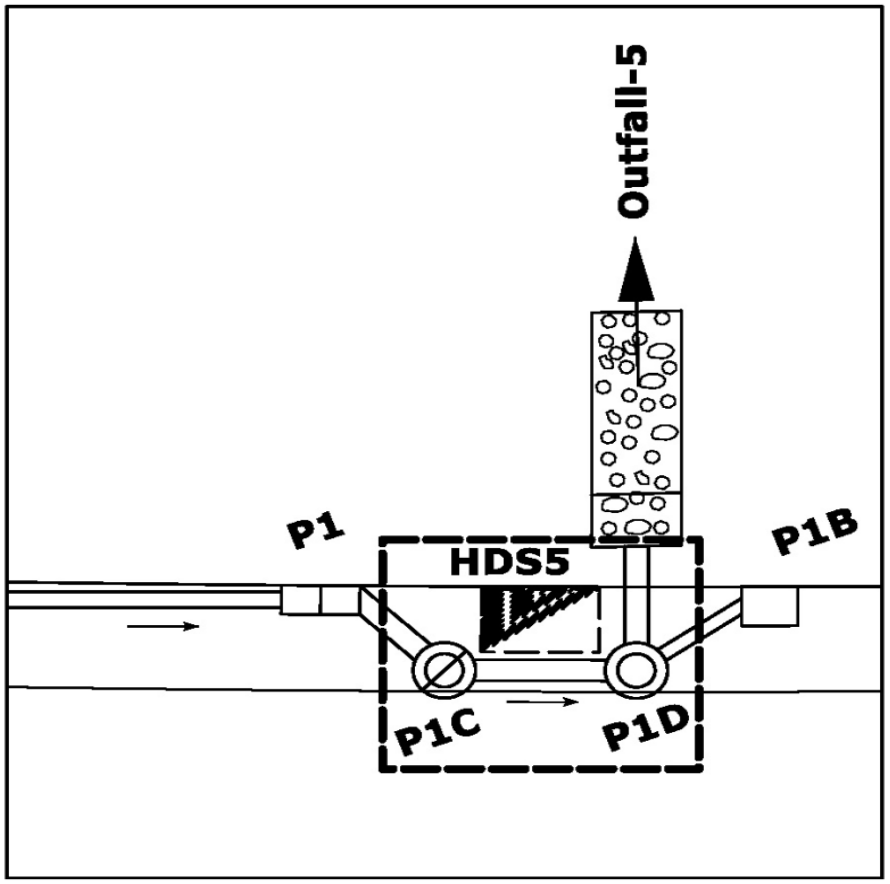
Coordinates:		Datum:	
X:	***282,408.3***	Horiz.	***NAD 83***
Y:	***230,962.0***	Vert.	***NGVD 1929***
Head loss coefficient		***1.75***	
Sediment Storage Capacity (**cu. m**):		HGL Elevation:	
Required	***1.445***	@ WQF	***108.601***
		@ Design Q	***108.837***
Maximum Flow to HS at Drainage Design Flow (**cms**)			***0.278***

Comments:

FLOW DIVERSION STRUCTURE

Type:	***MH Diameter:***		***1,630***	***mm***
Weir and/or Bypass Elev.	***108.683***			
Weir Length **(m)**	***1.220***	Weir Coeff. (C)	***1.830***	
HGL Elevation:		Flow Split @ Drainage Design		
@ WQF	***108.657***	To HS	***0.160***	
@ Design Q	***108.980***	Bypassing HS	***0.380***	

Comments:



Sketch (NTS) - Dashed Line Indicates Pay limits

Outfall No. 5 Form A: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS
(FORM A - DESIGN) - Site No. 1 - Outfall No. 5

Project No:	*151-273*	**Location/Station:**	*Outfall No. 5 - I-84 WB 1+762 L*	**Date:**	*June 2014*

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)
WQF ANALYSIS																					
OUT-P1D	Outfall	600	0.111	107.373	106.773	106.990	0.217	0.074	107.064	3.5	0.033	0.114	107.178	0.074	107.104	0.217	106.887	111.260	P1D	0.150	0.011
P1D-HDS5	P1D	300	0.111	111.260	108.031	108.288	0.257	0.151	108.439	2.8	0.018	0.049	108.488	0.151	108.338	0.258	108.080	111.203	HDS5	1.750	0.264
HDS5-P1C	HDS5	300	0.111	111.203	108.080	108.601	0.300	0.126	108.727	2.8	0.013	0.037	108.764	0.126	108.638	0.300	108.128	111.145	P1C	0.150	0.019
P1C-P1	P1C					108.657															
SYSTEM ANALYSIS with SPLIT FLOW to HDS																					
OUT-P1D	Outfall	600	0.540	107.373	106.773	107.252	0.479	0.254	107.506	3.5	0.033	0.114	107.620	0.254	107.366	0.479	106.887	111.260	P1D	0.150	0.038
P1D-HDS5	P1D	300	0.160	111.260	108.031	108.317	0.286	0.271	108.588	2.8	0.025	0.071	108.659	0.261	108.398	0.300	108.080	111.203	HDS5	1.750	0.457
HDS5-P1C	HDS5	300	0.160	111.203	108.080	108.855	0.300	0.262	109.117	2.8	0.027	0.077	109.194	0.261	108.932	0.300	108.128	111.145	P1C	0.150	0.039
P1C-P1	P1C	600	0.540	111.145	108.128	108.971	0.600	0.186	109.158	3.7	0.008	0.028	109.186	0.186	109.000	0.600	108.203	111.143	P1	0.150	0.028
P1-P1A	P1	600	0.440	111.143	108.203	109.028	0.600	0.124	109.152	11.4	0.005	0.058	109.210	0.124	109.087	0.600	108.317	111.150	P1A		
SYSTEM ANALYSIS with FLOW BYPASSING HDS																					
OUT-P1D	Outfall	600	0.540	107.373	106.773	107.252	0.479	0.254	107.506	3.5	0.033	0.114	107.620	0.254	107.366	0.479	106.887	111.260	P1D	0.150	0.038
P1D-P1C	P1D	600	0.380	111.260	108.031	108.310	0.279								108.719	0.591	108.128	111.145	P1C		

Outfall No. 5 Form A: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 1 - Outfall No. 5

Project No	***151-273***	Route No.	***I-84 WB***	PE Signature:	
Town	***Waterbury, CT***	Location/Station	***Outfall No. 5***		

HYDROLOGIC DATA (Copy from FORM A - DESIGN)		Name:		Date:	
Drainage Area (Hectares)		License No:		State:	
% Impervious Area		Company:			
Time of Concentration (min.)					
Drainage Design Flow (cms)					
Drainage Design Frequency (yr)					
Water Quality Flow (cms)					

HYDRODYNAMIC SEPARATOR (HS)			
Manufacturer			
Model Name			
Model No.			
Coordinates:		Datum:	
X:		Horiz.	
Y:		Vert.	
Sediment Storage Capacity (cu. m):		HGL Elevation:	
Required		@ WQF	
Installed		@ Design Q	
Head loss coefficient			

FLOW DIVERSION STRUCTURE			
Type			
Weir and/or Bypass Elev.			
Weir Length (m)		Weir Coeff. (C)	
HGL Elevation:		Flow Split @ Drainage Design Flow	
@ WQF		To HS	
@ Design Q		Bypassing HS	

Sketch (NTS)

Comments:

Outfall No. 5 Form B: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 1 - Outfall No. 5

Project No:	*151-273*	Location/Station:	*Outfall No. 5 - I-84 WB 1+762 L*	Date:	

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (in)	Flow (cfs)	Ground Elev. OUT (ft)	Invert Elev. OUT (ft)	HGL OUT (ft)	Depth OUT (ft)	Vel. Head OUT (ft)	EGL OUT (ft)	Length (ft)	Friction Slope (ft/ft)	Friction Loss (ft)	EGL IN (ft)	Vel. Head IN (ft)	HGL IN (ft)	Depth IN (ft)	Invert Elev. IN (ft)	Ground Elev. IN (ft)	Upstream Str.	Headloss Coeff.	Str. headloss (ft.)

Outfall No. 5 Form B: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM A - DESIGN) - Site No. 2 - Outfall No. 49

Project No	*151-273*	Route No.	*I-84 HFR*	Prepared By:	*tjb*	Date:	*July 2014*
Town	*Waterbury, CT*	Location/Station	*Outfall No. 49*	Checked By:		Date:	
				Company:	*Ammann & Whitney*		

HYDROLOGIC DATA

Drainage Area (**Hectares**)	*5.790*
Percent Impervious Area %	*14%*
Time of Concentration (min.)	*20.5*
Drainage Design Flow (**cms**)	*1.090*
Drainage Design Frequency (yr)	*10*
Water Quality Flow (**cms**)	*0.040*

HYDRODYNAMIC SEPARATOR (HDS)

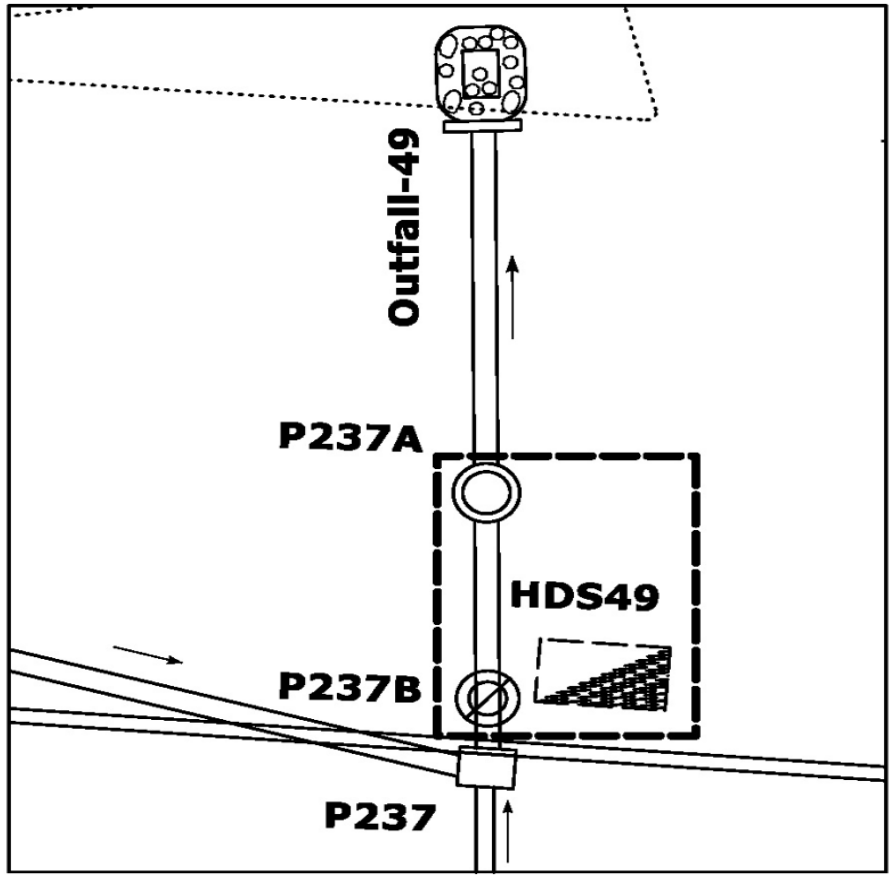
Coordinates:		Datum:	
X:	*282,961.3*	Horiz.	*NAD 83*
Y:	*230,789.4*	Vert.	*NGVD 1929*
Head loss coefficient		*1.75*	
Sediment Storage Capacity (**cu. m**):		HGL Elevation:	
Required	*0.765*	@ WQF	*119.201*
		@ Design Q	*120.412*
Maximum Flow to HS at Drainage Design Flow (**cms**)			*0.100*

Comments:

FLOW DIVERSION STRUCTURE

Type:	*MH Diameter:*		*1,830*	*mm*
Weir and/or Bypass Elev.	*119.274*			
Weir Length **(m)**	*1.830*	Weir Coeff. (C)	*1.830*	
HGL Elevation:		Flow Split @ Drainage Design		
@ WQF	*119.248*	To HS	*0.090*	
@ Design Q	*119.720*	Bypassing HS	*1.000*	

Comments:



Sketch (NTS) - Dashed Line Indicates Pay limits

Outfall No. 47 Form A: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS
(FORM A - DESIGN) - Site No. 2 - Outfall No. 49

Project No:	*151-273*	**Location/Station:**	*Outfall No. 49 - HFR 60+308 L*	**Date:**	*July 2014*

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)
WQF ANALYSIS																					
OUT-P 237A	Outfall	900	0.040	114.679	113.779	114.392	0.613	0	114.392	10.4	0.000	0.000	114.392	0.001	114.391	0.404	113.987	120.500	P237a	0.750	0.001
P 237A-HDS49	P237a	250	0.040	120.500	118.750	118.861	0.111	0.183	119.045	6.0	0.017	0.104	119.149	0.069	119.080	0.165	118.915	124.000	HDS49	1.750	0.121
HDS49-P 237B	HDS49	250	0.040	124.000	118.915	119.201	0.250	0.034	119.235	3.0	0.004	0.013	119.248	0.044	119.204	0.204	119.000	124.500	P237B	1.000	0.044
P 237B-P 237	P237B					119.248															
SYSTEM ANALYSIS with SPLIT FLOW to HDS																					
OUT-P 237A	Outfall	900	1.090	114.679	113.779	114.392	0.613	0.285	114.677	10.4	0.020	0.208	114.885	0.285	114.600	0.613	113.987	120.500	P237A	0.750	0.214
P 237A-HDS49	P237A	250	0.090	120.500	118.750	118.938	0.188	0.263	119.201	6.0	0.022	0.132	119.333	0.173	119.159	0.244	118.915	124.000	HDS49	1.750	0.304
HDS49-P 237B	HDS49	250	0.090	124.000	118.915	119.463	0.250	0.172	119.635	3.0	0.023	0.068	119.703	0.172	119.532	0.250	119.000	124.500	P237B	1.000	0.172
P 237B-P 237	P237B	900	1.090	124.500	119.500	120.006	0.506	0.447	120.453	2.1	0.007	0.014	120.467	0.183	120.284	0.763	119.521	124.307	P237	0.150	0.027
P 237-P 238	P237	900	0.990	124.307	120.772	121.368	0.595	0.251	121.618	19.4	0.005	0.097	121.715	0.252	121.464	0.594	120.869	124.388	P238		
SYSTEM ANALYSIS with FLOW BYPASSING HDS																					
OUT-P 237A	Outfall	900	1.090	114.679	113.779	114.392	0.613	0.285	114.677	10.4	0.020	0.208	114.885	0.285	114.600	0.613	113.987	120.500	P237A	0.150	0.043
P 237A-P 237B	P237A	900	1.000	120.500	118.750	119.069	0.319								120.330	0.900	119.000	124.500	P237B		

Outfall No. 49 Form A: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 2 - Outfall No. 49

Project No	***151-273***	Route No.	***I-84 - HFR***	PE Signature:	
Town	***Waterbury, CT***	Location/Station	***Outfall No. 49***		

HYDROLOGIC DATA (Copy from FORM A - DESIGN)	
Drainage Area **(Hectares)**	
% Impervious Area	
Time of Concentration (min.)	
Drainage Design Flow **(cms)**	
Drainage Design Frequency (yr)	
Water Quality Flow **(cms)**	

Name:		Date:	
License No:		State:	
Company:			

HYDRODYNAMIC SEPARATOR (HS)			
Manufacturer			
Model Name			
Model No.			
Coordinates:		Datum:	
X:		Horiz.	
Y:		Vert.	
Sediment Storage Capacity **(cu. m)**:		HGL Elevation:	
Required		@ WQF	
Installed		@ Design Q	
Head loss coefficient			

FLOW DIVERSION STRUCTURE			
Type			
Weir and/or Bypass Elev.			
Weir Length **(m)**		Weir Coeff. (C)	
HGL Elevation:		Flow Split @ Drainage Design Flow	
@ WQF		To HS	
@ Design Q		Bypassing HS	

Sketch (NTS)

Comments:

Outfall No. 49 Form B: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 2 - Outfall No. 49

Project No:	*151-273*	Location/Station:	*Outfall No. 49 - HFR 60+308 L*	Date:	

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)

Outfall No. 49 Form B: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM A - DESIGN) - Site No. 3 - Outfall No. 19

Project No	*151-273*	Route No.	*I-84 WB*	Prepared By:	*tjb*	Date:	*June 2014*
Town	*Waterbury, CT*	Location/Station	*Outfall No. 19*	Checked By:		Date:	
				Company:	*Ammann & Whitney*		

HYDROLOGIC DATA

Drainage Area (**Hectares**)	*2.390*
Percent Impervious Area %	*77%*
Time of Concentration (min.)	*12.7*
Drainage Design Flow (**cms**)	*0.900*
Drainage Design Frequency (yr)	*10*
Water Quality Flow (**cms**)	*0.127*

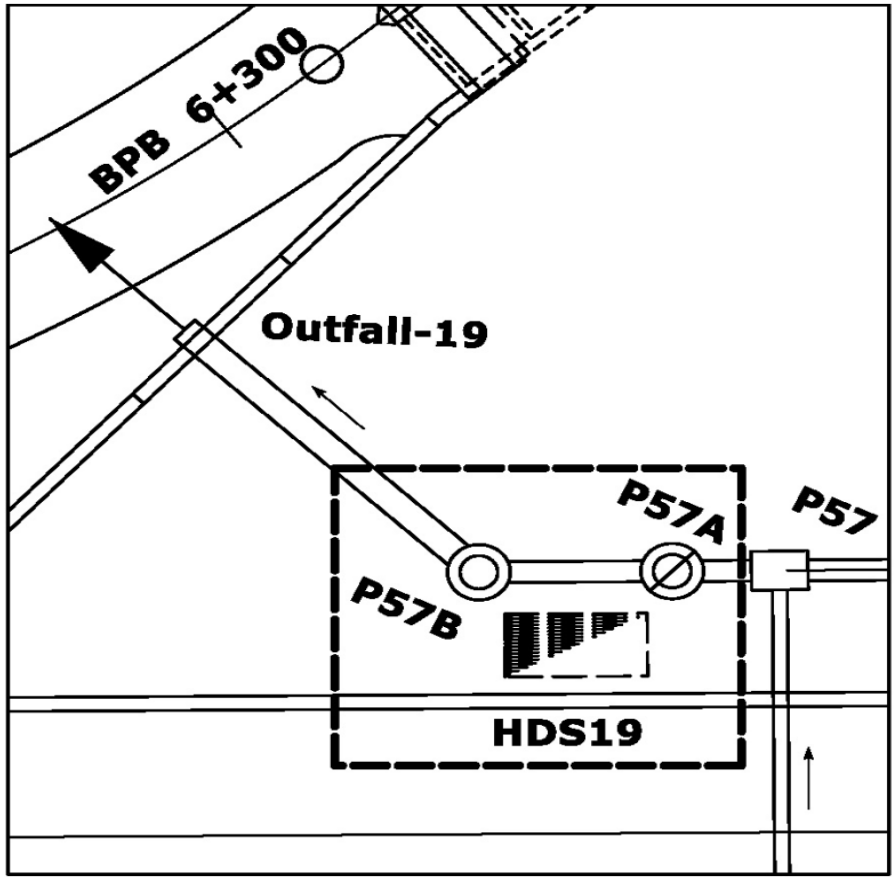
HYDRODYNAMIC SEPARATOR (HDS)

Coordinates:		Datum:	
X:	*284,248.3*	Horiz.	*NAD 83*
Y:	*230,961.5*	Vert.	*NGVD 1929*
Head loss coefficient		*1.75*	
Sediment Storage Capacity (**cu. m**):		HGL Elevation:	
Required	*1.748*	@ WQF	*132.614*
		@ Design Q	*132.850*
Maximum Flow to HS at Drainage Design Flow (**cms**)			*0.317*

Comments:

FLOW DIVERSION STRUCTURE

Type:	*MH Diameter:*		*1,830*	*mm*
Weir and/or Bypass Elev.		*132.680*		
Weir Length **(m)**	*1.220*	Weir Coeff. (C)	*1.830*	
HGL Elevation:		Flow Split @ Drainage Design		
@ WQF	*132.654*	To HS	*0.200*	
@ Design Q	*133.115*	Bypassing HS	*0.700*	



Sketch (NTS) - Dashed Line Indicates Pay limits

Comments:

Outfall No. 19 Form A: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS
(FORM A - DESIGN) - Site No. 3 - Outfall No. 19

Project No:	*151-273*	**Location/Station:**	*Outfall No. 19 - I-84 WB 3+690 L*	**Date:**	*June 2014*

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)
WQF ANALYSIS																					
OUT- P57B	Outfall	900	0.127	131.980	131.080	131.637	0.557	0.005	131.642	10.2	0.076	0.773	132.415	0.065	132.349	0.209**	132.140	134.800	P57B	0.750	0.049
P57B-HDS19	P57B	450	0.127	134.800	132.140	132.398	0.258	0.092	132.491	3.2	0.015	0.048	132.539	0.1	132.439	0.250**	132.189	134.825	HDS19	1.750	0.174
HDS19-P57A	HDS19	450	0.127	134.825	132.189	132.614	0.425	0.034	132.648	3.2	0.002	0.006	132.654	0.041	132.613	0.376	132.237	134.850	P57A	1.000	0.041
P57A-P57	P57A					132.654															
SYSTEM ANALYSIS with SPLIT FLOW to HDS																					
OUT- P57B	Outfall	900	0.900	131.980	131.080	131.637	0.557	0.242	131.879	10.2	0.104	1.060	132.939	0.242	132.697	0.557	132.140	134.800	P57B	0.750	0.182
P57B-HDS19	P57B	450	0.200	134.800	132.140	132.878	0.450	0.081	132.959	3.2	0.005	0.016	132.975	0.081	132.894	0.450	132.189	134.825	HDS19	1.750	0.141
HDS19-P57A	HDS19	450	0.200	134.825	132.189	133.035	0.450	0.081	133.116	3.2	0.005	0.016	133.132	0.081	133.051	0.450	132.237	134.850	P57A	1.000	0.081
P57A-P57	P57A	900	0.900	134.850	132.237	133.132	0.895	0.102	133.234	2.8	0.002	0.006	133.240	0.11	133.132	0.839	132.293	134.539	P57	1.000	0.108
P57-P53	P57	750	0.720	134.539	132.443	133.240	0.750	0.136	133.376	86.4	0.013	1.131	134.507	0.245	134.261	0.522	133.739	135.691	P53		
SYSTEM ANALYSIS with FLOW BYPASSING HDS																					
OUT- P57B	Outfall	900	0.900	131.980	131.080	131.637	0.557	0.242	131.879	10.2	0.104	1.060	132.939	0.242	132.697	0.557	132.140	134.800	P57B	0.750	0.182
P57B-P57A	P57B	900	0.700	134.800	132.140	132.878	0.738								132.850	0.613	132.237	134.850	P57A		

Outfall No. 19 Form A: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 3 - Outfall No. 19

Project No	***151-273***	Route No.	***I-84 WB***	PE Signature:	
Town	***Waterbury, CT***	Location/Station	***Outfall No. 19***		

HYDROLOGIC DATA (Copy from FORM A - DESIGN)		Name:	Date:
Drainage Area (Hectares)		License No:	State:
% Impervious Area		Company:	
Time of Concentration (min.)			
Drainage Design Flow (cms)			
Drainage Design Frequency (yr)			
Water Quality Flow (cms)			

HYDRODYNAMIC SEPARATOR (HS)			
Manufacturer			
Model Name			
Model No.			
Coordinates:		Datum:	
X:		Horiz.	
Y:		Vert.	
Sediment Storage Capacity (cu. m):		HGL Elevation:	
Required		@ WQF	
Installed		@ Design Q	
Head loss coefficient			

FLOW DIVERSION STRUCTURE			
Type			
Weir and/or Bypass Elev.			
Weir Length (m)		Weir Coeff. (C)	
HGL Elevation:		Flow Split @ Drainage Design Flow	
@ WQF		To HS	
@ Design Q		Bypassing HS	

Sketch (NTS)

Comments:

Outfall No. 19 Form B: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 3 - Outfall No. 19

Project No:	*151-273*	Location/Station:	*Outfall No. 9 - I-84 WB 3+690 L*	Date:	

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)

Outfall No. 19 Form B: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM A - DESIGN) - Site No. 4 - Outfall No. 21

Project No	*151-273*	Route No.	*I-84 WB 25 Off*	Prepared By:	*tjb*	Date:	*August 2014*
Town	*Waterbury, CT*	Location/Station	*Outfall No. 21*	Checked By:		Date:	
				Company:	*Ammann & Whitney*		

HYDROLOGIC DATA

Drainage Area (**Hectares**)	*1.150*
Percent Impervious Area %	*100%*
Time of Concentration (min.)	*11.4*
Drainage Design Flow (**cms**)	*0.420*
Drainage Design Frequency (yr)	*10*
Water Quality Flow (**cms**)	*0.084*

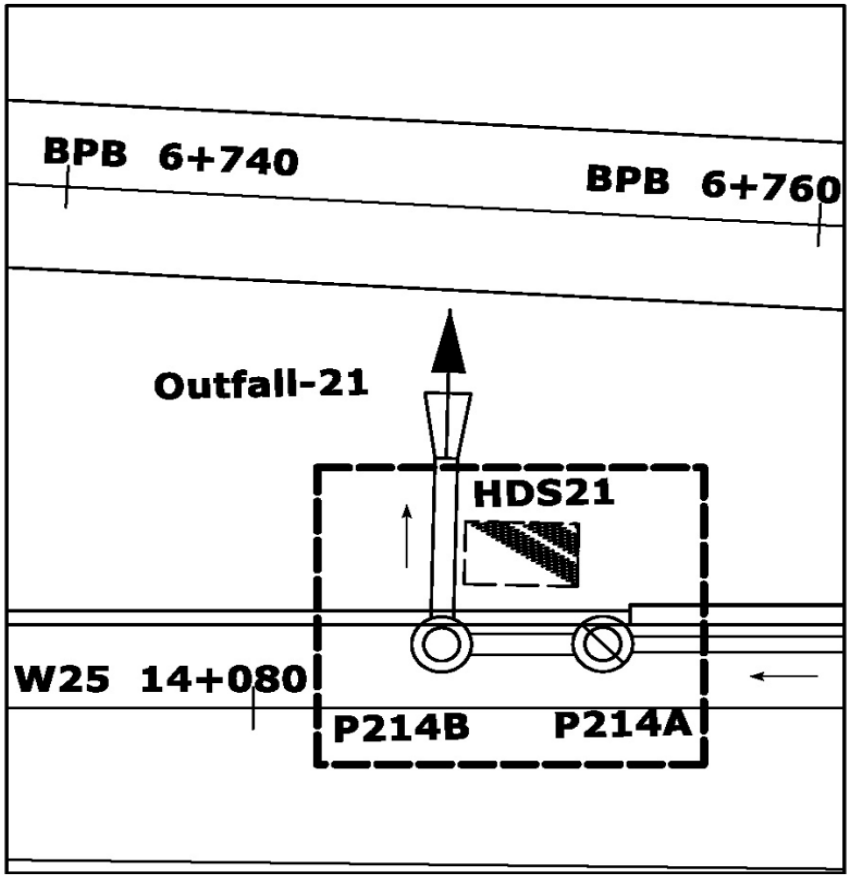
HYDRODYNAMIC SEPARATOR (HDS)

Coordinates:		Datum:	
X:	*284,603.4*	Horiz.	*NAD 83*
Y:	*231,142.2*	Vert.	*NGVD 1929*
Head loss coefficient		*1.75*	
Sediment Storage Capacity (**cu. m**):		HGL Elevation:	
Required	*1.086*	@ WQF	*137.882*
		@ Design Q	*138.099*
Maximum Flow to HS at Drainage Design Flow (**cms**)		*0.210*	
Comments:			

FLOW DIVERSION STRUCTURE

Type:	*MH Diameter:*		*1,830*	*mm*
Weir and/or Bypass Elev.	*137.945*			
Weir Length **(m)**	*0.915*	Weir Coeff. (C)	*1.830*	
HGL Elevation:		Flow Split @ Drainage Design		
@ WQF	*137.919*	To HS	*0.150*	
@ Design Q	*138.240*	Bypassing HS	*0.270*	

Comments:



Sketch (NTS) - Dashed Line Indicates Pay limits

Outfall No. 21 Form A: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS
(FORM A - DESIGN) - Site No. 4 - Outfall No. 21

Project No:	*151-273*	**Location/Station:**	*Outfall No. 21 - WB 25 Off 14+087 L*	**Date:**	*August 2014*

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)
WQF ANALYSIS																					
OUT-P214B	Outfall	750	0.084	138.090	137.340	137.817	0.477	0.004	137.821	5.3	0.000	0.001	137.822	0.005	137.818	0.451	137.367	139.200	P214B	1.000	0.005
P514B-HDS21	P214B	375	0.084	139.200	137.367	137.822	0.375	0.03	137.852	3.4	0.002	0.008	137.860	0.03	137.830	0.375	137.384	139.215	HDS21	1.750	0.052
HDS21-P214A	HDS21	375	0.084	139.215	137.384	137.882	0.375	0.03	137.911	3.4	0.002	0.008	137.919	0.03	137.890	0.375	137.400	139.229	P214A	1.000	0.030
P214A-P214	P214A					137.919															
SYSTEM ANALYSIS with SPLIT FLOW to HDS																					
OUT-P214B	Outfall	750	0.420	138.090	137.340	137.817	0.477	0.102	137.919	5.3	0.003	0.016	137.935	0.117	137.818	0.451	137.367	139.200	P214B	1.000	0.117
P514B-HDS21	P214B	375	0.150	139.200	137.367	137.935	0.375	0.094	138.029	3.4	0.007	0.025	138.054	0.094	137.960	0.375	137.384	139.215	HDS21	1.750	0.165
HDS21-P214A	HDS21	375	0.150	139.215	137.384	138.124	0.375	0.094	138.219	3.4	0.007	0.025	138.244	0.094	138.149	0.375	137.400	139.229	P214A	1.000	0.094
P214A-P214	P214A	750	0.420	139.229	137.500	138.244	0.743	0.046	138.290	31.7	0.001	0.047	138.337	0.07	138.267	0.567	137.700	139.410	P214	1.500	0.105
P214-P64B	P214	750	0.260	139.410	137.700	138.372	0.672	0.02	138.392	95.8	0.002	0.216	138.608	0.111	138.498	0.316	138.182	139.983	P64B		
SYSTEM ANALYSIS with FLOW BYPASSING HDS																					
OUT-P214B	Outfall	750	0.420	138.090	137.340	137.817	0.477	0.102	137.919	5.3	0.003	0.016	137.935	0.117	137.818	0.451	137.367	139.200	P214B	1.000	0.117
P214B-P214A	P214B	750	0.270	139.200	137.367	137.935	0.568								137.934	0.534	137.400	139.229	P214A		

Outfall No. 21 Form A: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 4 - Outfall No. 21

Project No	***151-273***	Route No.	***I-84 WB 25 Off***	PE Signature:	
Town	***Waterbury***	Location/Station	***Outfall No. 21***		

HYDROLOGIC DATA (Copy from FORM A - DESIGN)				Name:		Date:	
Drainage Area (Hectares)				License No:		State:	
% Impervious Area				Company:			
Time of Concentration (min.)							
Drainage Design Flow (cms)							
Drainage Design Frequency (yr)							
Water Quality Flow (cms)							
HYDRODYNAMIC SEPARATOR (HS)							
Manufacturer							
Model Name							
Model No.							
Coordinates:		Datum:					
X:		Horiz.					
Y:		Vert.					
Sediment Storage Capacity (cu. m):		HGL Elevation:					
Required		@ WQF					
Installed		@ Design Q					
Head loss coefficient							
FLOW DIVERSION STRUCTURE							
Type							
Weir and/or Bypass Elev.							
Weir Length (m)		Weir Coeff. (C)					
HGL Elevation:		Flow Split @ Drainage Design Flow					
@ WQF		To HS					
@ Design Q		Bypassing HS		Sketch (NTS)			

Comments:

Outfall No. 21 Form B: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 4 - Outfall No. 21

Project No:	*151-273*	Location/Station:	*Outfall No. 21 - WB 25 Off 14+087*	Date:	

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)

Outfall No. 21 Form B: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM A - DESIGN) - Site No. 5 - Outfall No. 43

Project No	*151-273*	Route No.	*I-84 HFR*	Prepared By:	*tjb*	Date:	*July 2014*
Town	*Waterbury, CT*	Location/Station	*Outfall No. 43*	Checked By:		Date:	
				Company:	*Ammann & Whitney*		

HYDROLOGIC DATA

Drainage Area (**Hectares**)	*2.860*
Percent Impervious Area %	*21%*
Time of Concentration (min.)	*14.6*
Drainage Design Flow (**cms**)	*0.650*
Drainage Design Frequency (yr)	*10*
Water Quality Flow (**cms**)	*0.034*

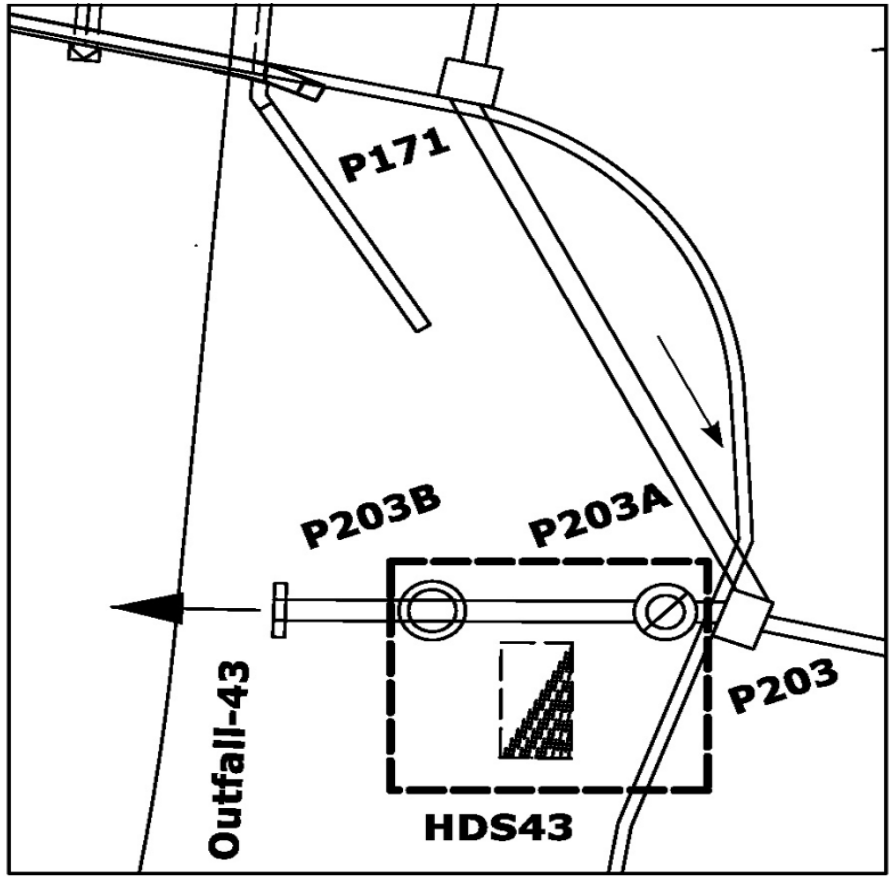
HYDRODYNAMIC SEPARATOR (HDS)

Coordinates:		Datum:	
X:	*283,186.9*	Horiz.	*NAD 83*
Y:	*230,970.4*	Vert.	*NGVD 1929*
Head loss coefficient		*1.75*	
Sediment Storage Capacity (**cu. m**):		HGL Elevation:	
Required	*0.765*	@ WQF	*113.212*
		@ Design Q	*113.236*
Maximum Flow to HS at Drainage Design Flow (**cms**)			*0.084*

Comments:

FLOW DIVERSION STRUCTURE

Type:	*MH Diameter:*		*1,630*	*mm*
Weir and/or Bypass Elev.	*113.276*			
Weir Length **(m)**	*1.220*	Weir Coeff. (C)	*1.830*	
HGL Elevation:		Flow Split @ Drainage Design		
@ WQF	*113.250*	To HS	*0.080*	
@ Design Q	*113.675*	Bypassing HS	*0.570*	



Sketch (NTS) - Dashed Line Indicates Pay limits

Comments:

Outfall No. 43 Form A: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS
(FORM A - DESIGN) - Site No. 5 - Outfall No. 43

Project No:	*151-273*	**Location/Station:**	*Outfall No. 43 - HFR 60+601 L*	**Date:**	*July 2014*

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)
WQF ANALYSIS																					
OUT-P 203B	Outfall	750	0.034	113.334	112.584	113.156	0.572	0	113.156	4.1	0.000	0.000	113.156	0	113.156	0.551	112.605	114.000	P203B	0.150	0.000
P 203B-HDS 43	P203B	250	0.034	114.000	112.605	113.156	0.250	0.024	113.180	4.0	0.003	0.014	113.194	0.024	113.169	0.250	112.617	115.000	HDS43	1.750	0.043
HDS 43-P 203A	HDS43	250	0.034	115.000	112.617	113.212	0.250	0.024	113.236	4.0	0.003	0.014	113.250	0.024	113.225	0.250	112.629	115.100	P203A	1.000	0.024
P 203A-P 203	P203A					113.250															
SYSTEM ANALYSIS with SPLIT FLOW to HDS																					
OUT-P 203B	Outfall	750	0.650	113.334	112.584	113.156	0.572	0.165	113.321	4.1	0.004	0.017	113.338	0.172	113.166	0.561	112.605	114.000	P203B	0.150	0.026
P 203B-HDS 43	P203B	250	0.080	114.000	112.605	113.192	0.250	0.136	113.327	4.0	0.018	0.073	113.400	0.136	113.264	0.250	112.617	115.000	HDS43	1.750	0.237
HDS 43-P 203A	HDS43	250	0.080	115.000	112.617	113.501	0.250	0.136	113.637	4.0	0.018	0.072	113.709	0.136	113.574	0.250	112.629	115.100	P203A	1.000	0.136
P 203A-P 203	P203A	750	0.650	115.100	112.629	113.709	0.750	0.11	113.820	3.2	0.003	0.011	113.831	0.11	113.720	0.750	112.645	115.079	P203	1.500	0.166
P 203-P 174	P203	750	0.340	115.079	112.745	113.886	0.750	0.03	113.916	12.3	0.001	0.012	113.928	0.03	113.898	0.750	112.904	115.099	P174		
SYSTEM ANALYSIS with FLOW BYPASSING HDS																					
OUT-P 203B	Outfall	750	0.650	113.334	112.584	113.156	0.572	0.165	113.321	4.1	0.004	0.017	113.338	0.172	113.166	0.561	112.605	114.000	P203B	0.150	0.026
P 203B-P 203A	P203B	750	0.570	114.000	112.605	113.192	0.587								113.199	0.570	112.629	115.100	P203A		

Outfall No. 43 Form A: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 5 - Outfall No. 43

Project No	***151-273***	Route No.	***I-84 HFR***	PE Signature:	
Town	***Waterbury***	Location/Station	***Outfall No. 43***		

HYDROLOGIC DATA (Copy from FORM A - DESIGN)				Name:		Date:	
Drainage Area (Hectares)				License No:		State:	
% Impervious Area				Company:			
Time of Concentration (min.)							
Drainage Design Flow (cms)							
Drainage Design Frequency (yr)							
Water Quality Flow (cms)							
HYDRODYNAMIC SEPARATOR (HS)							
Manufacturer							
Model Name							
Model No.							
Coordinates:		Datum:					
X:		Horiz.					
Y:		Vert.					
Sediment Storage Capacity (cu. m):		HGL Elevation:					
Required		@ WQF					
Installed		@ Design Q					
Head loss coefficient							
FLOW DIVERSION STRUCTURE							
Type							
Weir and/or Bypass Elev.							
Weir Length (m)		Weir Coeff. (C)					
HGL Elevation:		Flow Split @ Drainage Design Flow					
@ WQF		To HS					
@ Design Q		Bypassing HS		Sketch (NTS)			

Comments:

Outfall No. 43 Form B: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 5 - Outfall No. 43

Project No:	*151-273*	Location/Station:	*Outfall No. 43 - HFR 60+601 L*	Date:	

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)

Outfall No. 43 Form B: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM A - DESIGN) - Site No. 6 - Outfall No. 47

Project No	*151-273*	Route No.	*I-84 SR*	Prepared By:	*tjb*	Date:	*July 2014*
Town	*Waterbury, CT*	Location/Station	*Outfall No. 47*	Checked By:		Date:	
				Company:	*Ammann & Whitney*		

HYDROLOGIC DATA

Drainage Area (**Hectares**)	*2.620*
Percent Impervious Area %	*40%*
Time of Concentration (min.)	*15.8*
Drainage Design Flow (**cms**)	*0.680*
Drainage Design Frequency (yr)	*10*
Water Quality Flow (**cms**)	*0.056*

HYDRODYNAMIC SEPARATOR (HDS)

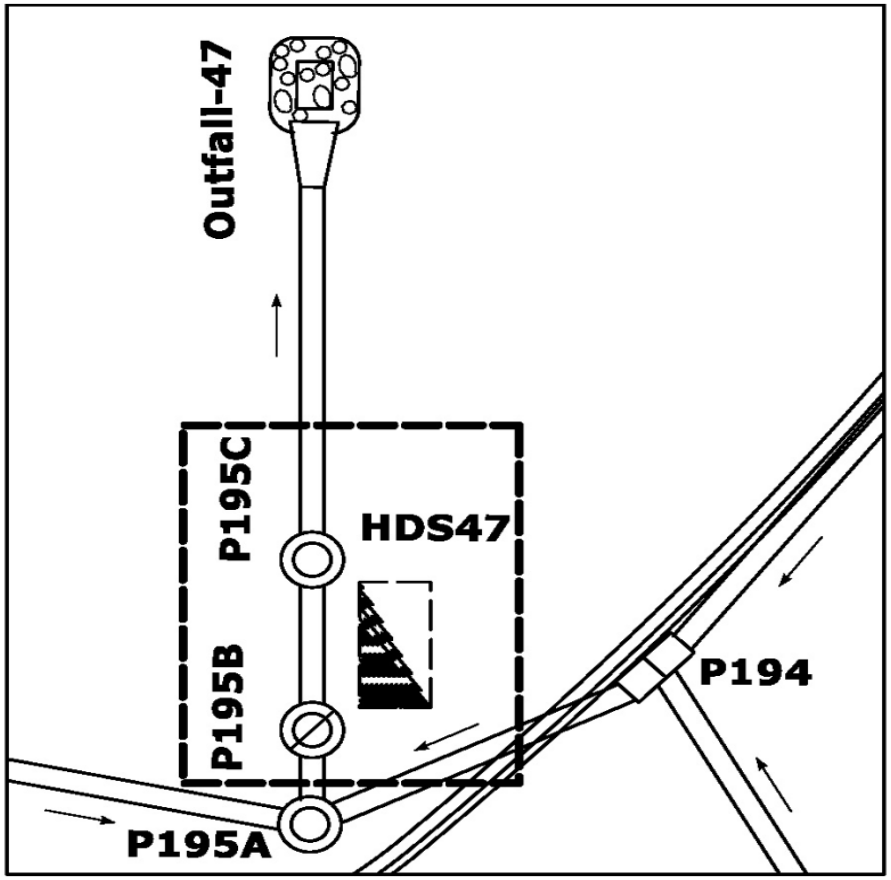
Coordinates:		Datum:	
X:	*284,306.9*	Horiz.	*NAD 83*
Y:	*231,093.8*	Vert.	*NGVD 1929*
Head loss coefficient		*1.75*	
Sediment Storage Capacity (**cu. m**):		HGL Elevation:	
Required	*0.765*	@ WQF	*137.952*
		@ Design Q	*138.259*
Maximum Flow to HS at Drainage Design Flow (**cms**)			*0.140*

Comments:

FLOW DIVERSION STRUCTURE

Type:	*MH Diameter:*		*1,830*	*mm*
Weir and/or Bypass Elev.	*138.005*			
Weir Length **(m)**	*1.830*	Weir Coeff. (C)	*1.830*	
HGL Elevation:		Flow Split @ Drainage Design		
@ WQF	*137.979*	To HS	*0.125*	
@ Design Q	*138.310*	Bypassing HS	*0.555*	

Comments:



Sketch (NTS) - Dashed Line Indicates Pay limits

Outfall No. 47 Form A: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS
(FORM A - DESIGN) - Site No. 6 - Outfall No. 47

Project No:	*151-273*	**Location/Station:**	*Outfall No. 47 - SR 5+298 R*	**Date:**	*July 2014*

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)
WQF ANALYSIS																					
OUT-P 195C	Outfall	1200	0.056	136.200	135.000	135.449	0.449	0.001	135.450	10.7	0.219	2.340	137.790	0.037	137.753	0.129	137.624	141.000	P195C	0.150	0.006
P 159C-HDS47	P195C	375	0.056	141.000	137.624	137.759	0.134	0.126	137.885	3.3	0.009	0.029	137.914	0.051	137.862	0.189	137.673	141.000	HDS47	1.750	0.090
HDS47-P 195B	HDS47	375	0.056	141.000	137.673	137.952	0.279	0.021	137.973	3.3	0.002	0.006	137.979	0.034	137.945	0.224	137.721	140.552	P195B	1.000	0.034
P 195B-P 195A	P195B					137.979															
SYSTEM ANALYSIS with SPLIT FLOW to HDS																					
OUT-P 195C	Outfall	1200	0.680	136.200	135.000	135.449	0.449	0.158	135.607	10.7	0.245	2.624	138.231	0.158	138.073	0.449	137.624	141.000	P195C	0.150	0.024
P 159C-HDS47	P195C	375	0.125	141.000	137.624	138.097	0.375	0.065	138.162	3.3	0.005	0.017	138.179	0.065	138.114	0.375	137.673	141.000	HDS47	1.750	0.114
HDS47-P 195B	HDS47	375	0.125	141.000	137.673	138.228	0.375	0.065	138.293	3.3	0.005	0.017	138.310	0.065	138.245	0.375	137.721	140.552	P195B	1.000	0.065
P 195B-P 195A	P195B	900	0.680	140.552	137.721	138.310	0.589	0.121	138.431	2.7	0.008	0.022	138.453	0.192	138.261	0.486	137.775	140.023	P195A	1.000	0.192
P 195A-P 194	P195A	750	0.540	140.023	137.925	138.453	0.528	0.135	138.588	9.8	0.013	0.129	138.717	0.192	138.525	0.452	138.073	140.023	P194		
SYSTEM ANALYSIS with FLOW BYPASSING HDS																					
OUT-P 195C	Outfall	1200	0.680	136.200	135.000	135.449	0.449	0.158	135.607	10.7	0.245	2.624	138.231	0.158	138.073	0.449	137.624	141.000	P195C	0.150	0.024
P 195C-P 195B	P195C	900	0.555	141.000	137.624	138.097	0.473								138.158	0.437	137.721	140.552	P195B		

Outfall No. 47 Form A: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 6 - Outfall No. 47

Project No	***151-273***	Route No.	***I-84 SR***	PE Signature:	
Town	***Waterbury, CT***	Location/Station	***Outfall No. 47***		

HYDROLOGIC DATA (Copy from FORM A - DESIGN)		Name:	Date:
Drainage Area (Hectares)		License No:	State:
% Impervious Area		Company:	
Time of Concentration (min.)			
Drainage Design Flow (cms)			
Drainage Design Frequency (yr)			
Water Quality Flow (cms)			

HYDRODYNAMIC SEPARATOR (HS)			
Manufacturer			
Model Name			
Model No.			
Coordinates:		Datum:	
X:		Horiz.	
Y:		Vert.	
Sediment Storage Capacity (cu. m):		HGL Elevation:	
Required		@ WQF	
Installed		@ Design Q	
Head loss coefficient			

FLOW DIVERSION STRUCTURE			
Type			
Weir and/or Bypass Elev.			
Weir Length (m)		Weir Coeff. (C)	
HGL Elevation:		Flow Split @ Drainage Design Flow	
@ WQF		To HS	
@ Design Q		Bypassing HS	

Sketch (NTS)

Comments:

Outfall No. 47 Form B: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 6 - Outfall No. 47

Project No:	*151-273*	Location/Station:	*Outfall No. 47 - SR 5+298 R*	Date:	

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)

Outfall No. 47 Form B: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM A - DESIGN) - Site No. 7 - Outfall No. 57

Project No	*151-273*	Route No.	*I-84 EB*	Prepared By:	*tjb*	Date:	*August 2014*
Town	*Waterbury, CT*	Location/Station	*Outfall No. 57*	Checked By:		Date:	
				Company:	*Ammann & Whitney*		

HYDROLOGIC DATA

Drainage Area (**Hectares**)	*4.020*
Percent Impervious Area %	*47%*
Time of Concentration (min.)	*14.7*
Drainage Design Flow (**cms**)	*0.990*
Drainage Design Frequency (yr)	*10*
Water Quality Flow (**cms**)	*0.102*

HYDRODYNAMIC SEPARATOR (HDS)

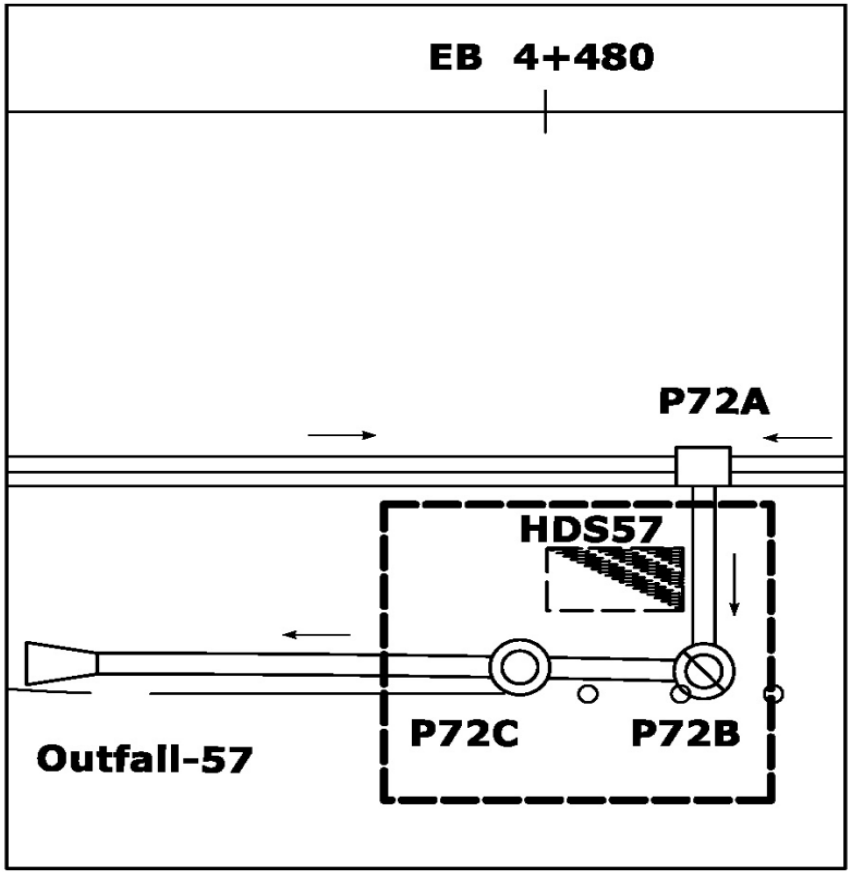
Coordinates:		Datum:	
X:	*284,948.3*	Horiz.	*NAD 83*
Y:	*231,245.7*	Vert.	*NGVD 1929*
Head loss coefficient		*1.75*	
Sediment Storage Capacity (**cu. m**):		HGL Elevation:	
Required	*1.795*	@ WQF	*140.030*
		@ Design Q	*140.403*
Maximum Flow to HS at Drainage Design Flow (**cms**)			*0.260*

Comments:

FLOW DIVERSION STRUCTURE

Type:	*MH Diameter:*		*1,830*	*mm*
Weir and/or Bypass Elev.	*140.081*			
Weir Length **(m)**	*1.220*	Weir Coeff. (C)	*1.830*	
HGL Elevation:		Flow Split @ Drainage Design		
@ WQF	*140.055*	To HS	*0.220*	
@ Design Q	*140.575*	Bypassing HS	*0.770*	

Comments:



Sketch (NTS) - Dashed Line Indicates Pay limits

Outfall No. 57 Form A: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS
(FORM A - DESIGN) - Site No. 7 - Outfall No. 57

Project No:	*151-273*	**Location/Station:**	*Outfall No. 57 - EB 4+482 R*	**Date:**	*August 2014*

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)
WQF ANALYSIS																					
OUT-P72C	Outfall	1200	0.102	140.700	139.500	139.983	0.483	0.003	139.986	11.2	0.000	0.001	139.987	0.004	139.983	0.417	139.566	141.700	P72C	0.750	0.003
P72C-HDS57	P72C	450	0.102	141.700	139.566	139.986	0.420	0.022	140.009	3.2	0.001	0.003	140.012	0.023	139.990	0.412	139.578	141.700	HDS57	1.750	0.040
HDS57-P72B	HDS57	450	0.102	141.700	139.578	140.030	0.450	0.021	140.051	3.2	0.001	0.004	140.055	0.021	140.033	0.443	139.590	141.700	P72B	1.000	0.021
P72B-P72A	P72B					140.055															
SYSTEM ANALYSIS with SPLIT FLOW to HDS																					
OUT-P72C	Outfall	1200	0.990	140.700	139.500	140.042	0.542	0.203	140.245	11.2	0.006	0.066	140.311	0.204	140.108	0.542	139.566	141.700	P72C	0.750	0.153
P72C-HDS57	P72C	450	0.220	141.700	139.566	140.260	0.450	0.098	140.358	3.2	0.006	0.019	140.377	0.098	140.280	0.450	139.578	141.700	HDS57	1.750	0.171
HDS57-P72B	HDS57	450	0.220	141.700	139.578	140.450	0.450	0.098	140.548	3.2	0.006	0.019	140.567	0.098	140.469	0.450	139.590	141.700	P72B	1.000	0.098
P72B-P72A	P72B	1050	0.990	141.700	139.810	140.567	0.757	0.112	140.679	5.8	0.002	0.011	140.690	0.122	140.569	0.729	139.840	141.834	P72A	1.000	0.122
P72A-P72	P72A	1050	0.960	141.834	139.946	140.690	0.744	0.109	140.799	43.4	0.005	0.237	141.036	0.221	140.815	0.552	140.263	142.377	P72		
SYSTEM ANALYSIS with FLOW BYPASSING HDS																					
OUT-P72C	Outfall	1200	0.990	140.700	139.500	140.042	0.542	0.203	140.245	11.2	0.006	0.066	140.311	0.204	140.108	0.542	139.566	141.700	P72C	0.150	0.031
P72C-P72B	P72C	1050	0.770	141.700	139.566	140.138	0.572								140.132	0.542	139.590	141.700	P72B		

Outfall No. 57 Form A: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 7 - Outfall No. 57

Project No	***151-273***	Route No.	***I-84 EB***	PE Signature:	
Town	***Waterbury, CT***	Location/Station	***Outfall No. 57***		

HYDROLOGIC DATA (Copy from FORM A - DESIGN)				Name:		Date:	
Drainage Area (Hectares)				License No:		State:	
% Impervious Area				Company:			
Time of Concentration (min.)							
Drainage Design Flow (cms)							
Drainage Design Frequency (yr)							
Water Quality Flow (cms)							
HYDRODYNAMIC SEPARATOR (HS)							
Manufacturer							
Model Name							
Model No.							
Coordinates:		Datum:					
X:		Horiz.					
Y:		Vert.					
Sediment Storage Capacity (cu. m):		HGL Elevation:					
Required		@ WQF					
Installed		@ Design Q					
Head loss coefficient							
FLOW DIVERSION STRUCTURE							
Type							
Weir and/or Bypass Elev.							
Weir Length (m)		Weir Coeff. (C)					
HGL Elevation:		Flow Split @ Drainage Design Flow					
@ WQF		To HS					
@ Design Q		Bypassing HS		Sketch (NTS)			

Comments:

Outfall No. 57 Form B: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 7 - Outfall No. 57

Project No:	*151-273*	Location/Station:	*Outfall No. 47 - EB 4+482 R*	Date:	

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)

Outfall No. 57 Form A: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM A - DESIGN) - Site No. 8 - Outfall No. 71

Project No	*151-273*	Route No.	*I-84 EB*	Prepared By:	*tjb*	Date:	*July 2014*
Town	*Waterbury, CT*	Location/Station	*Outfall No. 71*	Checked By:		Date:	
				Company:	*Ammann & Whitney*		

HYDROLOGIC DATA

Drainage Area (**Hectares**)	*0.790*
Percent Impervious Area %	*100%*
Time of Concentration (min.)	*10*
Drainage Design Flow (**cms**)	*0.270*
Drainage Design Frequency (yr)	*10*
Water Quality Flow (**cms**)	*0.057*

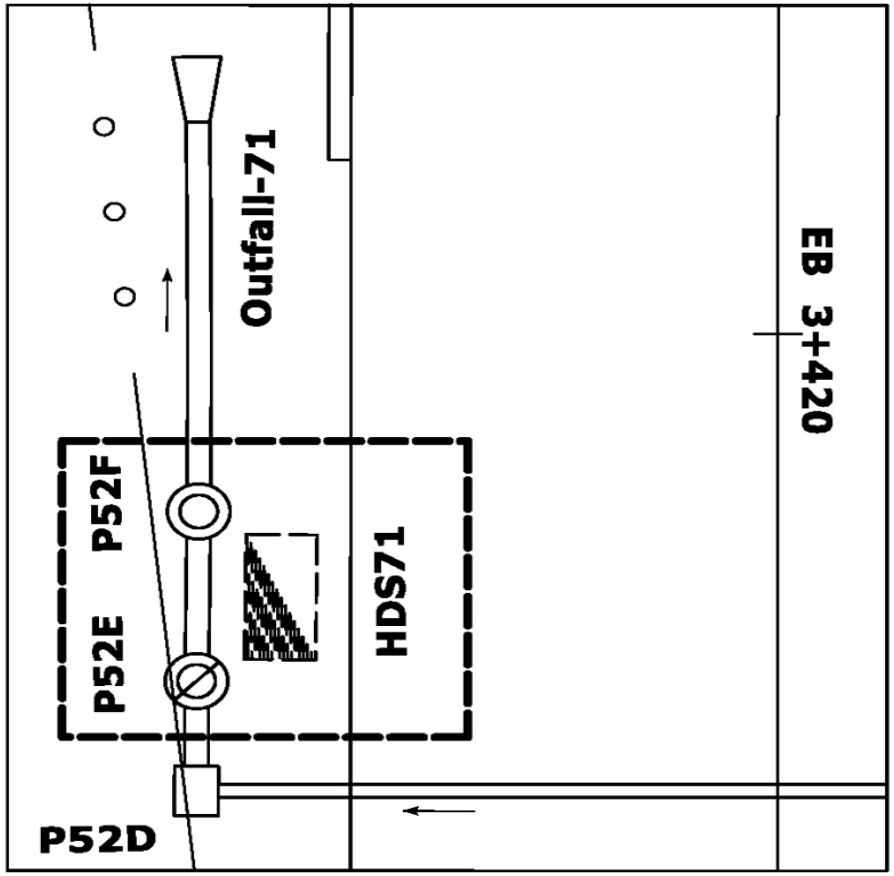
HYDRODYNAMIC SEPARATOR (HDS)

Coordinates:		Datum:	
X:	*283,995.4*	Horiz.	*NAD 83*
Y:	*230,794.8*	Vert.	*NGVD 1929*
Head loss coefficient		*1.75*	
Sediment Storage Capacity (**cu. m**):		HGL Elevation:	
Required	*0.765*	@ WQF	*129.663*
		@ Design Q	*129.967*
Maximum Flow to HS at Drainage Design Flow (**cms**)			*0.144*

Comments:

FLOW DIVERSION STRUCTURE

Type:	*MH Diameter:*		*1,830*	*mm*
Weir and/or Bypass Elev.		*129.990*		
Weir Length **(m)**	*0.915*	Weir Coeff. (C)	*1.830*	
HGL Elevation:		Flow Split @ Drainage Design		
@ WQF	*129.964*	To HS	*0.115*	
@ Design Q	*130.200*	Bypassing HS	*0.155*	



Sketch (NTS) - Dashed Line Indicates Pay limits

Comments:

Outfall No. 71 Form A: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS
(FORM A - DESIGN) - Site No. 8 - Outfall No. 71

Project No:	*151-273*	**Location/Station:**	*Outfall No. 71 - EB 3+428 R*	**Date:**	*July 2014*

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)
WQF ANALYSIS																					
OUT-P52F	Outfall	600	0.057	129.600	129.000	129.156	0.156	0.049	129.205	11.2	0.026	0.291	129.496	0.049	129.447	0.156	129.291	130.920	P52F	0.750	0.037
P52F-HDS71	P52F	300	0.057	130.920	129.291	129.591	0.300	0.033	129.624	3.2	0.003	0.011	129.635	0.037	129.598	0.270	129.328	131.300	HDS71	1.750	0.065
HDS71-P52E	HDS71	300	0.057	131.300	129.328	129.663	0.300	0.033	129.696	3.2	0.000	0.001	129.697	0.033	129.664	0.300	129.364	130.966	P52E	1.000	0.033
P52E-P52D	P52E					129.964															
SYSTEM ANALYSIS with SPLIT FLOW to HDS																					
OUT-P52F	Outfall	600	0.270	129.600	129.000	129.600	0.600	0.047	129.647	11.2	0.011	0.120	129.767	0.137	129.630	0.339	129.291	130.920	P52F	0.750	0.103
P52F-HDS71	P52F	300	0.115	130.920	129.291	129.733	0.300	0.135	129.868	3.2	0.014	0.045	129.913	0.135	129.778	0.300	129.328	131.300	HDS71	1.750	0.236
HDS71-P52E	HDS71	300	0.115	131.300	129.328	130.015	0.300	0.135	130.150	3.2	0.014	0.045	130.195	0.135	130.060	0.300	129.364	130.966	P52E	1.000	0.135
P52E-P52D	P52E	600	0.270	130.966	129.364	130.195	0.600	0.047	130.242	3.1	0.002	0.006	130.248	0.047	130.201	0.600	129.411	131.050	P52D	1.000	0.047
P52D-P49B	P52D	600	0.270	131.050	129.411	130.248	0.600	0.047	130.294	21.4	0.006	0.127	130.421	0.137	130.284	0.339	129.945	131.725	P49B		
SYSTEM ANALYSIS with FLOW BYPASSING HDS																					
OUT-P52F	Outfall	600	0.270	129.600	129.000	129.600	0.600	0.047	129.647	11.2	0.011	0.120	129.767	0.137	129.630	0.339	129.291	130.920	P52F	0.150	0.021
P52F-P52E	P52F	600	0.155	130.920	129.291	129.891	0.600								129.891	0.527	129.364	130.966	P52E		

Outfall No. 71 Form A: Sheet 2 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 8 - Outfall No. 71

Project No	***151-273***	Route No.	***I-84 EB***	PE Signature:	
Town	***Waterbury, CT***	Location/Station	***Outfall No. 71***		

HYDROLOGIC DATA (Copy from FORM A - DESIGN)				Name:		Date:	
Drainage Area (Hectares)				License No:		State:	
% Impervious Area				Company:			
Time of Concentration (min.)							
Drainage Design Flow (cms)							
Drainage Design Frequency (yr)							
Water Quality Flow (cms)							
HYDRODYNAMIC SEPARATOR (HS)							
Manufacturer							
Model Name							
Model No.							
Coordinates:		Datum:					
X:		Horiz.					
Y:		Vert.					
Sediment Storage Capacity (cu. m):		HGL Elevation:					
Required		@ WQF					
Installed		@ Design Q					
Head loss coefficient							
FLOW DIVERSION STRUCTURE							
Type							
Weir and/or Bypass Elev.							
Weir Length (m)		Weir Coeff. (C)					
HGL Elevation:		Flow Split @ Drainage Design Flow					
@ WQF		To HS					
@ Design Q		Bypassing HS		Sketch (NTS)			

Comments:

Outfall No. 71 Form B: Sheet 1 of 2

CONNECTICUT DEPARTMENT OF TRANSPORTATION HYDRODYNAMIC SEPARATOR DESIGN DATA SHEETS (FORM B - CONTRACTOR PROPOSAL) - Site No. 8 - Outfall No. 71

Project No:	*151-273*	Location/Station:	*Outfall No. 47 - EB 3+428 R*	Date:	

HYDRAULIC GRADE LINE ANALYSIS

Pipe	Downstream Str.	Pipe Size (mm)	Flow (cms)	Ground Elev. OUT (m)	Invert Elev. OUT (m)	HGL OUT (m)	Depth OUT (m)	Vel. Head OUT (m)	EGL OUT (m)	Length (m)	Friction Slope (m/m)	Friction Loss (m)	EGL IN (m)	Vel. Head IN (m)	HGL IN (m)	Depth IN (m)	Invert Elev. IN (m)	Ground Elev. IN (m)	Upstream Str.	Headloss Coeff.	Str. headloss (m)

Outfall No. 71 Form B: Sheet 2 of 2

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ITEM #0507856A – CONCRETE BAFFLES

Description: Work under this item shall consist of furnishing and installing precast concrete energy dissipation baffles within the culvert as shown on the plans and temporary water diversion as included in the special provision for Handling Water.

Materials: The energy dissipation baffles shall consist of precast concrete units placed on a bed of epoxy mortar and anchored to the bottom box culvert slab which mechanical anchors.

Concrete shall conform to the requirements of Article M.14.01 amended as follows:

1. Precast concrete baffles shall conform to Class "A" concrete.

2. Concrete shall have a minimum 28 day strength (fc) of 21 megapascals.

3. Reinforcing steel shall conform to the requirements of Article M.06.01.

Mechanical anchors shall be Hilti Kwik Bolt 3 or approved equal.

Epoxy mortar shall be SikaTop 122 Plus or approve equal.

Shop Drawings: Before installation of the precast concrete energy dissipation baffles, the Contractor shall submit nine (9) sets of shop drawings for the precast concrete energy dissipation baffles to the Engineer for review and approval in accordance with Article 1.05.02. Shop drawings shall include details of each component of the precast concrete energy dissipation baffles including the catalog number, dimensions, weights, material specifications, written installation and handling procedures, and a maintenance/repair procedure.

Temporary Water Diversion: The Contractor shall submit a plan for diverting the steam flow during installation of precast concrete energy dissipation baffles for approval by the Engineer. He shall utilize a temporary sandbag berm or other type of cofferdam to temporarily direct stream flows as required. No work shall be performed until the Engineer has approved the diversion method.

Construction Methods: A technically competent representative of the manufacturer shall be present during installation of the precast concrete energy dissipation baffles to give such aid and instruction in the installation of the system as is required to obtain satisfactory results. The preparation of the mortar bed and the installation of precast concrete energy dissipation baffles shall be in accordance with the written recommendations of the supplier.

The Contractor shall not block the channel to perform work in the stream. The stream flow shall be diverted by means submitted to and approved by the Engineer.

The precast concrete energy dissipation baffles shall be anchored into the box culvert bottom slab by drilling and installing an expansion bolt at locations at indicated on the plans.

At the completion of this work, the Contractor shall remove from the job site and properly dispose of all remaining debris, waste materials, excess materials, and equipment.

Method of Measurement: This work will be measured for payment by the number linear meters of precast concrete energy dissipation baffles installed and accepted at locations as shown on the plans.

Basis of Payment: This work will be paid for at the contract unit price per linear meters for "Precast Concrete Energy Dissipation Baffles," completed and accepted. This price shall include all materials, equipment, tools and labor incidental to the installation of the precast concrete energy dissipation baffles, placement of mortar bedding, and drilling into bottom culvert slab for mechanical anchors, and all clean-up. Access to install the precast concrete energy dissipation baffles is included in the cost of this item. Also included in the cost of this item shall be any work and materials required to divert stream flows and removal of same.

Pay Item	**Pay Unit**
Precast Concrete Energy Dissipation Baffles	Meter

ITEM #0521008A -SLIDING PLATE BEARINGS (PTFE)

DESCRIPTION

Non-Guided Polytetrafluoroethylene (PTFE) Sliding Plate Bearings. The work shall consist of furnishing, testing, placing, and setting non-guided PTFE sliding bearings at the locations indicated on the plans.

MATERIALS

Non-Guided PTFE Sliding Bearings. All material shall be new and unused, with no reclaimed material incorporated into the finished non-guided PTFE sliding bearing. The following shall apply

Stainless steel sliding plate shall conform to the requirements of ASTM A240, Type 316. The sliding surface shall be polished to a No. 8 bright mirror finish. The weld on the sliding surface shall be grinded and polished to a No.8 bright mirror finish

PTFE sheet shall be manufactured from pure virgin (not reprocessed) unfilled TFE resin or from TFE resin uniformly blended with either 15% glass fiber or 25% carbon (maximum recommended filler, by weight).

PTFE sheet shall have a minimum thickness of 6 mm. The mating sliding surface of filled PTFE sheet in contact with stainless steel sliding surface shall be polished or burnished to insure smooth and low friction movement of the bearing.

Finished PTFE sheet and strip shall be resistant to all acids, alkalis, and petroleum products, stable at temperatures from -217 deg. to 260 deg. C., non-flammable, non- absorbing of water and shall conform to the following minimum physical requirements.

Physical Property	ASTM Test Method	Unfilled	Filled	
			15% Glass	25% Carbon
Ultimate Tensile Strength, MPA	D638	19.3	13.79	8.96
Ultimate Elongation, %	D638	200	150	75
Specific Gravity	D792	2.13	2.18	2.05

The elastomeric compound used in the construction of these bearings shall contain only virgin crystallization resistant polychloroprene (neoprene) or virgin natural polyisoprene (natural rubber) as the raw polymer. The resulting product shall be free of porous areas, weak sections, bubbles, foreign matter, or other defects affecting serviceability. The physical properties of the cured elastomeric compound shall be determined by an Independent Testing Laboratory by using samples taken from the bearings and shall meet the following requirements.

Physical Property	ASTM Test Method	Requirements	
		Neoprene	Natural Rubber

Tensile Strength, Min., MPa	D412	13.79	13.79
Ultimate Elongation, Min., %	D412	400	400

Note 1: Tolerances for samples cut from finished parts have already been applied to each of these requirements. No greater tolerances will be allowed.
Note 2: For the purpose of determining conformance with these specifications, an observed or calculated value shall be rounded off to the nearest 70 KPa for tensile strength and to the nearest 10% for elongation.

The manufacturer shall certify that the elastomeric compound passes Grade 3 Low- Temperature Brittleness as determined by ASTM D746 – Brittleness Temperature of Plastics and Elastomers by Impact Procedure B.

Anti-galling compound shall contain molybdenum disulfide (moly or MoS_2), mica, graphite or talc, shall be exterior-grade, and shall be compatible with stainless steel.

Fabrication. Except as noted, all bearing surfaces of steel plates shall be finished or machined flat within 28 mm. Out-of-flatness greater than 0.25 mm of any plate shall be cause for rejection. The stainless steel plates and PTFE sheet have to be continuous along the back-wall.

For all welds of stainless steel, the Contractor shall submit for approval a proposed welding procedure and shop drawings prior to fabrication.

Gross bearing dimensions shall have a tolerance of -0 to +3 mm.

The elastomer shall be cast as a single unit in a mold and bonded and vulcanized under pressure and heat to the specified size and thickness. They shall be cast as a single unit with the external load plate bonded to the elastomer by vulcanization during the primary molding process.

During any welding of non-guided PTFE sliding bearing, the temperature of the steel adjacent to the elastomer shall not exceed 93 deg. C. Temperature shall be controlled by welding procedures and temperature indicating crayons or other devices approved by the Engineer.

Performance Characteristics. The service static coefficient of friction shall be calculated as the horizontal load required to initiate sliding of one bearing, divided by the vertical load. The measured static coefficient of friction shall not be less than the minimum design static coefficient of friction.

The design coefficients of friction are as follows:

Limit State	Friction Coefficient Type	Maximum	Minimum
Service	Static	-	0.036

ITEM #0521008A

A. Submittals. Detailed shop drawings of the non-guided PTFE sliding bearings shall be submitted, drawn by the manufacturer only, for approval by the Engineer prior to the start of fabrication. In addition, the manufacturer shall note the following on the shop drawings:

- The total quantity of non-guided PTFE sliding bearings required.
- The type of PTFE sheet (filled or unfilled) and, if applicable, the type and amount (by weight) of filler.
- The type of steel to be used.
- The shape factor, effective rubber thickness, typical laminate thickness, compressive area, and length to height ratio of the elastomeric element to be used.
- If applicable, any welding process used in the bearing manufacture or installation shall be clearly described and detailed. This shall include any welding of stainless steel.
- The location of the fabrication plant.
- The manufacturer's name, address, and the name of its representative who will be responsible for coordinating production, inspection, sampling and testing with the independent testing laboratory.

METHOD OF MEASUREMENT

Measurement will be taken as the area of non- guided PTFE sliding bearings furnished and installed in accordance with the plans.

BASIS OF PAYMENT

The unit price for each non-guided PTFE sliding bearing shall include the cost of all labor, materials, equipment and adjustment necessary to complete the work

PAYMENT

ITEM NO.	ITEM	PAYMENT UNIT
522999A	SLIDING PLATE BEARING (PTFE)	SQ. M

ITEM #0969030A - PROJECT COORDINATOR (MINIMUM BID)

Description: Under this item the Contractor shall furnish the services of one of his administrative employees or a consultant, who will develop and maintain the project schedule to be utilized to coordinate and expedite all phases of the work required for the project to ensure that the project is completed on time This person will be referred to as the Project Coordinator. The Project Coordinator shall be designated by name, in writing with a resume of his qualifications, submitted within 10 days of Contract Award and shall not be changed without prior written notice to the Department. The Project Coordinator qualifications must include previous completion of the Primavera Training Course Nos. 102 (Project Management Module – Basic Course) and 106-R (Project Management Module – Advanced Course for Resource Loading). If, in the judgment of the Engineer, the Project Coordinator is not sufficiently experienced and versatile in the preparation, interpretation and modification of the construction schedules, 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, the Consultant shall be present at the first meeting, along with the Project Coordinator, prepared to discuss, in detail, the proposed methods and techniques to be used. Thereafter, the Project Coordinator or the Consultant responsible for updating the CPM (Critical Path Method) Schedule shall attend all meetings between the Contractor, their Subcontractors, and any other meetings, which may affect the CPM schedule. The Project Coordinator shall be knowledgeable of the status of all aspects of the work throughout the length of the Contract. The Contractor shall prepare and maintain CPM Schedules utilizing the latest version of Oracle Primavera Engineering and Construction software.

The minimum lump sum bid for this item shall be **$1,000,000** (one million dollars). 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.

Schedule Requirements: 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 as amended and/or revised by the Contract Special Provisions. The schedules shall incorporate the Stages and 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 Schedules. All milestones or constrained dates within the schedule shall be clearly indicated.

The critical path shall be defined as the "longest path" and be clearly identifiable. 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. There is only one critical path for the project at any given time. The reports and schedule however shall provide detail of all near critical paths with less than 30 days of total float when compared to the critical path.

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.

Changes that do not affect the controlling activity on the critical path will not be considered as the basis for a time extension. The schedule shall indicate the logic of the work for the major elements and components of work under the Contract (on a structure by structure basis where applicable), such as the planned mobilization of equipment, sequences of operations or assembly, 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.

All required submittals shall be detailed as separate activities in the schedule and adequately tied to the logical progression of the work. There shall be separate activities for submittal, review and approval, ordering of materials, manufacturing or fabrication of materials, and delivery of materials to the project. Unless otherwise approved by the Engineer, all materials requiring more than two weeks between the time they are ordered and the time they are delivered to the site shall be detailed in the schedule. If requested by the Department, the Project Coordinator shall provide additional activities related to procurements for long lead items requiring greater than 90 days from ordering to delivery and/or require multiple phases of fabrication.

Since any of the submittals may require resubmissions, this time must be taken into consideration. The Department shall not be held responsible for any delay associated with the required re-submission of a submittal. Review and response times to be allocated to the Department and other agencies for various types of submittals are referenced in the specification for Item #0969049A – "Document Control Specialist". Submittal review time shall commence upon receipt by the Engineer of all pertinent documents and data required to perform the review. All submittals designated by the Department as "Revise and Resubmit" shall require that the Contractor insert new submittal and review activities with appropriate logic and review/response times into the schedule. 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 following list of elements is intended as guidance for the Project Coordinator. It does not contain all the elements necessary to construct the schedule required. In addition to the elements listed below the Project Coordinator shall include all elements of the work necessary to construct

a schedule that meets all the requirements of the contract and is an actual representation of the plan for the contractor for the Completion of the project. For this project, the preliminary list of elements are:

- Notice to Proceed
- Mobilization
- Permit Acquisition
- Submittals required by permit
- Shop & Working Drawings
- Submittals for third party approval (railroad, utilities, Army Corps. of Engineers, CT Department of Environmental Protection, etc.)
- Identification of each and every utility relocation and interface as a separate activity, including activity description and responsibility coding that identifies the type of utility and the name of the utility company involved
- Identification of any manpower, material, or equipment restrictions, as well as any activity requiring unusual shift work, such as double shifts, 6-day weeks, specified overtime, or work at times other than regular days or hours (regular days and hours means a work week consisting of (5) 8 hour days).
- Identification of each and every ramp closing and opening event as a separate one-day activity. The schedule shall not be used to replace the notification requirements for press releases.
- Start and Finish Milestones for:
  - The overall project
  - Each stage and/or phase of construction
  - Major structures
  - Activities with required start or finish dates
  - Work associated with the Incentive and Liquidated Damages Provisions
  - Required detours
  - Local road & ramp closures

  (Note milestones listed in Section 1.08.07 must be included.
- Identification of interfaces and dependencies with preceding, concurrent, and follow-on contractors, railroads, and utilities as shown on the plans or specified in the specifications
- Equipment and labor shall be differentiated by a cost account code within the resource dictionary
- Staged Construction (temporary pavements, temporary drainage, temporary illumination, temporary signing, etc.) Differentiate between Eastbound and Westbound staging when appropriate
- Construction Staking
- Clearing & Grubbing
- Maintenance & Protection of Traffic
- Environmental Controls (reuse/waste stockpile area, erosion and sedimentation controls, etc.)
- Turf Establishment
- Drainage (breakdown into one activity per drainage structure that includes the pipe draining the structure)

- Erection and removal of falsework and shoring
- Demolition/Removal of Superstructure (Breakdown into Concrete Deck Removal, Lead Removal, Structural Steel Removal, etc.)
- Demolition/Removal of Substructure (Breakdown into Pier or Abutment demolition, pile extraction, etc)
- Structural Steel Fabrication
- Roadway Construction (Breakdown into Excavation, Fill, Subbase, Pavement, Drainage, Curbing, Guiderail, etc.)
- Retaining Walls (breakdown into excavation, form, reinforce, & pour pad(s)/footing(s), form, reinforce, & pour/erect stem, backfill, and form, reinforce, & pour moment slab and parapet, etc.)
- Earth Retaining Systems (temporary and permanent, sheeting, etc.)
- Cofferdams
- Foundation Test Piles
- Foundation Pile Installation
- Form, reinforce and pour Abutment and Wingwall Footings and Stems
- Form, reinforce, and pour Pier Footings, Pier Columns and Pier Caps
- Setting Proposed Steel Superstructures (Breakdown into Bearings, Spans Segments, Girder Lines, Diaphragms, Splices, Edge Girders, etc.)
- Form, reinforce, and pour Bridge Deck and Parapets (breakdown by segment)
- Cast-In-Place Concrete (form & reinforce activities shall be separate from the concrete placement activities; cure activities are required for all concrete placement work)
- Bridge Scuppers – Permanent and Temporary
- Latex Modified Concrete Overlay
- Testing and settlement periods
- Membrane Waterproofing
- Bituminous Concrete Pavements
- Signing (Breakdown Signs Individually)
- Incident Management System
- Illumination
- Pavement Markings
- Signalization
- Temporary Barriers, Barricades, and Markings
- Temporary Structures
- Punchlist / Clean-up (Breakdown by structure and/or area/location)
- Project Completion

In the event of a conflict between the requirements of the contract documents and the information provided or shown on an accepted schedule, the requirements of the contract documents shall take precedence.

The Contractor shall prepare and maintain CPM Schedules utilizing the latest version of Oracle-Primavera P6 Professional Project Management (P6) software. Formatting the project schedule within the P6 software is of critical importance to ensure consistency.

The schedules shall consist of a network technique of planning, scheduling and control; be a clear statement of the logical sequence of work to be done; and be prepared in such a manner that the Contractor's work sequence is optimized between early start and late start constraints. All schedule activities shall have at least one predecessor and one successor activity, except for the project first and last activity indicating the start and finish dates of the project. The work shall be broken out into sufficient detail such that no activity has duration greater than fifteen (15) calendar days, unless approved by the Engineer. The Contractor shall utilize the same criteria in a consistent manner throughout the term of the project. If, at any time, the Contractor alters his logic, original durations and descriptions, adds activities or activity codes, or in any way modifies the Baseline Schedule, he must notify the Engineer of the change(s), in writing, presenting the reason(s) for the change(s) in detail. The Engineer reserves the right to accept or reject any such change(s).

All task activities, except administrative activities, shall be supplemented with crew allocation information. The crew allocations shall be shown to a level of detail that facilitates report generation based on various crew classes for the Contractor and subcontractors. Crew resources shall be assigned to a role in the role dictionary. Roles shall consist of the Department, General Contractor, Subcontractor (with each subcontractor type and supplier type specifically listed as a subrole), Utilities (each listed individually by type), Designer, etc. Roles may be assigned to task activities where a specific party has not been assigned to date. Once the specific party is known the crew resource must be created and assigned to the activity and primary role. The Contractor shall use average composite crews to display the labor loading of onsite construction task activities for each project. The Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work and to assure that crew allocations are not duplicated in concurrent activities. Leveling shall be performed utilizing Late Start as the primary criteria.

The Engineer may review the baseline schedule crew allocations using Means Productivity Standards or other recognized industry standard(s) to determine if the schedule is practicable.

The Contractor shall not:

- Arrange the critical path through activities more susceptible to State caused delay
- Sequester float through strategies including, but not limited to:
  - Falsely extending activity duration estimates
  - Use of preferential logic (creating logic between activities for the purpose of suppressing float and/or manipulating the critical path; sequencing of schedule activities in a way other than in the manner the work is physically and logically required to be built)
  - use of extensive or insufficient resource loading
  - use of float suppression techniques
  - use of special lead/lag logic restraints
  - use of zero total float or free float constraints (other than as allowed by this specification)
  - imposing constraint dates other than as required by the contract

The use of one or more of these manipulations shall be cause for rejection of the project schedule or its updates.

Resource constraints may not be established though the use of activity logic. If the Contractor deems it necessary to enter resource constraints (labor or equipment) in the schedule, these constraints shall be established through the use of resource loading and leveling of the schedule. 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.

Lags will not be used when the creation of an activity will perform the same function. Lag durations contained in the schedule shall not have a negative value. The Contractor shall identify any lag proposed and provide an explanation for the purpose of the lag in the narrative report.

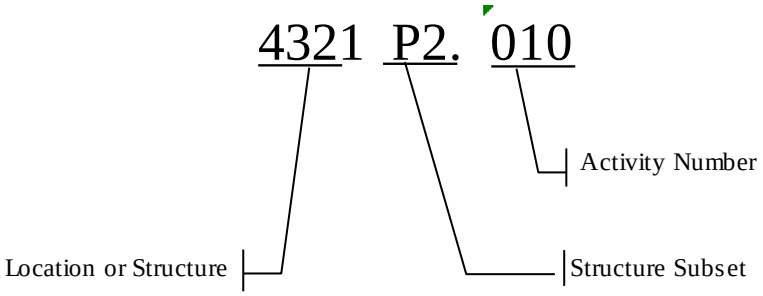
The use of mandatory start and finish constraints is prohibited. All constraints shall be of the type "on or before" or "on or after". ("As Late As Possible" is to be used only for submittal, fabrication, and delivery activities as previously noted).

The use of activity steps (breaking activities down into smaller units within an activity) may be utilized where appropriate (i.e. multiple related work activities that do not necessarily need to be performed in a specific order).

Activity ID

Activity ID numbers shall strictly adhere to the following format. The first four digits of the activity ID number shall be utilized to designate the location of the work being performed (i.e. structure, roadway, ramp, area, pier, etc) followed by a period. The remaining three digits may be used to provide unique, orderly, and sequential ID numbers for each activity. The following is an example Activity ID format to be used where "4321" represents Bridge No. 4321, "P2" represents Pier 2, and "010" is the activity number.

Example



"Location or Structure" coding shall be formatted based on the examples as follows:

Location Examples (for all ramp, mainline and local roadway construction work, excluding structures):

EB23Off	EB Exit 23 Off Ramp
I84EB or I84WB or I84M	I-84 Northbound/Southbound/Median
PLANK	Plank Road
REID	Reidville Drive
HAMIL	Hamilton Avenue

Structure Examples (refers to bridges and retaining walls):

4321	Bridge No. 4321 (Site 1)
E4321	Existing Bridge No. 4321 (demolition)
1226	Bridge No. 1226 (Site 6)
RW101	Retaining Wall 101

Structure Subset Examples (to be used for structures only):

P2	Pier 2 (for foundation to bearing installation activities)
A1	Abutment 1 (for foundation to bearing installation activities)
SS	Superstructure (for inst. of structural steel through deck/parapet activities)

The items below shall have specific numbering for the location of work as follows:

Milestone Activities	0000 (unless otherwise named in Section 1.08.07)	
Level of Effort Activities	9999	
Submittal Activities	SUBM Extra Work Activities	EWA

Activity Description

Each Activity shall have a narrative description consisting of a verb or work function (i.e. form, pour, excavate, etc), an object (i.e. slab, footing, wall, etc), and a location (i.e. STA, bridge, pier, or retaining wall number, street, ramp letter, etc and be consistent for activities with similar type work.

Activity Codes

Activity Codes shall be global, conform to the following table, and must be entered exactly as shown (spelling, letter case, etc.). No additional activity codes will be allowed without the approval of the Engineer. All activities shall be assigned specific values for the following ten (10) Activity Codes:

Activity Code Name	Max **Length**	Use
PHASE	3	Assign appropriate Corridor Traffic Phase
STAGE	2	Assign the appropriate stage of construction

TYPE	3	Designate whether the activity is a construction activity (CON) or administrative activity (ADMIN)
ADMIN	3	This is a sublevel of the TYPE activity code, not a separate activity code. Designate whether the ADMIN activity is a submittal (SUB), review & approval process (RA), a material fabrication (FAB), or delivery process (DEL)
RESPONSIBILITY	5	Assign by company name the party responsible for the activity; activities shall not belong to more than one responsible party; responsible parties include, but are not limited to, the prime contractor, subcontractors, state or government agencies, suppliers, and utilities
ITEM	4	Assign the first four digits if the contract item number associated with this work activity
ROUTE	7	Assign the route the work is taking place on or adjacent to (EB 23 Off Ramp (EB23Off)), I-84 Eastbound (84EB), Hamilton Street (HAMIL), etc.)
DIRECTION	3	Assign whether the corresponding work is taking place along Eastbound (EB) or Westbound (WB) I-84 Ramps should be designated the same direction as the Route they connect from. Local roads are to be coded as Offline (OFF).
STRUCTURE	5	Assign a structure name or number as applicable. (4321, 6590, etc). If the activity is not related to a specific structure assign it as Roadway (RDWY) for embankment, drainage, subbase, etc, or Administrative (ADMIN) for submittals, fabrication, and other non-construction activities.
STR SUBSET	5	This is a sublevel of the STRUCTURE activity code, not a separate activity code. Assign structure components including piers and abutments (Abutment 1 (Al), Pier 1 (Pl), and Superstructure (SS) for setting structural steel, constructing decks and parapets, etc.

Notebooks

Activities that are modified or added by construction order shall be identified in the activity notebook. The construction order number, as issued by the Engineer, and the date the activity was modified or added shall be clearly recorded. Notebook entries must be updated with every monthly update submission and be as detailed as necessary to explain

any modifications to an activity original duration, logic, etc.

Calendars

Calendars shall be project level only. No global calendars are allowed. All milestones shall be assigned to the "Calendar Days" calendar, conform to the following table, and must be entered exactly as shown (spelling, letter case, type, etc.). No additional calendars will be allowed without the approval of the Engineer. All subprojects shall utilize the same global calendars. All calendars must strictly adhere to Section 1.08.04, Limitations of Operations, and the Standard Specifications as applicable.

Calendar Name	Calendar Description
4 Day Work Week	4 Day Work
5 Day Work Week	5 Day Work
6 Day Work Week	6 Day Work
7 Day Work Week	7 Day Work
Paving Restrictions – Day	Include any time of year restrictions for daytime paving
Paving Restrictions - Night	Include any time of year restrictions for nighttime paving
Concrete Restrictions	Include any time of year restrictions for placement of concrete
Railroad Restrictions	Includes restricted work periods in the vicinity of the railroad
Paint	Includes restricted painting periods
Seeding Restrictions	Includes restricted seeding periods
Calendar Days	Includes all days (no holidays, restricted periods, etc)

Schedule Submittals: The Contractor shall submit to the Department the project schedules via the Document Control System utilized on this project (submittal/transmittal) and shall have the following electronic requirements attached:

- a XER backup of the entire schedule;
- a PLF backup of all layouts used to create the submitted charts and reports
- Gantt charts in Adobe Acrobat PDF file format, formatted to fit ANSI Size D paper (610 mm x 914 mm), and showing the Activity ID, Activity Description, Original Duration, Remaining Duration, Total Float, Early Start and Finish Dates, and Calendar ID. Types of Gantt Charts to be included are:
    - The project critical (longest) path;
    - The project near critical path (excluding critical path activities);
    - All uncompleted work activities as of the data date;
- Reports in Adobe Acrobat PDF file format, formatted to fit 216 mm x 279 mm size paper, to include:
    - Schedule/Leveling Report which includes the scheduling/leveling settings, statistics, errors, warnings, results, and exceptions
    - A listing of all activities, by activity code, with early & late starts and total float
    - A Claim Digger Report that details all changes in scheduling options,

resources, relationships, durations, activities added or deleted, constraints, notebook or any other change requested by the Engineer, between the current schedule submittal and the previous month's update submittal

- Detailed Predecessor/Successor Report which includes a listing of all activities that immediately precede and immediately succeed that activity in the schedule logic.
- A Monthly Resources Loading Summary Report (tabular) indicating the peak number of resources required for each activity on the critical path.

The Contractor shall submit a hardcopy version of the aforementioned submittal requirements as follows:

- Three (3) compact discs that each include; the XER backup file and all Adobe Acrobat PDF Gantt Charts and reports specified above;
- Three (3) paper copies of each Gantt chart and report on the paper size specified above

Schedule submittals will only be considered complete when all documents and data have been provided as described below.

The Project Coordinator shall be required to prepare and submit the following documents:

1) Initial Baseline Schedule

Within Forty-Five (45) calendar days after contract award, the Contractor shall prepare and submit, in accordance with all requirements of the Contract, and submit for review and acceptance a detailed Initial Baseline CPM schedule for all work contemplated from the Award date to one hundred and eighty (180) calendar days after the Notice to Proceed Part 2. All work contemplated beyond the first one hundred and eighty (180) calendar days shall be shown in sufficient detail such that the Critical Path may be identified, all contract milestones are identified and the cost loading of the schedule can be verified and compare to the previously approved schedule of values. The Department shall be the sole judge as to whether the schedule is sufficiently detailed and shall be allowed 30 days to review and comment or accept the Initial Baseline Schedule.

The schedule data date shall be the contract award date, shall not include any completed work to date, and shall not attribute negative float or negative lag to any activity.

Upon acceptance of this schedule, it shall be designated the "Initial Baseline Schedule" and the Contractor will commence submitting monthly updates based on the accepted Initial Baseline schedule. The acceptance of the Initial Baseline Schedule shall in no way waive the requirements of the contract nor shall it excuse the Contractor from any obligations under the contract.

2) Baseline Schedule a) Phase 1

Within ninety (90) calendar days after acceptance of the "Initial Baseline Schedule" the Contractor shall submit to the Engineer, for review and acceptance, a detailed Project CPM Schedule for all contract work.

All project files shall be backed up and submitted in a single XER file that shall be identified as EBASE1-1.XER (EBASE1-2.XER if a second submission is required, etc).

b) Baseline Schedule Guidelines

This schedule shall be prepared in accordance with all requirements of this specification and be prepared separately from the initial baseline and subsequent schedule updates. As a guide, 30 to 35 activities should be provided per $1 million of contract work. Construction work activities, excluding the preparation, submission, review and approval of submittals shall represent 75% of the overall minimum required activities.

The Contractor shall require each major subcontractor and major supplier to submit in writing a statement certifying that the major subcontractor or major supplier has concurred with the Contractor's CPM Schedule (both phases), including major updates, and that the major subcontractor's or major supplier's related schedule has been incorporated accurately, including the duration of activities, crew allocations (note, certification of crew allocations for any subcontractor is required if their work activities are on the overall project or individual project Critical Path; certification for major supplier activities on the overall project or individual project Critical Path will require a detailed production schedule for the materials to be supplied that can be physically inspected and verified by the Engineer). The definition of a "major subcontractor" is one that exceeds five percent (5%) of the contract value. The definition of "major supplier" is one that provides material(s) or services valued in excess of one (1%) of the contract value. Failure of the Contractor to provide the required information will delay the approval of the baseline schedules.

Should the Baseline Schedule, submitted for acceptance, show variances from the requirements of the contract, the Contractor shall make specific mention of the variations in the letter of transmittal, in order that, if accepted, proper adjustments to the project schedule can be made.

The Engineer shall be the sole judge as to whether the schedule is sufficiently detailed. Upon acceptance of this schedule, it shall be designated the "Baseline Schedule" . The acceptance 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 the Baseline Schedule has not been accepted. If the Contractor fails to submit a Baseline Schedule acceptable to the Department for any portion of the work, the Contractor may be found in violation of Article 1.02.02 of the Standard Specifications "for having failed to prosecute work continuously, diligently and

cooperatively in an orderly sequence."

3) Revised Baseline Schedule

If, in the opinion of the Engineer, there have been significant changes to a previously approved baseline schedule or revised baseline schedule, the Engineer may direct the Contractor to prepare a "Revised Baseline Schedule" which fully recognizes and accounts for all major changes to the project. The Revised Baseline Schedule shall be submitted for review and acceptance within twenty (20) calendar days of the Engineer's request. Revised Baseline Schedules shall be prepared in compliance with this specification in all other respects.

The acceptance of a Revised Baseline Schedule shall in no way waive the requirements of the contract nor shall it excuse the Contractor from any obligations under the contract.

4) Monthly Updates

The Contractor shall update and progress the latest accepted version of the CPM schedule(s) through the last day of the each month (the Data Date is the 1st day of the month). Updating and progressing the CPM schedule shall be completed and submitted by the fifth (5th) business day each month. Except as otherwise authorized by the Engineer, monthly submissions received after the due date are considered late.

All project files shall be backed up and submitted in a single XER file that shall be identified as E-YYMMDD.XER, where YY is the two digit year, MM is the two digit month, and DD is the two digit day, and where the date represents the Data Date (example – schedule with a data date of November 1, 2012, therefore the file name shall be E-121101.XER).

The Contractor shall create a copy of the previous mid-month schedule for the purpose of updating and progressing it. The schedule shall be updated to show the work actually accomplished during the preceding month, the actual time consumed for each activity, and the estimated time remaining for any activity that has been started but not completed. The updating of the percent complete and the remaining duration of any activity shall be independent functions; program features that calculate one of these parameters from the other shall be disabled. Out of sequence progress (if applicable) shall be scheduled utilizing Retained Logic, not Progress Override or Actual Dates. All out of sequence activities shall be corrected to reflect the current construction operations. The monthly update shall include revisions to the schedule based on review comments by the Engineer or as necessitated by revisions to the project, which have been directed by the Engineer during the month preceding the update. Similarly, any changes to the schedule due to Contractor influences shall also be included within the schedule. All changes (i.e. duration changes, logic changes, new logic, new or modified activities, changes in work sequence, etc) shall be recorded and a note added to the activity notebook. The record shall include at a minimum, the date and reason for the change, and description of the change. The Engineer reserves the right to accept or reject any such changes.

The Contractor will provide a narrative to accompany the monthly update. The narrative shall include:

a) The Contractor's transmittal letter
b) A discussion of work completed during the period
c) A listing of all changes made to the schedule since the prior monthly update
d) Identification of unusual conditions or restrictions regarding labor, equipment, or material; including multiple shifts, 6-day work weeks, specified overtime or work at times other than regular days or hours.
e) Description of the current overall critical path and individual project critical paths
f) Changes to the overall critical path, intermediate and completion milestones
g) Description of the overall near critical path, defined as those activities not on the critical path with total float less than fifteen (15) calendar days.
h) Description of problem areas i) Current or potential delays
   i Cause of delay
   ii Impact of delay on other activities, milestones, and completion dates iii Corrective action and schedule adjustments to correct the delay
j) Pending items and status thereof:
   i Permits
   ii Time adjustments
   iii Non-compliance notices
k) Reasons for an early or late scheduled completion date in comparison to the contract completion date

5) Mid-Month Updates

The Contractor shall progress the CPM schedule through the 15th day of the each month (the Data Date is the 16th day of the month). Progressing the CPM schedule shall be completed within 3 business days of the 15th of each month. Except as otherwise authorized by the Engineer, mid-month submissions received after the due date are considered late.

All project files shall be backed up and submitted in a single XER file that shall be identified as E-YYMMDD.XER, where YY is the two digit year, MM is the two digit month, and DD is the two digit day, and where the date represents the Data Date (example – schedule with a data date of November 16, 2012, therefore the file name shall be E-121116.XER).

The Contractor shall create a copy of the previous monthly schedule update for the purpose of progressing it. The mid-month schedule shall be updated for actual progress only. No other changes to the schedule will be permitted without concurrence by the Engineer. The schedule shall be updated to show the work actually accomplished since the previous monthly schedule update submittal, actual time consumed for each activity, and the estimated time remaining for any activity that has been started but not completed. The updating of the percent complete and the remaining duration of any activity shall be independent functions; program features that calculate one of these parameters from the other shall be disabled. Out of sequence progress (if applicable) shall be scheduled utilizing Retained Logic, not Progress Override.

Gantt Charts and reports, both electronic and hardcopy, are not required to be submitted with the Mid-Month Update.

6) Four Week Material Movement Look Ahead Schedules

The Contractor shall be required to produce and submit to the Engineer a four week material movement schedule, to be updated and submitted the first business day of each week. Except as otherwise authorized by the Engineer, submissions received after the due date are considered late.

This short-term schedule must be submitted in electronic format (i.e. .pdf, .xls, .doc, etc.) and shall clearly indicate all anticipated hauling of soils to and from a designated RSA, WSA, or other designated project stockpile for the four-week period. The short-term schedule should be of sufficient detail to identify specific areas where the soil will be hauled from or to.

Gantt Charts, reports, and the XER backup file are not required for the Four Week Look Ahead submission.

7) Two Week Look Ahead Schedules

The Contractor shall be required to produce and submit to the Engineer a biweekly schedule, to be updated and submitted the first business day of each week. Except as otherwise authorized by the Engineer, submissions received after the due date are considered late.

This short-term schedule must be submitted in electronic format (i.e. .pdf, .xls, .doc, etc.) and shall clearly indicate all work planned for the two-week period. The short-term schedule should be of sufficient detail to identify specific work crew activities by location.

Gantt Charts, reports, and the XER backup file are not required for the Two Week Look Ahead submission.

8) Daily Activity Reports

The Contractor shall be required to produce and submit to the Engineer a 48 hour activity report, to be updated daily and submitted by 7:00 AM or as agreed to by the Engineer. Except as otherwise authorized by the engineer, submissions received after that time are considered late.

9) Time Impact Analysis

The Contractor shall submit a written time impact analysis (TIA) to the Engineer when the Contractor or Engineer considers that a major change may impact the critical path or contract progress. A change may be considered of major nature if the estimated time required or actually used for an activity or the network logic is varied from the Baseline Schedule to a degree that there is a reasonable doubt as to the effect on the contract completion date, intermediate milestone dates, or stage completion dates. Changes that affect activities with adequate float time shall be considered a major change when their cumulative effect could extend the contract completion date. The TIA shall illustrate the impact of each change on the current scheduled stage or project completion date or other internal milestone, as appropriate. The analysis shall use the schedule update that has a data date closest to and prior to the event. If the Engineer determines that the schedule update used does not appropriately represent the conditions prior to the event, the schedule shall be progressed to the day before the event being analyzed. The TIA shall include an impact schedule

developed from incorporating the event into the schedule by adding or deleting activities, or by changing durations or logic of existing activities. Each TIA shall include a Fragmentary Network (fragnet) demonstrating how the Contractor proposes to incorporate the impact into the project schedule. A fragnet is defined as the sequence of new activities and/or activity revisions, logic or resource changes that are proposed to be added to the existing schedule to demonstrate the influence of impacts to the schedule. The fragnet shall identify the predecessors to the new activities and demonstrate the impacts to successor activities. The TIA shall include a narrative report describing the effects of the new activities and relationships to interim and contract completion dates.

The Contractor shall submit a TIA within fifteen (15) working days of receiving a written request for a TIA from the Engineer. The Engineer will withhold remaining payment on the Project Coordinator Item if a TIA is requested by the Engineer and not submitted by the Contractor within fifteen (15) working days. The Project Coordinator Item payment will resume on the next estimate after the requested TIA is submitted. The Contractor shall allow the Engineer thirty (30) calendar days after receipt to approve or reject the submitted TIA. All approved TIA schedule changes shall be incorporated on the next monthly schedule update and shall be submitted for approval as a Revised Baseline Schedule.

If the TIA submitted by the Contractor is rejected, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If an agreement is not reached, the Contractor shall not show unapproved changes related to the TIA in subsequent schedule updates.

Compensation for the submission of any TIA is included in the per month cost for the services of the Project Coordinator.

10) Recovery Schedules

If, in the opinion of the Engineer, the Monthly or Mid-Month Update indicates that the Contractor has fallen behind schedule, or that a revision in sequence of operations may be necessary for any other reason, the Contractor shall within five (5) business days of receiving a written request to perform "Recovery" from the Engineer, immediately institute all necessary steps to improve his progress and shall submit such revised network diagrams, tabulations, operational plans and any supplementary information, 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's "Recovery" efforts not demonstrate an ability to regain an acceptable rate of progress, the Engineer shall require the development of a "Recovery Schedule". The Recovery Schedule is to be supplemented with resource allocations for every task activity and include time-scaled resource histograms. The resource allocations shall be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for the Contractor and subcontractors. The Contractor shall use average composite crews to display the labor loading of onsite construction activities. The Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not over allocated in multiple concurrent activities. The time-scaled resource histograms shall show labor crafts and equipment classes to be utilized on the

contract. The Contractor shall submit a Recovery Schedule within fifteen (15) business days of receiving a written request for the Recovery Schedule from the Engineer.

In addition to required submittals the "Recovery Schedule" submission will also include a narrative meeting the requirements of the monthly update, a time-scaled resource histogram and a Monthly Resources Loading Summary Report (tabular) indicating the peak number of resources required for each activity.

The Engineer may review the recovery schedule resource allocations using Means Productivity Standards or equivalent to determine if the schedule is practicable. The Engineer shall be the sole judge as to whether the Recovery Schedule is sufficiently detailed. Upon acceptance of this Recovery Schedule, it shall be designated a "Revised Baseline Schedule".

Compensation for the submission of any Recovery Schedule is included in the per month cost for the services of the Project Coordinator. No additional compensation will be allowed for resource loading the schedule.

11) As-Built Schedule (Final)

Within thirty (30) calendar days of completion of the project, the Contractor shall submit an "As-Built Schedule" showing the actual progress of all work. The Contractor shall provide a written certificate with this submittal signed by the Contractor's Project Manager and an officer of the company stating, "To my knowledge and belief, the enclosed final update schedule reflects the actual start and finish dates of the actual activities for the project contained herein." An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager.

Schedule Review and Evaluation Meetings: The Contractor, represented by the Project Coordinator and/or the Consultant, shall participate with the Engineer, at the Engineer's request, in the review and evaluation of the Initial Baseline Schedule, Baseline Schedule, Revised Baseline Schedule, and Recovery Schedule submittals. Any and all revisions made necessary as a result of this review shall be made by the Contractor and a revised Initial Baseline Schedule, Baseline Schedule, Revised Baseline Schedule, or Recovery Schedule submitted within ten (10) business days of the date of the meeting. Any further revisions required thereafter shall also be submitted for acceptance within (10) business days of the request for revisions by the Engineer.

The Contractor, represented by the Project Coordinator and/or the Consultant, shall participate with the Engineer, at the Engineer's request, in the review and evaluation of each Monthly CPM Schedule Update. Items of discussion will include, but are not limited to, near term schedule activities, long-term schedule issues, and any relevant technical issues that are schedule related.

Computer Hardware: The Contractor shall provide the following equipment with all the required maintenance and repairs (to include labor and parts), and supplies (paper and toner cartridges) throughout the contract life. The Engineer reserves the right to expand or relax the specification to adapt the hardware limitations and availability. The Contractor shall deliver to the Engineer and the following hardware, including all instructions and manuals:

Savin Multifunction C6055 Printer (Minimum or equivalent)

-Integrated finishing options including stapling, booklet finishing, and hole punching
-Resolution – 600x600 DPI
-Media Sizes: from 5.5x8 to 12x18
-Output Speed - Black & White 60 ppm/ Full Color 55 ppm
-Memory - 320GB (160GB x 2)
-Scanning Speed - 81/69 ipm (BW/FC)

All repairs must be performed within 24 hours. If the repairs require more than 24 hours then a replacement must be provided.

Method of Measurement: Within ten (10) calendar days of the award of the Contract, the Contractor shall submit to the Engineer for approval a cost breakdown of his lump sum bid price. The submission must include substantiation showing that the costs breakdown submitted are reasonable based on the Contractor's lump sum bid. The cost breakdown shall be in accordance with the following payment schedule:

1) The development cost to prepare the Initial Baseline Schedule in accordance with these specifications. Development costs shall not exceed 5% of the total cost of the item and shall include costs to maintain and submit all monthly and mid-month updates prior to acceptance of the Baseline Schedule and to furnish and install all specified hardware.

2) The development cost to prepare the Baseline Schedule in accordance with these specifications. Development costs shall not exceed 10% of the total cost of the item for submission of the Baseline Schedule.

3) The submission and certification of the As-Built Schedule in accordance with these specifications. The submission and certification costs shall be no less than 1% of the total cost of the item.

4) The cost to provide the services of the Project Coordinator, including costs to prepare and submit the Monthly and Mid-Monthly Updates; furnish and submit any Revised Baseline or 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.

Upon approval of the payment schedule by the Engineer, payments for work performed will be made as follows:

1) Upon acceptance of the Initial Baseline Schedule by the Engineer, the lump sum development cost from the payment schedule will be certified for payment.

2) Upon acceptance of the Baseline Schedule by the Engineer, the lump sum development cost from the payment schedule will be certified for payment.

3) Upon receipt of each Mid-Month CPM Schedule Update, 30% of the per month cost for the services of the Project Coordinator will be certified for payment.

4) Upon receipt of each Monthly CPM Schedule Update, 70% of the per month cost for the services of the Project Coordinator will be certified for payment.

5) Upon receipt of the As-Built Schedule (Final), the lump sum development cost from the payment schedule will be certified for payment.

Basis of Payment: This service will be paid for at the contract lump sum price for "Project Coordinator (Minimum Bid)" complete, which price shall include the preparation and submission of all schedules, updates, and submittals, and the furnishing, maintenance, and supply costs for all required hardware as noted above. 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 or Mid-Month CPM Schedule Update is submitted late, without authorization from the Engineer, will result in the following actions:

   a) 2.5% of the monthly payment estimate or $25,000, whichever is greater, shall be retained until such time as the Contractor submits all required schedules and reports.

   b) The payment, as described in "Method of Measurement", shall be reduced by 6.5% per calendar day for each day the schedule has been submitted late.

2) Any week where the Four Week Material Movement Schedule, Two Week Look Ahead Schedule, or Daily Activity Report is submitted late, without authorization from the Engineer, will result in a 1% per day per submission reduction of the entire monthly project coordinator payment for each day the schedule has been submitted late, up to a maximum of five (5) days (or 5%) per submission (max. 15% reduction if all submissions are not submitted for the five (5) day week).

3) Failure of the Contractor to submit a Baseline Schedule or Revised Baseline Schedule for any portion of the work in accordance with this specification may result in the withholding of all contract payments until the schedule is submitted to, and accepted by, the Engineer.

4) 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.

Pay Item	Pay Unit
Project Coordinator (Minimum Bid)	L.S.

ITEM #0969049A – DOCUMENT CONTROL SPECIALIST (MINIMUM BID)

Description: Under this item the Contractor shall furnish the services of one of his administrative employees, entitled Document Control Specialist who will ensure that the Contractor and all other parties as designated by the Engineer will prepare, status, electronically file and send all project correspondence and drawings utilizing a document control system as established and maintained by the Department. The primary function of the document control system is to ensure timely processing of all contract documentation in coordination with the project schedule. This document control system will also provide uniform project information and reporting. The Document Control Specialist shall be designated by name, in writing with a resume of their qualifications, within five (5) calendar days of the award of the Contract and shall not be changed without prior written notice to the Department.

The Document Control Specialist shall be knowledgeable of the status of all contract documentation aspects of the work throughout the length of the Contract. The Contractor shall prepare and maintain the contract documentation utilizing the latest version of Microsoft Sharepoint (MS) software . The document control system will be physically located in a secure location designated by the Department. The Contractor will directly access the document control system via the internet. The Department will provide the Contractor access to the latest version of MS and a common file server. All references to the use of MS and the common file server below shall refer to the Department's shared document control system as described above. All information that resides on the shared document control system shall become the sole property of the Department.

The minimum lump sum bid for this item shall be **$500,000** (five hundred thousand dollars). 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.

Documentation Requirements: All correspondence for the project shall be produced and controlled using MS, including, but not limited to: transmittals, meeting minutes, requests for information (RFI's), requests for change (RFC's), submittals, field memos, notices, letters, and punch lists. All common correspondence files (submittals, requests, answers, changes, reports, minutes, agendas, letters, etc) shall be generated from, and stored within the common file server, including any and all file attachments. Submittals, including shop drawings, working drawings, catalog cuts, material certifications, and all documentation required by contract, shall be submitted electronically via MS . The Contractor is responsible to coordinate the overall creation and submission of all project documentation to meet the requirements of the project schedule and specifications. The Contractor is encouraged to supply the Department with corporate logos, formats, Sybase Infomaker files, etc. to facilitate the creation and utilization of custom forms and reports.

The named Document Control Specialist shall be designated as the Submittal Coordinator within M S and will be responsible for maintaining information related to the responsibility, status, elapsed time since submission, held time, start/finish times, and a history of all submittal revisions. A submittal log must be maintained to indicate the latest construction submittals sent and received and the distribution of these drawings to the Department. Each submittal (shop drawing, working drawing, product data, samples, etc) must be individually entered, tracked, and the status maintained, including all revisions. The Contractor is responsible to utilize the latest approved drawings as identified in the control system. All revisions are to be logged into the control system, describing each change.

All meeting minutes shall be logged into the control system. The Contractor is responsible to utilize meeting minutes and respond (electronically) to meeting minute items assigned to the Contractor.

Documents (letters, logs, shop or working drawings, sketches, payrolls, etc) to be transmitted to the Department by the Contractor, for which the Contractor does not have an electronic version, shall be scanned, converted into an Adobe Acrobat PDF format, and attached accordingly in MS.

The document control system shall be available for Contractor use at all times unless system maintenance (i.e. backups, upgrades, etc) is being performed. System maintenance will generally be limited to 8 PM – 6AM, Monday - Friday and at various times on weekends. In the event a Contractor's authorized user cannot access the control system, the Contractor shall notify the Department's control system representative. In the event the control system becomes unavailable during normal business hours for an extended period of time, the Contractor may issue correspondence requiring immediate attention by the Department in hard copy format. The hard copy correspondence must be entered into the control system immediately upon becoming available again. Inability by the Contractor to gain access to the document control system for any reason shall not be grounds for claim. The use of the database is not required for proprietary cost and contract information.

The Department shall be allocated a minimum of ten (10) calendar days (using a 7-day calendar, exclusive of holidays) for review and response to each RFI submitted. RFI's requiring information from outside agencies shall be allocated twenty-one (21) days (using a 7-day calendar, exclusive of holidays).

The Department shall be allocated a minimum of thirty (30) calendar days (using a 7-day calendar, exclusive of holidays) for review and response to each RFC submitted. RFC's requiring information from outside agencies shall be allocated sixty (60) days (using a 7-day calendar, exclusive of holidays).

The Department reserves the right to reject any RFC submitted in the form of an RFI for the purpose of reducing the Department's review and response time. Such documents will not be considered for review by the Department and will be returned to the Contractor for resubmission.

Review and response time for such document will commence upon resubmission in the correct format.

The Department shall be allocated a minimum of thirty (30) calendar days (using a 7-day calendar, exclusive of holidays) for review and approval of each submittal, unless specified otherwise within the contract documents. Any submittals requiring approval by an outside Agency (CTDEEP, , Army Corps of Engineers, City of Waterbury, etc.) shall be allocated a minimum of sixty (60) calendar days (using a 7-day calendar, exclusive of holidays). Whenever multiple Contractor submittals are under review by the Department, the Contractor shall prioritize the submittals and notify the Department thereof. 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.

All resubmissions shall be numbered with the original submittal number but designated a new revision number. All resubmissions shall be logged into the control system to properly calculate the entire duration required for the submittal process from the original submission date to final approval to indicate total days to process the submittal through all review cycles. Coordination of submittals is required for same work and interfacing work so that one submittal will not delay another.

The submittal log will be developed according to the following format:

Submittal Package

The Package name shall be the seven digit Item Number. The Package Title shall be the corresponding Item Name. Instances where contract items require an extensive number of submittals (i.e. rebar, structural steel, etc), packages shall be further separated by structure components or location. For example:

Package	Title
0602006-01	Deformed Steel Bars – Epoxy Coated / Abutment 2
0602006-02	Deformed Steel Bars – Epoxy Coated / PN-13
0602006-03	Deformed Steel Bars – Epoxy Coated / PN-14

Instances where a submittal requires review by more than one department or agency (i.e. traffic items requiring both CDOT and City of Waterbury review), the multiple reviewers option must be checked so that the individual reviewers can be designated, with each receiving a copy of the submittal for review.

The Package status shall initially be "Unsubmitted". Upon submission of any submittal within the package the status should be changed to "Open". Upon receipt of all final review comments for all package submittals, the status should be changed to "Closed".

Submittal Item

All submittal items, as required by contract, must be individually entered, including shop & working drawings, product data, samples, etc. All submittals shall be associated with and generated within a specific package. The submittal number shall be the package name followed

by a three digit incremental number (i.e. 1205201-01-001, 0602006-03-001). The Title shall be a clear description the submittal item. In the case of a drawing submittal, the title shall be the exact name of the drawing and the drawing number shall be entered in the Details section. The appropriate Category and Type shall then be selected.

Shop drawings shall be submitted in Adobe Acrobat PDF Package format. Each drawing will be included as a separate file within the package and named in kind with the drawing number. The PDF package shall be listed and attached in MS to the first submittal. The drawings shall be listed individually thereafter.

Working drawings shall be submitted in Adobe Acrobat PDF format. The PDF package shall be listed and attached in PCM to the first submittal. The drawings shall be listed individually thereafter.

Electronic submittal attachments shall be named in kind with the submittal to which they are attached and include the revision number (ie. Submittal 0602006-03-001 would have a PDF attachment named 0602006-03-001-1.pdf).

Submittals requiring signature by a licensed engineer or other party shall be digitally signed utilizing a digital ID obtained from an Adobe partner (see adobe.com for list of partners).

Required Start & Required Finish shall represent the date range for the review process. Required Start shall be the date the submittal is issued by the Contractor for review. Required Finish shall be the completion date for the review cycle (either 30 or 60 days later, as appropriate).

Workflow must be completed for each submittal. Received From shall be the party from which the submittal originated (prime contractor, subcontractor, fabricator, vendor, etc). Sent To and Returned By shall be the primary reviewer as designated by the contract documents. Forwarded To shall be the Contractor's designated submittal coordinator.

Review cycles will be numbered 001, 002, 003, etc. according to the number of resubmissions. Distributions (submittal recipients) must be listed on the transmittal.

Submittal Forecast

In order facilitate the Department's review of the large number of submittals anticipated for this project the Contractor is to provide a submittal schedule. The submittal schedule will be created and maintained in MS as follows:

A submittal package must be created for each contract item requiring a submittal (note that large submittal items must be broken out as prescribed above). Within each package, a single submittal, numbered 001, will be generated from the submittal package which will be utilized to approximate when submittals for that package will be submitted for review. At a minimum, the submittal Number, Title, Status, Required Start, and Required Finish must be entered, where the Status is "Unsubmitted" and the Required Start and Required Finish represents the review period

for all submittals within this package. The Required Start and Required Finish dates must be coordinated with the project CPM schedule.

Documentation Control System Access Requirements: Within five (5) days of Contract Award, the Contractor shall designate, in writing, up to ten (10) named Contractor personnel, to be approved and authorized by the Engineer to access the document control system. The Contractor shall designate one of the ten authorized personnel to be the Document Control Specialist and act as the document control system contact person for the Contractor. That person shall be experienced and trained in the use of MS. All Contractor personnel requesting access authorization must complete the minimum training requirements described below and submit a certificate of completion to the Department. Upon receipt of the request (with training certificate(s) and approval thereof, the Department will issue a username and password to each of the authorized Contractor personnel. The Contractor will ensure that only authorized Contractor personnel access and utilize the control system in a responsible, non-destructive manner. The Contractor shall make every reasonable effort to prevent the disclosure of access information for unauthorized use of the control system. The Department, at its discretion, may revoke access authorization from any user if it is determined that the user: a) has used the control system for any other reason than is intended by this specification; b) is no longer in the Contractor's employ or associated with the project or c) has disclosed their access authorization for use by another person or party for any reason. The Contractor is responsible to ensure their authorized users have access to the public internet from a computer system running any currently supported Microsoft Windows Operating System and Microsoft Internet Explorer Web Browser with a minimum Cipher Strength of 128 bit, version 5.5, 6.0, or 7.0. Minimum modem speed shall be 56K. The Contractor is responsible to ensure that anti-virus software is installed and maintained on any computer accessing the Department's document control system. Additionally, it is the Contractor's sole responsibility to maintain a compatible software system. Compatibility is defined as the ability to send and receive documents in a format viewable by the Department. The Contractor must provide valid individual email addresses for each authorized user to the Department based upon a MAPI compliant email system, such as Microsoft Outlook or Exchange.

Training Requirements: Contractor personnel accessing the document control system must fulfill minimum training requirements as follows: personnel must attend a one (1) day project specific MS training class provided by others. The Contractor must supply an acceptable training facility within 15 miles of the project site. Training facility shall have a computer workstation for each student in addition to a computer for the instructor. The instructor computer must be able to project to a screen/wall for classroom illustrations via a digital projector or large screen monitor (Minimum 40"). The computer workstations must be a minimum Pentium 2 GHz with 512MB of RAM, 200MB free disk space, running Windows XP/2000/NT 4(Service Pack 6). Additional workstation requirements include Microsoft TCP/IP networking protocol and a valid IP address, Microsoft Internet Explorer 5.50 SP2, 16-bit or higher color video, and 800x600 video resolution minimum. Training facility shall have one (1) database server with the minimum specifications of: Pentium, 1 GHz, 512 MB RAM, 1.5 GB free disk space, running Windows 2000/XP Professional/NT 4 (Service Pack 6), or Novell 5.x. and one (1) web server

with the minimum specifications of: Pentium 2 GHz, 1 GB RAM, 200 MB free disk space, running Windows 2000/NT 4 (Service Pack 6), Microsoft TCP/IP networking with a permanent IP address, the port for the web server requests is 80 (the port is configurable, although port 80 is recommended), a local user account (local to the domain) on the server with read rights to the PCM report and forms directories, and access to the database server. Note that the database server and web server cannot run on the same hardware.

Any additional training required as a result of adding additional or replacing existing Contractor staff, including additional costs associated with meeting hardware requirements to run the latest version of the software at that time, shall be included in the total cost of this item.

Submittals: Within thirty (30) calendar days after award, the Submittal Coordinator shall prepare, in accordance with all requirements of this specification, and submit for review and acceptance, a Submittal Forecast and shall have the following requirements attached:

- Submittal Packages Summary Report
- Submittal Bar Chart Report

Method of Measurement: Within ten (10) calendar days of the award of the Contract, the Contractor shall submit to the Engineer for approval a cost breakdown of his lump sum bid price. The submission must include substantiation showing that the costs breakdown submitted are reasonable based on the Contractor's lump sum bid. The cost breakdown shall be in accordance with the following payment schedule:

1) The cost to successfully complete all preparation and training to utilize the document control system in accordance with these specifications. The preparation and training costs shall not exceed 5% of the total cost of the item and shall include costs to establish customized forms or reports, back enter and scan all contract documentation prior to the access authorization, and to furnish and install all specified hardware.

2) The development cost to prepare the Submittal Forecast in accordance with these specifications shall not exceed 5% of the total cost of the item. Payment for this work will be made upon acceptance of the Submittal Forecast by the Engineer.

3) The cost to provide services of the Document Control Specialist, including costs to maintain the Submittal Forecast; Coordinating the Document Control System submittal information with the CPM Schedule submissions; preparing, submitting, utilizing, maintaining, coordinating and updating document control system items as required by all Contractor personnel with access rights to the system Shall be paid as a per month cost and shall be derived by taking this cost divided by the number of contract months.

Basis of Payment: This service shall be paid for at the contract lump sum price for "Document Control Specialist (Minimum Bid)" complete, which price shall include the training, preparation, statusing, electronically scanning, filing, and sending all project correspondence, and the furnishing, maintenance, and supply costs for all required hardware, software, and services as noted above in the utilization of the document control system as established and maintained by

the Department. The lump sum price will be certified for payment as described in "Method of Measurement" subject to the following conditions:

1) Failure by the Contractor to utilize and regularly update the specified MS database in a manner acceptable to the Department or failure to utilize the common file server for the storage of all project related files may result in the withholding of all contract payments until such time as all specification requirements have been satisfied. Failure by the designated Document Control Specialist to update submittal statuses on a regular basis shall result in the replacement of the Document Control Special at the Engineer's request.
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 the continued utilization of the Document Control System which shall be paid at the per month cost for the services of the Document Control Specialist.

Pay Item	Pay Unit
Document Control Specialist (Minimum Bid)	l.s.

ITEM #0969052A - CONTRACTOR QUALITY CONTROL PROGRAM (MINIMUM BID)

Description: Under this item, the Contractor shall furnish the services of one of its management staff to serve as Quality Control Manager (QCM) for the project. The QCM shall have demonstrated experience implementing a QC Program, shall report directly to upper management, and shall have the authority to issue stop work orders. Additional Contractor personnel performing Quality Control Program activities shall be experienced and qualified and adhere to the details of the Program.

The Contractor shall also establish, maintain, and implement a written Quality Control Program tailored to the complexity and scope of the work. The written Quality Control Program shall provide a comprehensive description of the planning, monitoring and reporting program the Contractor intends to implement to ensure and document the quality of the work. The Quality Control Program shall cover, as a minimum, the following elements: Organization, Document Control, Design Control, Procurement Control, Control of Subcontractors, Special Process Control, Inspection, Non-Conforming Items, and Records. The Quality Control Program shall identify and list critical, major, and routine items, which shall be used to differentiate the level of reporting, inspection, and attention throughout the process. The Program shall be designed to minimize deviations from the contract documents in materials or workmanship or both by monitoring and documenting the quality of the Contractor's services, with particular emphasis on the following basic principles:

- Satisfaction of Contract requirements
- Construction conformance with design

The Quality Control Program shall include a method for identifying and resolving any deviations from the Contract while maintaining the Project schedule. The Quality Control Program shall include a method to prevent similar deviations from occurring once a deviation has been identified and resolved.

The additional Contractor Quality Control requirements described in this section are to be used in conjunction with the Department's Standard Specifications Form 816 "Division I General Provisions." The Quality Control Program is neither intended to relieve the Contractor from its responsibility under the Contract, nor to replace the external inspections of the work carried out by, or on behalf of, the Engineer.

The minimum lump sum bid for this item shall be **$500,000** (five hundred thousand dollars)**.** Failure of the Contractor to bid at least the minimum amount will result in the Department adjusting the Contractor's bid to the minimum bid amount for this item.

Submittals

(1) The Quality Control Manager shall be identified by name, in writing, with a resume of qualifications, submitted for acceptance by the Department. The Quality Control Manager shall not be changed without prior written notice to the Department.

The QCM must be an individual with demonstrated experience implementing a QC program and supervising inspectors. This experience shall include at least seven (7) years of Quality Control (QC) background in any combination of the following areas:

- Field inspection experience
- Construction phase experience relevant to the type of work and the scope of this Project
- Previous experience as a Quality Control Professional
- Substitutions allowed – 4 years for Bachelor's Degree in CE, CE Tech., Construction Management, or Construction Engineering; (2 years for Associates Degree in a related field); 4 years for NICET IV certification; (2 years for a NICET III certification)

In addition, the QCM shall have the following special experience:

- Prior supervisory experience
- Documented training in quality control principles

(2) Within forty five (45) calendar day after Contract Award, the Contractor shall prepare and submit for acceptance by the Department, a Quality Control Program, in accordance with all requirements of this Specification. The Engineer reserves the right to audit this Program on behalf of the Department. The Contractor shall modify the Program as needed to meet the requirements of this specification. The Quality Control Program shall be recognized as a flexible program that shall be subject to revisions and amendments, as required, in response to actual Site conditions, work methods, and in response to deviations encountered and corrected throughout the Project.
Sample forms and reports intended to be used to assure compliance with this Specification shall be included with the initial submittal of the Quality Control Program. Samples forms and reports shall include but are not limited to:

- Sample document control tracking form
- Sample design control tracking form
- Sample material receiving inspection report
- Sample inspection forms
- Sample special process control forms
- Sample non-conformance report
- Sample daily and monthly reports

The QCM, Project Manager and Project Executive shall sign the final QC Program submission and any revisions or amendments thereto. Any revisions or amendments made to the QC Program shall be submitted to the Engineer for acceptance.

Subcontractors, fabricators and suppliers, as defined in the QC Program, shall have their own QC Program or an addendum to the Contractor's QC Program, and shall comply with all conditions of this Specification.

(3) The Contractor shall be required to produce and submit to the Engineer on a monthly basis, daily inspection reports as described in Section 10 of this Specification.

The Contractor shall document all methods instituted to ensure compliance with its Quality Control Plan and provide this information to the Department in their monthly submittals.

Construction Methods:

1. Organization

This section shall describe the Contractor's organization, including reporting relationships within and external to the Contractor's organization. The name of the QCM shall be clearly stated and this individual shall report directly to upper management, independent of manufacturing/construction. Duties and responsibilities within the said organization shall be stated. An organizational chart shall be included to graphically depict the Contractor's organizational structure and major reporting lines and relationships. The organization plan shall clearly state the hierarchy between the QCM and upper management and shall define the role of each person in the resolution of QA/QC issues.

2. Document Control

This section shall describe the methods used by the Contractor and the QCM to control the use of the various design documents, shop drawings, procedures, etc. to assure that only the latest reviewed documents are used and are distributed to the individuals performing the Work. Recall of documents which have been superseded or revised shall be implemented. The Contractor shall describe the process used to determine what submittals are required by the Contract and the system used to track these submittals and their current status. The Contractor's submittal schedule required under Contract Item No. 0969049A, "Document Control Specialist(Minimum Bid)," shall be included in the Quality Control Program for reference and use in complying with this section.

3. Design Control

This section shall describe how the Contractor and the QCM controls any Design process (i.e. working and shop drawings), for which it is responsible. This should include the selection of design input data; checking for correctness, completeness, compatibility and format, and reviewing and approving design output documents prior to submission to the Department. When submitting working and shop drawings to the Engineer for review, documentation should be provided with evidence that these documents have been reviewed by the Contractor prior to

submission including sign off from the person responsible for the review and the QCM.

4. Procurement Control

This section shall describe the methods used by the Contractor and the QCM to assure that all materials/equipment purchased for the Work are as specified. Included shall be provisions for the review of purchase documents to assure that correct details have been specified, including specification, grade, type, color, or other aspects as required by specifications and drawings. The Contractor shall describe receiving inspection activities performed, to determine that the correct material/equipment has been delivered. This activity shall be documented on a "Material Receiving Inspection Report" and shall include documentation of inspections performed and review of material test reports, certificates of conformance or other documentation required by the Contractor. A list of items requiring a Materials Certificate and/or Material Certified Test Report will be developed by the Contractor and approved by the Engineer. The "Material Receiving Inspection Report" will include the Materials Certificate and/or Material Certified Test Report for all these items.

As a minimum, receiving inspections will be performed on the following materials:

- Materials requiring a Certificate of Compliance
- Source Controlled Material not inspected at the manufacturer
- Job Controlled Materials (other than concrete, bituminous and soils) which require tracking for testing or payment purposes
- Equipment that is to be incorporated into the work.

After completion of receiving inspection activities, the form, along with associated documents, shall be submitted to the Engineer.

5. Control of Subcontractors, Fabricators and Suppliers

Subcontractors, fabricators and suppliers, as defined in the QC Program, shall have their own QC Program or an addendum to the Contractor's QC Program, which shall comply with all conditions of this Specification. The Contractor shall be responsible for reporting on QC activities performed by subcontractors, fabricators and suppliers working on routine items to assure compliance with this Specification.

It is the Contractor's responsibility to notify all subcontractors, fabricators, and suppliers of the specification requirements of the various Contract Documents. This section shall describe the methods used by the Contractor and the QCM to assure that all the applicable requirements of the Contract are passed on to the subcontractors, fabricators and suppliers. Included in this section are the methods used by the Contractor and the QCM to monitor and control the quality of the work performed by subcontractors, fabricators and suppliers, and obtain the required quality records.

For fabrication under the terms of the Contract, the Contractor must notify the Engineer as to the source of supply and place of fabrication, including component parts. In order to assign inspection personnel, it will be necessary that the notification include the date of beginning of

fabrication and the date the material is to be delivered to the project. Any material requiring inspection which is fabricated without notification or approval shall not be incorporated into the Work. Properly documented mill test reports must be furnished by suppliers. The Contractor must be aware that the governing specifications prohibit the start of fabrication prior to the submission and review of shop drawings.

6. Inspection

This section shall describe how the Contractor and the QCM will assure that the specified quality of materials and workmanship has been achieved. The Contractor's program is not related to any inspection carried out by the Engineer on behalf of the Department. Inspection will include the identification and tracking of the quality characteristics (metrics) used to verify that the level of quality of materials and workmanship conforms to the requirements of the Contract. The Contractor shall describe the system, including but not limited to, checks, inspections, surveillances, or a combination of such methods, to assure that all materials and workmanship are in conformance with the Contract. The Quality Control Program shall identify the reporting requirements for each, and these reporting requirements will be subject to approval of the Engineer.

The QCM shall be familiar with all aspects of the Work and no work shall be performed on the Project without the knowledge and oversight of the QCM. The Quality Control Program shall define specific means and methods that will be employed to minimize, identify, resolve and prevent similar deviations from the Contract in regards to materials and and/or workmanship. Quality control reporting forms shall be developed to document the work performed by the QCM and related staff. The forms shall be signed by supervisory field personnel and the QCM to document conformance for the work being performed. All work performed by the QCM and related staff shall be documented and included in the QCM's monthly reports.

A quality control report shall be implemented for a specific item when necessary, as determined by the QCM or the Engineer. The Quality Control Program shall include specific guidelines for each of these items to show means and methods that will be employed to minimize, identify, resolve and prevent similar deviations from the Contract in regards to materials or workmanship or both. All work performed by the QCM and related staff shall be documented and included in the QCM's monthly reports.

7. Special Process Control

This section shall describe the measures used to assure that any special processes such as but not limited to: welding, high strength bolting, nondestructive examination, critical coatings, surveys, control of critical tolerances, etc., are controlled by procedures that are described in and comply with the Contractor's approved QC Program, and that the results are properly documented and in conformance with the Contract. In addition, where required by item specification, the process, personnel, and equipment shall be qualified prior to the work activity; the Contractor shall describe the method used to verify, document and track these requirements.

8. Non-Conforming Items

This section shall describe the protocol(s) for correcting any material or workmanship or both not in compliance with the contract documents, and the reporting requirements for documenting any non-compliance and subsequent corrective measures and issue resolution. The Contractor shall implement the use of non-conformance reports to document actions taken to identify, resolve and prevent similar deviations. The non-conformance reports shall include signatures of the responsible persons for each process of the corrective action taken. Upon resolution of a non- conformance issue, the Quality Program shall be revised to identify preventive measures that will be taken to prevent similar deviations. Supervisory field personnel involved in the work shall be informed of any changes implemented to avoid similar deviations.

Non-Compliance Notices issued by the Engineer shall be addressed and resolved to the satisfaction of the Engineer. Upon resolution, the Quality Program shall be revised to identify preventive measures that will be taken to prevent similar deviations. Supervisory field personnel involved in the work shall be informed of any changes implemented to avoid similar deviations.

This section shall also include the provisions for Department or Engineer participation in such resolution when disposition decisions are beyond the competence or authority of the Contractor.

9. Records

This section shall describe how various records generated by the Contractor are originated and maintained, received, filed, protected, and authenticated. Quality Control Records required for submittal to the Engineer shall be described. Record retention of five (5) years after acceptance of the Contract shall be documented.

10. Reporting

QA/QC Inspection Reports: The Contractor shall be required to produce and submit to the Engineer, monthly inspection reports in accordance with all requirements of this Specification. The monthly reports shall include the daily inspection reports for that month, as well as other
reporting documents as specified under this item. The Quality Control Program shall clearly define what information is to be provided as part of the monthly reports.

Daily reports shall include documentation of all activities performed by the QCM and other personnel specific to this Specification. Any forms utilized relative to this Specification shall be included with daily reports.

The monthly reports shall include a summary of work performed related to this Specification with attention to document control, design control, procurement control, control of subcontractors, special process control, inspection and non-conforming items. For any month that a non-conformance report is issued, either by the Contractor or the Engineer, actions taken to resolve the non-conformance report shall be reported. Updates in the monthly report shall continue until the non-conformance report is resolved. Once resolved, the monthly report shall

document that supervisory field personnel involved in the work have been informed of any changes implemented to avoid similar deviations. Any revisions or amendments made to the QC Program shall be documented in the monthly report, once submitted and accepted by the Engineer.

Monthly reports shall include a one (1) month "look ahead" with expected QC efforts and procedures for critical, major and routine items.

Monthly reports shall be submitted to the Engineer by 12 PM on the Tuesday following the month of the inspection reports, or as agreed to by the Engineer. Except as otherwise authorized by the Engineer, submissions after that time are considered late.

Monthly reports shall be submitted to the Engineer by the fifth (5^{th}) business day each month. Except as otherwise authorized by the Engineer, monthly submissions after the due date are considered late.

QA/QC Meetings: Meetings will be held specific to the Quality Control Program. The Contractor, represented by at least the QCM, shall participate with the Engineer, bi-weekly or at the Engineer's request, in the review and evaluation of all items related to this Specification.

Method of Measurement: Within forty (40) calendar days of the Award of the Contract, the Contractor shall submit to the Engineer for approval a cost breakdown of the lump sum bid price. The submission must include substantiation showing that the cost breakdowns submitted are reasonable based on the Contractor's lump sum bid. The cost breakdown shall be in accordance with the following payment schedule:

1. The development costs to prepare the Quality Control Program shall not exceed twenty percent (20%) of the total cost of the item.

2. The cost to provide the services of the Quality Control Manager and implement the Quality Control Program, including costs for all inspections, monitoring, inventory, daily logs, reports, meetings, record keeping databases, and all materials, equipment, labor and work incidental to this service shall be paid as a per month cost and shall be derived by taking this cost divided by the number of Contract months.

Upon approval of the payment schedule by the Engineer, payments for work performed will be made as follows:

1. Upon acceptance of the Quality Control Program, the lump sum development cost from the payment schedule will be certified for payment.

2. Upon receipt of the reports required each month as per this Specification, the per- month cost for "Contractor Quality Control Program" will be certified for payment.

Basis of Payment: This service will be paid for at the contract lump sum price for "Contractor

Quality Control Program (Minimum Bid)" complete, which price shall include all inspections, monitoring, inventory, daily logs, reports, meetings, record keeping, and all materials, equipment, labor and work incidental to this service. The lump sum price will be certified for payment as described in "Method of Measurement" subject to the following conditions:

1. Failure of the Contractor to provide a Quality Control Manager or Quality Control Program, as required by this Specification, will result in a five percent (5%) reduction to the monthly payment for each day that is not covered as required by this Specification. A day is defined as any twenty four (24) hour period, or any portion thereof. The total deduction for any calendar month may exceed the monthly payment for the item.

2. Any monthly QA/QC report that is submitted late, without authorization from the Engineer, will result in a one percent (1%) per day per report reduction of the entire Contractor Quality Control Program monthly payment for each day that the report has been submitted late, up to a maximum of twenty percent (20%) of the monthly payment per report.

3. Should the Contractor fail to continuously provide a Quality Control Manager or Quality Control Program including all reports, as required by this Specification, the Engineer may withhold all Contract payments until such time as all requirements are satisfied. All Contract payments may be withheld when either of the following conditions apply:

   a. If the deduction under 1 or 2 or both above exceeds the monthly payment for the item in any calendar month
   b. If deductions under 1 or 2 or both above exceed ten percent (10%) of the monthly payment for the item for any three (3) months in any twelve (12) month period.

4. Failure by the Contractor to comply with the requirements of this Specification will result in the replacement of the Quality Control Manager at the Engineer's request.

5. Only one (1) monthly payment will be made for each calendar month regardless of the number of personnel required to complete the specified work.

6. In the event the project extends beyond the original Completion date by more than thirty (30) calendar days, and if a time extension is granted to the Contractor, the Department may require the continuation of the "Contractor Quality Control Program" which will be paid at the per-month cost for "Contractor Quality Control Program".

Pay Item	Pay Unit
Contractor Quality Control Program (Minimum Bid)	l.s.

ITEM #0969202A – CLASS B OFFICE

Description: Under this item, office quarters will be located, leased, built out and furnished by the Contractor, for the use of CTDOT and other personnel engaged in the Reconstruction of I-84 in Waterbury. The Class B Office shall be located convenient to the project corridor at a location approved by the Engineer.

It shall be separated from any office occupied by the Contractor. The Class B Office shall conform to the standards for Class B office space and shall be approved by the Engineer. It shall provide a minimum of 10,000 square feet of floor space and shall be built out as shown on a building floor plan as provided by the Engineer. Specific details and requirements of the office space, build out, furnishings, equipment, building services including security and maintenance shall be as specified by the Engineer.

The lease shall be transferable and renewable so that the Class B Office can be maintained for the duration of the program or as determined by the Engineer.

Prior to leasing, build out and furnishing any office space under this Item, the Contractor shall obtain and submit to the Engineer a minimum of three quotes conforming to the requirements in Appendix A. The Contractor shall submit quotes to the State within 10 days of Award of the Contract. The Engineer will review the quotes submitted and respond in writing within 10 days of receipt of the quotes.

Method of Measurement: The sum of the 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 only for the actual costs incurred for the Class B Office. 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 bid for the contract.

Basis of Payment: The item "Furnish Class B Office" shall be paid for in accordance with Section 1.09. The Administrative Expense specified in subparagraph (e) shall be limited to 5% on the cost of the lease.

APPENDIX A

I. INTRODUCTION

The State of Connecticut, Department of Transportation (State) will accept lease proposals/site offerings from property owners (Owner) or their representative(s) to lease usable office space with on-site, reserved, paved and lighted parking for vehicles for use and occupancy by the Department of Transportation and it's consultants for a term of three (5) years, with one (1) or two (2) six (6) month renewal options. The term of the lease will start on or about October 1, 2014. Offers from option holders cannot be considered. The premises must be accessible to handicapped individuals and public transportation. Preference will be given to proponents offering renewal options.

II. SPACE REQUIREMENTS

A. Minimum Net Usable Office Space: The State will require the following minimum square feet of net usable office space as part of the lease. The space provided shall have a minimum ceiling height of 8 feet. The Owner shall describe in the proposal response how they will provide each of these requirements.

1. The State will require a base amount of 10,000 square feet of net usable office space.

B. Minimum Number of Parking Spaces: The State will require the following minimum number of on-site, paved and lighted parking spaces as part of the lease agreement. The owner shall describe in the proposal response how they will provide each of these requirements.

1. The State will require forty (40) reserved parking spaces as described above plus parking capacity at the building for an additional thirty (30) visitors.

2. Handicapped accessible parking spaces, as required by State and local ordinances, shall not be included in the calculation of the number of parking spaces provided to the State under this requirement.

C. Location: The office space shall be located within close proximity to the project corridor. The office space shall be located no more than one (1) mile from the Project Site.

III. OFFICE RENOVATIONS

As part of the lease agreement, and included in the square foot price, the owner shall improve the area to be occupied by the State to provide the following base requirements:

A. Suitable office space to a minimum of Class B Office standards, for the purpose of conducting consulting engineering practice.

B. The space shall be furnished with new carpeting, paint, and window treatments.

C. The space shall provide a minimum of twenty (20) offices. Offices shall be approximately 160 square feet each and each shall be provided with a door.

D. The space shall provide a minimum of two (2) common rooms suitable for a minimum of 10 cubicles per room.

E. The space shall provide a minimum of three conference rooms with one approximately 500 square feet and others approximately 200 square feet each.

F. The space shall provide a kitchenette area with a countertop area including a sink, with outlets for microwave and refrigerator. Area shall be approximately 150 square feet.

G. The space shall provide a minimum of one computer server storage rooms with a minimum of 100 square feet each. Server storage rooms shall be fireproof, air-conditioned and supplied with locking doors and dedicated electrical outlets.

The owner shall coordinate with appropriate individuals within the State to ensure desired work is in accordance with State's needs. The owner will be responsible for preparing and furnishing drawings and specifications for the improvements, ensuring their compliance with all governing federal, state, and municipal laws, ordinances, rules, regulations, and orders relative to property, environmental, and health and safety matters as part of the improvements. The base renovations shall be completed no later than 4 weeks after the signing of the lease.

IV. ADDITIONAL LEASE CONDITIONS

A. Quotes: Quotes provided shall include a price per square meter for leasing the base space amount, including the base renovations listed herein. Additional prices shall be provided for the two options to lease additional space specified herein, including the base renovations listed herein.

B. Transfers: The lease holder shall be a construction Contractor currently retained by the State to perform work under a current State Construction Project. The lease shall be transferable to subsequent construction Contractors retained by the State, as required. The tenant, the State of Connecticut and its consultants, will remain as the tenant for the duration of the lease. The timing and number of the transfers of the lease shall vary.

C. Security Deposit: The owner shall not request a security deposit as a condition of the lease. D.

Increases: Any yearly percentage increases in the square foot price shall be specified as part of the proposal submitted.

E. Utility Costs: Utility costs shall be included in the square foot price. For any utility cost not included in the square foot price (electricity, HVAC, water, etc.) the owner shall provide estimated costs per square foot based on past history for the building or space proposed.

V. SECURITY REQUIREMENTS

A. The office space provided shall be located within a building with a 24 hour, full-time security system. The space provided to the State shall be provided within a separate zone of this system so as to allow the zone to be activated/deactivated at the States discretion.

B. The building shall be provided with a security guard at the main entrance to the building. The guard shall be present during normal business hours, with a minimum of 8 a.m. to 4 p.m. Monday through Friday, with the exception of holidays.

C. The State and its consultants shall have access to the space 24 hours a day, 7 days a week, 365 day per year, including holidays.

VI. BUILDING MAINTENANCE/OPERATIONS

A. The owner shall provide all required building operation activities and services, including repairs and maintenance (including preventative).

B. The owner shall provide building custodial services and cleaning to include a high standard of cleanliness, including rubbish removal and recycling (in accordance with State regulations).

C. The owner shall provide parking allocation and control, as well as snow and ice removal.

D. The owner shall assure compliance with all health and safety related issues such as, but not necessarily limited to, building code requirements, fire code requirements, OSHA requirements, indoor air quality issues, and general building occupant safety, including conducting fire drills and developing, posting, and training occupants concerning building evacuation plans.

E. Restrooms made available to tenants under the lease shall meet current Americans with Disabilities Act (ADA) code requirements and not be grandfathered under the code.

F. The owner shall provide a plan for ensuring compliance with Connecticut Public Act 07-124, "An Act Concerning the Inspection and Evaluation of Air Quality in State Buildings".

G. The owner shall provide as part of the proposal a description of the elevators within the building available for tenant use.

H. The owner shall provide as part of the proposal a description of the telecommunications currently provided to the building.

I. Electrical service requirements: Electricity Service provided to the premises will be no less than six watts per square foot (exclusive of electrical capacity needed to service base building HVAC). Electrical service shall be a minimum of 120/240 volt, 1 phase, 3 wire.

J. HVAC requirements: Heating, ventilation, and air conditioning ("HVAC") will be provided as required for the comfortable use and occupancy of the premises at all hours At all times when HVAC is to be provided under this lease, the HVAC system provided shall be sufficient to maintain conditions in the premises to not more than 25C (78°F) during warmer seasons nor less than 20C (69°F) in colder seasons.

K. Lighting: All lighting shall be in working order and shall be sufficient to provide a minimum of 1075 lux (107 foot-candles) at desk level height.

ITEM #0969205A – CLASS B OFFICE SUPPLIES (MONTH)

Description: Under this item, the Contractor will provide supplies and furnishings for the Class B Office quarters used by ConnDOT and other personnel engaged in the Reconstruction of I-84 in Waterbury for the duration of the project.

Supplies and furnishings for the Class B Office shall be provided for the duration of the contract.

Materials: Materials shall be in like new condition for the purpose intended and shall be approved by the Engineer.

Office Requirements:

The Contractor shall provide the following additional new supplies, equipment, facilities, and/or services at the Class B Office on this contract to include at least the following to the satisfaction of the Engineer:

40 - Office desks (36" by 60") with L-shape return (24" x48"), with drawers, locks, and matching high-back desk chairs with arms that have pneumatic seat height adjustment and dual wheel casters on the legs or base.

80 - Office Chairs

2 - Standard secretarial type desk and matching desk chair that has pneumatic seat height adjustment and dual wheel casters on the legs or base.

1 - Conference table, 44in x 20 ft (nominal).

2 - Conference table, 44in x 12 ft (nominal).

40 - Conference table chairs, medium back padded, swiveling with casters.

16 - Fire resistant cabinets (letter size/4 drawer), locking.

10 - Non-fire resistant cabinets (letter size/4 drawer), locking.

6 - Drafting, type tables each 3 ft x 6 ft, self-supported.

6 - Drafters' stools.

2 - Flat file (4/drawers).

2 - Heavy Duty Stapler, capable of 160 sheets, minimum

2 - Heavy Duty 3 hole punch

2 - Multifunction color copier/scanner/facsimile/printer machine with auto document feeder and sorter/stapler. All supplies, paper and maintenance shall be provided by the Contractor. Specified below under Computer Hardware and Software.

36 - Personal computer tables – 6 ft x 2.5 ft size and quality for the purpose intended.

1 - 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 - Electronic office type printing calculators capable of addition, subtraction, multiplication and division with memory and a supply of printing paper.

3 - "POD" style conference room telephone. (I.e. Polycom SoundStation 2 Conferencer) with remote external microphones

46 - Desktop computer systems as specified below under Computer Hardware and Software.

4 - Black and White Laser printers and supplies as specified below under Computer Hardware and Software.

2 - Color Laser printer and supplies as specified below under Computer Hardware and Software
1 - HP Design Jet T2300 – Full size color printer plotter scanner inc. paper and ink supplies.
2 - SMART Board 885ix interactive whiteboard system with speakers (includes an interactive white board and projector) or equivalent. Including all necessary software and installation accessories as needed.
1 - Dell 1610 HD Projector with HDMI connector cables
2 – Projector screens (1-free standing 65", 1-100" hanging screen complete with mounting hdwre)
1- Logitech BCC950 Conference Cam – or equivalent
1- 70" 1080P LED 120hz Television with Wall mount and all cables necessary to accommodate video conferencing

10 - Digital Camera and supplies as specified below under Computer Hardware and Software.
42 - Wastebaskets - two 30 gal and forty 5 gal.
42 - Recycling Bins. (two large, forty five 5 gal)
1 - Cross-cut paper shredder, commercial grade.
2 - Electric pencil sharpeners.
25 - Wall clocks.
* - 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.
2 - First Aid kit.
20 - Tables - 3 ft x 6 ft.
15 - Cubicles - 6 ft x 6 ft, soundproof type, portable and freestanding.
10 - Vertical plan racks for 2 sets of 2 ft x 3 ft plans for each rack. Inc all necessary plan clamps
2 - Double door supply cabinet with 4 shelves and a lock - 6 ft x 4 ft.
4 - Easel/Chalkboard
40 - Open bookcases - 4 shelf - 3 ft long.
5 - Infrared Thermometer, including certified calibration, case, cleaning wipes.
5 - Concrete Air Meter as specified below under Concrete Testing Equipment.
5 - Concrete Slump Cone as specified below under Concrete Testing Equipment.
1 - The latest version of Primavera Contractor software (deluxe version or equivalent, capable of servicing 2000 or more activities) with associated data pack, including Oracle technical support for the duration of the Contract, licensed to ConnDOT. The software is to remain the property of the Engineer at the conclusion of the Contract.
1 - Set of the following building and fire codes, consistent with the Contract Documents, to remain the property of the Engineer at the conclusion of the Contract:
International Building Code with the State Building Code, including latest Connecticut Supplement.
International Plumbing Code International
Mechanical Code International Existing Building
Code International Energy Conservation Code
NFPA 70 National Electric Code ICC/ANSI
A117.1
The Fire Safety Code, including latest Connecticut Supplement
International Fire Code NFPA 1
Uniform Fire Code NFPA 101 Life

Safety Code
"Americans with Disabilities Act Accessibility Guidelines"

1 - Set of the following Means books, updated throughout the Contract life, to remain the property of the Engineer at the conclusion of the Contract:
"Building Construction Cost Data" "Heavy
Construction Cost Data" "Electrical
Construction Cost Data" "Plumbing
Construction Cost Data" "Mechanical
Construction Cost Data"

The furnishings and equipment required herein, except as noted above, 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. Computer Hardware and Software:

Before ordering the computer hardware and software, the Contractor must provide a copy of their proposed PC specifications to the CDOT Project Engineer for review by the CDOT 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 CDOT Data Center, 2710 Berlin Turnpike, Newington, CT, where it will be configured and prepared for field installation. Installation will then be coordinated with 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 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) Computer – Minimum Specification:
Processor – Intel® Core 2 Duo Processor (2.00 GHz, 800 MHz FSB 2MB L2 Cache) Memory – 2 GB DIMM DDR2 667MHz.
Monitor – Dual 24.0 inch LCD color monitors.
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 Professional
- See exceptions noted above for Primavera Contractor and other additional software

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) Black and White Laser Printer – Minimum Specification:
Print speed – 35 ppm.
Resolution – 1,200 x 1,200 dpi.
Paper size – Up to 216 mm x 355 mm (8.5 in x 14 in). RAM – 128 MB.
Print Drivers – Must support HP PCL6 and HP PCL5e. Printer cable – 1.8 m (6 ft).
Capable of automatic duplex printing (two-sided)

Note B1: Laser printer brand is limited to Hewlett-Packard only. The CTDOT 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.

C) Color Laser Printer – Minimum Specification:
Print speed – 17 ppm.
Resolution – 600 x 600 dpi.
Paper size – Up to 216 mm x 355 mm (8.5 in x 14 in). RAM – 64MB.
Print Drivers – Must support HP PCL6 and HP PCL5e. Printer cable – 1.8 m (6 ft).
Capable of duplex printing (two-sided)

Note C1: Color Laser printer brands is limited to Hewlett-Packard 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.

D) Multifunction color copier/scanner/facsimile/printer machine:
Copy speed – 20 ppm.
Resolution – 600 x 600 dpi. Paper size – Up to 12 in x 18 in
Print Drivers – Must support HP PCL6 and HP PCL5e. Printer cable – 1.8 m (6 ft).
Capable of duplex printing (two-sided)

Note D1: Multifunction brands are limited to Savin 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.

E) Digital Camera – Minimum Specification:
Optical – 10mega pixel, with 3x optical zoom.
Memory – 32 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.

Turbidity Monitoring

Provide 1 Turbidity Meter meeting the requirements of Hach 2100Q Handheld Turbidity Meter or approved equal.

Insurance Policy: The Contractor shall provide a separate insurance policy, with no deductible, in the 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.

Method of Measurement: The providing of supplies and furnishings for the Class B Office will be measured for payment by the number of calendar months that supplies and furnishing are provided to the Class B Office under this contract, measured to the nearest month.

Basis of Payment: The providing of supplies and furnishings for the Class B Office will be paid at the listed unit price per month for "Class B Office Supplies (Month)", which price shall include all material, equipment, labor, and work incidental thereto.

Any items not covered under this provision required for the operation of the Class B Office will be paid for as Extra Work as defined under Section 1.09.

Pay Item	Pay Unit
Class B Office Supplies (Month)	Month

ITEM #1008015A - 50 MM RIGID METAL CONDUIT – SURFACE

ITEM #1008017A - 75 MM RIGID METAL CONDUIT – SURFACE

ITEM #1008112 – 25 MM RIGID METAL CONDUIT

ITEM #1008115A - 50 MM RIGID METAL CONDUIT - IN TRENCH

ITEM #1008117A - 75 MM RIGID METAL CONDUIT - IN TRENCH

ITEM #1008215A - 50 MM RIGID METAL CONDUIT – UNDER ROADWAY

ITEM #1008791A – 100 MM PVC MULTIDUCT CONDUIT – IN MEDIAN

DESCRIPTION:

The mainline conduit shall be a 4" (100 mm) multiduct conduit system designed and engineered for direct burial and protection of optical fiber cable. The multiduct concept shall maximize duct usage by compartmentalization of cables for current requirements and for future expansion.

For the 100 mm PVC conduit, the Contractor shall be required to install the conduit **simultaneously** with the pullboxes to insure that the conduit innerduct on each side of the pullbox is at exactly a 90-degree angle to the side of the pullbox. For Rigid Metal Conduit under Roadway, the Contractor shall be required to install the conduit simultaneously with the installation of the pullboxes. For Rigid Metal Conduit under Roadway, the Contractor shall be required to install a minimum of 10 feet (3.0 meters) of Flexible Conduit on each side of the pullbox to insure that the innerduct enters the pullbox at exactly a 90 degree angle to the side of the pullbox. **The cost of the Flexible Metal Conduit shall be included in the cost of the appropriate conduit item; it shall not be paid for separately. The required installation is shown on the IMS details. The required length of Flexible Metal Conduit on each side of a structure shall be as shown on the appropriate detail.**

The mainline conduit shall contain four (4) factory installed 1.25" (30 mm) PVC inner-ducts within a 4" (100 mm) outer-duct. Conduit under road, and as noted on the plans, shall be Rigid Metal. Conduit in trench and in the median, and as noted on the plans, shall be 4" (100 mm) Polyvinyl Chloride.

The 2" (50 mm) RMC conduit shall be used for mainline optical fiber cable, branches off the mainline conduit, telephone service and electrical service as indicated on the plans. The 2" (50 mm) RMC – Surface used as risers on utility poles shall include an entrance fitting (weatherhead) at the top termination of the conduit run as indicated on the plans. The 3" (75

mm) conduit shall be used for utility service for CCTV cameras and variable message signs as indicated on the plans.

As part of this item, the Contractor will be required to test the integrity of the conduit with a poly-line and to install a pull tape in each and separate innerduct as required in the specification.

Work under the above items shall conform to Public Utility Commission Rules and Regulations, where applicable, and to Section 10.08 of the standard specifications, supplemented and amended as follows:

MATERIALS:

A. General:

The multi-cell conduit system shall be a pre-assembled conduit manufactured from a 4" (100 mm) round outerduct containing four (4) factory installed innerducts. The innerducts shall be held together in a square configuration by a system of spacers, bands, or other mechanism. The coupling system shall be resistant to water infiltration, air loss during cable installation, and shall be capable of locking the system tightly together to not allow free twisting of the innerducts.

The conduit shall be free from defects including non-circularity and foreign inclusions. It shall be nominally uniform (as commercially practical) in color, density, and physical properties. It shall be straight and the ends shall be cut square to the inside diameter. Polyvinyl Chloride (PVC) conduit shall be Type 40 grade conforming to Section M.15.09 of the standard specifications. Rigid Metal Conduit shall be galvanized steel also conforming to Section M.15.09 of the standard specifications. The PVC conduit shall include a grounding wire conforming to Article M.15.13 of the standard specifications. PVC conduit and fittings shall be supplied with an ultraviolet inhibitor.

B. PVC Outerduct:

The complete PVC Type 40 Multi-cell conduit system shall be UL Listed, designed and engineered for direct burial or encased underground applications. Protective outer-duct shall be 4" (100 mm) PVC Type 40 with extended 6" (150 mm) integral bell end and have a lay length of 20 feet (6.1 m). The outer-duct shall have a longitudinal running print line to assure proper innerduct orientation and alignment. This line shall consist of the following wording: "INSTALL THIS SIDE UP – Connecticut D.O.T. Cable – For Assistance Call 860-594-3447". The outer-duct shall be marked with data traceable to plant location, date, shift, and machine of manufacture.

The outer-duct shall have a circumferential ring on the spigot end of the ducts so as to provide a reference point for ensuring the proper insertion depth when connecting conduit ends. Both ends of the conduit shall be capped to protect inner-duct during shipment and job site storage.

The PVC conduit system to be utilized shall be a complete system and the Contractor shall provide the following fittings:

- Coupling Kits
- Terminator Kits
- Lubrication Fittings
- Repair Kits
- Installation Accessories

A complete line of fittings, adapters, and elbows shall be available and shall be manufactured from the same materials and manufacturing process as the conduit. The multi-cell conduit shall be joined by use of a coupling system that effectively seals the outerducts and innerducts but allows for expansion or contraction in the system. A silicone non-petroleum base lubricant may be used for assembly of the multi-cell conduit.

All conduit entering and exiting conduit termination points shall have a terminator installed that is made of PVC with an anti-reversing gasket that prevents ingress of water and debris into the outer conduit and the innerduct.

C. Couplings:

The PVC coupling body shall allow for transitions from PVC conduit to RMC conduit to Flexible Sweeps and any combination thereof. The coupling body shall have a factory assembled, multi-stage gasket that is anti-reversing for sealing both the outer and inner-duct. A secondary, mid-body gasket shall be seated at the shoulder of the bell to assure 100psi (690 kPa) air pressure (in accordance with Bellcore GR-2884 Issue 1) and watertight integrity with minimum joint infiltration of 6 psi (41 kPa). This will allow for the use of Air-Jet technology to be used in the placing of cables. The PVC conduit system shall be designed so that both straight sections and fittings will assemble without the need for cement or glue.

The coupling body shall be designed so that when the conduit is joined, the outer walls of the innerducts and the inner walls of the outerduct shall be sealed, providing an airtight seal from within the innerduct system and a watertight seal from the outside of the outerduct. The coupling body shall be tested for water tightness and air-tightness in accordance with Bellcore GR-2884-CORE Issue 1, July 1995 (R3-41 for water-tightness and R3-43 for air-tightness). The coupling body shall conform to the following requirements:

Watertightness: 6 psi (41 kPa) minimum
Air Tightness: no significant leakage at 100 psi (690 kPa)

The system shall be designed so that expansion and contraction of the inner-duct shall take place in the coupling body, and the fittings shall allow going from steel to PVC without compromising air/water tightness, or pulling capabilities. The coupling body shall be factory assembled in the bell end of the outer duct and shall be manufactured from high impact engineered thermoplastic.

The coupling body face shall be supplied with lead-ins to facilitate assembly. The coupling body shall have each conduit entrance identified with a raised number and the white inner duct locator conduit entrance shall have raised ribs that can be felt through a glove.

The PVC system shall be designed so that the assembly of components can be accomplished by inserting the spigot end into the male bell end to the marked insertion depth. (The insertion depth is marked on the spigot end)

D. Sweeps:

The PVC conduit system shall offer a complete line of fixed and flexible sweep-bends with system compatible bell and spigot ends. The PVC conduit system shall offer and the Contractor shall utilize the following standard fixed sweep-bends:

Radius	Bend	System
4 ft & 3 ft. (1200mm & 900mm)	11.25°, 22.5°, 45°, 90°	4-way

Note: Direction changes shall not exceed 90 degrees.

The flexible sweep-bend shall be supplied in two lengths to meet field requirements. They shall have a PVC outer jacket and be acceptable for exposed and direct burial installation. The inner-duct shall extend 6" out of the spigot end of the flexible elbow. Once the elbow is bent to the proper angle, the innerducts shall be trimmed to the proper length for insertion to the bell end. PVC inner ducts shall not be allowed in bend and sweeps.

Length Feet (Meters)	**Radius** Feet (Meters)	**Bend** degrees (°)	**System**
10 (3.2)	4 (1.2) min	0-90	4-way
10 (3.2)	6 (1.8)	0-70	4-way
10 (3.2)	9 (2.7)	0-55	4-way
16 (4.9)	4 (1.2) min	0-90	4-way
16 (4.9)	6 (1.8)	0-70	4-way
16 (4.9)	9 (2.7)	0-55	4-way

All bends, including flexible sweeps, shall have a minimum radius of 3 ft. (900 mm). The inner-duct system shall be solvent welded to the coupling body; supported by a moveable spacer every 4 ft. (1.32 m). The bends shall not violate the minimum bending radius of the fiber optic cable.

All bends shall have nylon inner ducts, or approved equivalent, installed to prevent burn-through in accordance with test procedure outlined in Bellcore GR-2884 Issue 1 Section R3-35 and R3-36.

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E. Innerduct:

The inner-duct in straight lengths shall be manufactured from PVC or high density polyethylene (HDPE). Innerducts shall be factory treated with atomized silicone or manufactured in a manner to reduce friction during pulling of fiber optic cable.

Innerduct to be used in bends and sweeps shall have a minimum burn through time of 90 minutes when tested in accordance with Bellcore GR-2884 Issue 1 Section R3-35, and R3-36.
PVC inner ducts shall not be allowed in bends and sweeps.

The innerducts shall have a permanent dry lubricant extruded within the inner wall and shall incorporate longitudinal ribs within the inner wall. The innerducts shall have a nominal size of 1.25" (30 mm) and shall consist of 4 unique colors: white, red, orange, and yellow. Innerduct colors shall be oriented in a clockwise direction as specified above, looking at the spigot end of the multi-cell conduit system. The white innerduct shall be located directly under the print line on the outerduct.

Each inner-duct shall be sealed with an expanding Neoprene Plug that withstands 22 psi (150 kPa) and seals the inner-duct from water and debris infiltration, and a provision for tying off a pull line.

F. Steel Outerduct:

All components of the conduit system shall meet or exceed the following specifications and standards:

1. ASTM A 36. Standard Specification for Structural Steel.
2. ASTM A 53. Standard Specification for Steel Pipe.
3. ASTM A 570 Standard specification for Steel.
4. ASTM A 479 Standard Specification For Stainless Steel.

In addition, the steel outer duct shall conform to the following industry standards:
NEC Article 346
ANSI C80.1
U.L. 6

The conduit system shall be a complete system with all the following fittings:

Manhole Terminator Kits
Deflection Fittings
Offset Fittings
Expansion/Contraction Fittings
Lubrication Fittings

Repair Kits
Installation Accessories
Steel to PVC Sched. 40
Steel PVC-Coated Flexible Elbows
Stand Off Fittings
Entrance Fittings

Galvanized outer-duct shall be hot dipped galvanized inside and out; conduit shall be smooth and free from burrs and coated with rust inhibitor.

Rigid steel shall be supplied in 10 foot (3-meter) lengths with a length tolerance of +/- ½ " (10mm) and shall be Schedule 40 minimum. Conduit shall be supplied with thread protectors.

Each section of steel conduit shall be supplied with one reversing spin coupling that allows straight sections and fittings to be joined without spinning the conduit. The reversing coupling shall be galvanized and have three set screws to lock the coupling in place.

The Steel Outerduct system shall be designed so that the assembly of components can be accomplished in the following steps:

a. Loosen set screws on coupling spin back to allow for insertion
b. Insert male into female and spin coupling forward to bottom
c. Once the spin coupling is installed, there shall be no threads visible on the 4" (100 mm) steel conduits.
d. Tighten set screws

The Steel conduit system shall offer a complete line of fixed and flexible sweep-bends with system compatible bell and spigot ends. The Steel conduit system shall offer and the Contractor shall utilize the following standard fixed sweep-bends:

Radius	Bend	System
4 ft & 3 ft. (1200mm & 900mm)	11.25°, 22.5°, 45°, 90°	4-way

Note: Direction changes shall not exceed 90 degrees.

The flexible sweep-bend shall be supplied in two lengths to meet field requirements. They shall have a steel core with a PVC outer jacket and be UL Listed for exposed and direct burial installation. The inner-duct shall always remain flush to the end of the flexible elbow, even when bending. PVC inner ducts shall not be allowed in bend and sweeps.

Length Feet (Meters)	Radius Feet (Meters)	Bend degrees (°)	System

10 (3.2)	4 (1.2) min	0-90	4-way
10 (3.2)	6 (1.8)	0-70	4-way
10 (3.2)	9 (2.7)	0-55	4-way
16 (4.9)	4 (1.2) min	0-90	4-way
16 (4.9)	6 (1.8)	0-70	4-way
16 (4.9)	9 (2.7)	0-55	4-way

All bends, including flexible sweeps, shall have a minimum radius of 3 ft. (900 mm). The inner-duct system shall be solvent welded to the coupling body; supported by a moveable spacer every 4 ft. (1.32 m). The bends shall not violate the minimum bending radius of the fiber optic cable.

All bends shall have nylon inner ducts, or approved equivalent, installed to prevent burn-through in accordance with test procedure outlined in GR-2884 Issue 1 Section R3-35 and R3-36.
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The following performance requirements shall be met:

Yield	30,000 psi (200 MPa)
Tensile	50,000 psi (345 MPa)
Hardness	Rockwell “B” 55-65

All conduit entering and exiting conduit terminal points shall have a terminator installed that is made of PVC with an anti-reversing gasket that prevents ingress of water and debris into the outer conduit and inner-duct.

The rigid steel conduit system shall offer expansion/contraction fittings with system compatible threads and reversing couplings. The inner-duct of the expansion/contraction fittings shall also be system compatible. The capacity of the fitting shall be 8” (200 mm) total stroke with 4” (100 mm) expansion and 4” (100mm) contraction capacities.

G. Conduit Testing:

The poly-line installed to verify the integrity of the conduit system shall be ¼” (6 mm) polypropylene.

The pull tape shall consist of polyethylene or PVC jacket woven into the polyester tape. The pull tape shall be NEPTCO Part No. WP1250P, or approved equal, for cable sizes of less than 97 fibers. NEPTCO Part No. WP1800P, or approved equal, shall be used for cable size of 97-288 fibers.

The pull tape shall have the following properties:

- 1250 lb tensile strength
- flat, not round, construction
- printed foot markings
- pre-lubricated for reduced pulling tension at start of cable pull
- low susceptibility to absorption of moisture; moisture resistant

Underground utility marking tape shall have a minimum tensile strength of 78 lbf (350 N) and a minimum elongation of 700 percent before breakage. The tape shall not delaminate nor smear when wet and shall be resistant to insects. The tape shall not degrade when exposed to alkalis, acids or other corrosive elements found in soil.

Pressure treated wood for Identification Posts shall conform to Article M.12.13 of the Standard Specifications. Signs on Identification Posts shall conform to Article M.18.13 of the Standard Specifications.

H. Bedding Material:

Bedding material for all conduit shall be No. 100 fine aggregate as defined in Section M.03 of the standard specifications and backfill for the pits shall be pervious structure backfill conforming to Article 2.16.02.

CONSTRUCTION METHODS:

A. General:

Construction methods shall conform to Article 10.08.03 of the Standard Specifications and to the manufacturer's instructions.

The Contractor shall layout the trench for the conduit in conjunction with the installation of pullboxes, vaults, or manholes. When installing the conduit, the Contractor shall be aware of the location of the proposed conduit terminal point when they are at a sufficient distance from the terminal point to allow for adjustment of the trench so that the conduit will line up flush with the applicable entry point. Flexible conduit will not be used indiscriminately or in the median.

A silicon, non-petroleum based lubricant on the coupling body may be used to facilitate installation.

PVC conduits entering conduit terminal points shall terminate flush with the inside wall. The inner-duct shall extend 6" (150 mm) from the inside face.

Galvanized rigid steel conduit shall extend 2" (50 mm) into the manhole/vault/pull box/handhole for installation of grounded end bushings.

Conduits and inner-duct entering conduit terminal points or where terminated in trench, shall be capped or sealed to prevent ingress of water and debris into the conduit. Conduits containing inner-duct shall be plugged using a quadplex expansion plug inside the conduit around the inner-duct. Inner-duct containing one cable shall be plugged using an expandable cable seal off. Conduits terminating in a trench shall be clearly marked and flagged, both in trench and above trench for future locating.

At each conduit terminal point, a PVC coupling body with anti-reversing gasket that seals between the conduit and inner-duct shall be used as follows:

In places where the field installed inner-duct enters and exits existing conduit, the space between the conduit and the inner-duct, as well as the space between the inner-duct and the cable shall be sealed by means of a split internal expansion plug. Bushing sleeves shall be equipped to suit varying cable sizes. Sealing capacity shall withstand 22 psi (150 kPa).

All inner-duct shall be sealed by means of a polypropylene duct plug equipped with a neoprene or polyurethane gasket. Plugs shall be equipped with an attachment to secure the pull rope in the inner-duct.

When PVC cannot be installed at the required depth, such as where ledge or rock is encountered, the Contractor shall install Rigid Metal conduit at the maximum depth possible. If the Contractor is unable to obtain a minimum depth of 18" (0.45 meters), the Contractor shall install the conduit as directed by the Engineer.

A Bare #8, stranded copper cable shall be fastened to the outside of all PVC in trench. The #8 cable shall be secured to the conduit with nylon cable tie wraps spaced at 8 ft. (2.5 meter) intervals. The #8 cable shall run continuously in trench with no splices. Splices shall only be made in manholes or handholes when necessary. Splices shall be made with a standard crimp type ground splice. The cable shall be securely bonded to metal conduit through the use of standard metal conduit bonding bushings as specified in the Standard Specification.

Warning Tape shall be placed in trench over conduit as shown on the details. Identification Posts shall be carefully placed adjacent to conduit in trench at intervals not to exceed 1200 ft. (365 meters) in length, except at long span bridges and paved areas.

B. Conduit Under Roadway:

The preferred method of installing steel casing under roadway shall be by veneering or cutting. In areas where the conduit is installed under live traffic, such as a ramp crossing, the conduit will be capped in concrete. In areas where the conduit is installed in the shoulder and the required depth cannot be obtained, the conduit shall be installed at a minimum depth of 18" (0.45 meters) and capped in concrete.

Where veneering or cutting is not possible, and under the direction of the Engineer, steel casing may be furnished and installed by jacking. The casing shall be designed to withstand all the loads that it will be subject to, including the loads during installation and the in-service highway loads. The casing shall be designed by and bear the seal and signature of a Connecticut Licensed Professional Engineer and the computations shall be submitted with the Jacking Plan. The pipe shall be installed to preclude interference with highway traffic or damage to traveled lanes or shoulders. Jacking operations shall be conducted so as to prevent caving ahead or to cause voids outside of the pipe.

The auger head shall not proceed more than 4" (100 mm) ahead of the pipe being jacked. Removal of the material from the jacking pits by washing or sluicing will not be permitted.

A shoring and jacking pit plan shall be prepared by and bear the seal and signature of a Connecticut licensed Professional Engineer.

After the casing pipe is jacked in place, the inside shall be thoroughly cleaned free from grease, dirt, rust, moisture or other deleterious contaminants. All welding on the steel casing pipe shall be done by a certified welder. The galvanized steel conduit shall be inserted with skids securely attached to maintain full support of the conduit and to prevent damage.

The space between the conduit and the casing shall be grout sealed for at least 1 ft. (0.30 meters) from each end of the casing. Grout shall attain a minimum of 400 psi (2.76 MPa) compressive strength after 7 days. Pits shall be back-filled with pervious structure backfill as prescribed in Article 2.16.03 of the Standard Specifications.

For Jacking operations, the Contractor shall provide the following:

A. A jacking pit plan depicting:
   (1) Protection of traffic and pedestrians
   (2) The dimension of pit
   (3) Shoring, bracing struts, walers, or sheet pile
   (4) Size and type of casing
   (5) Conduit skids and means of attachment

B. The proposed method of jacking including:
   (1) The jacking system
   (2) A detail of the separator-cushion at the end of casing against which the jacking force

will be applied.

(3) The support system behind the jack

(4) The support system under the jack and at the bottom of the pit.

C. Conduit Testing:

The Contractor shall test each cell of the multicell conduit after the conduit is installed. All testing shall be performed using the procedures and mandrel size recommended by the multicell or conduit manufacturer. The Contractor will be required to install a poly-line within each cell of the conduit. The intention of the conduit testing is to verify the integrity of the completed system; therefore, this testing will only be allowed to commence once the conduit system has been completely installed. Testing shall be performed in the presence of the Engineer. The Engineer will document the date, time, and the results of the testing and shall submit this information to Highway Operations for record keeping purposes.

D. Pull Tape:

The Contractor shall install pull tape, by hand pulling, blowing, or via vacuum method, into each empty conduit and empty cell within a multi-cell conduit during conduit installation. The Contractor shall install the pull tape after conduit testing has been completed. The Contractor shall neatly coil and secure 10 ft (3 meters) of slacked pull tape in each vault location.

The pull tape shall be field installed within each innerduct for the purpose of attaching to, and pulling of, the fiber optic cable.

E. As -Built Plans:

The Contractor shall advise the Engineer of any change of measurement of layout of the Plans submitted to them. Upon completion of construction but prior to acceptance of the contract, the Contractor shall furnish as-built plans on 2 ft. by 3 ft. (55 cm by 91 cm) standard plan sheets. All construction changes, with the final location and depth of the conduits, etc. shall be shown in sepia or other reproducible format. These plans shall include all field installations. One sepia or other reproducible of the Project Plans will be provided to the Contractor for their use. Any other base maps that may be necessary for the Contractor to comply with this requirement shall be the Contractor's responsibility.

METHOD OF MEASUREMENT:

The conduit shall be measured for payment by the actual number of feet (meters) of the type and size installed and accepted**. Expansion fittings, fixed and flexible sweep-bends, conduit fittings, will not be measured for payment but shall be included in the pay item for the conduit of the type and size specified.** The measured length shall be from end to end along the centerline through all fittings.

All work necessary to complete the attachment of the rigid metal conduit of the type indicated, including but not limited to mounting brackets, clamps, hangers, anchors, bolts, fittings etc. to the structures, will not be measured for payment but shall be included in the pay item for the conduit. In-Structure conduit installed under the bridge deck and within the girders shall be measured for payment as conduit of the size and type specified – surface.

The warning tape, identification posts with signs, pull tape, and the poly-line conduit testing will not be measured for payment but shall be included in the pay item for the conduit of the type and size specified.

The #8 Bare copper ground cable, splices, and installation will not be measured for payment but shall be included with the cost of the appropriate conduit item contained within this specification.

BASIS OF PAYMENT:

Article 10.08.05 – Basis of Payment shall be amended as follows:
In the second paragraph, after the words "bonding bushings", add the words "bonding wire,".

This work shall be paid for at the contract unit price per foot (meter) for conduit of the size and type indicated, within the limits shown on the plans and in the details. This price shall include all materials required including expansion fittings, fixed and flexible sweep-bends, conduit fittings, pervious structure backfill, boxes, caps, entrance fittings, pull tape, poly-line, inserts, warning tape, ground wire, identification posts with signs, structural supports, equipment, tools, labor and work incidental thereto.

Trenching and backfilling shall be paid as specified in Section 10.01 of the Standard Specifications.

ITEM #1201802A – 4 CHORD TRUSS BRIDGE SIGN STRUCTURE

Description: Work under this item shall consist of designing, fabricating and installing a sign support structure to carry extruded aluminum traffic signs, on a prepared foundation, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. For the purposes of this specification, the sign support structure shall be composed of a 4 chord truss supported on each end by a 2 post tower.

Materials: The tower posts, tower bracing, truss chords and truss bracing shall be tubular members fabricated from round steel pipe. The steel pipe shall have a tabulated yield stress no less than 35,000 psi.

Tower and truss members fabricated from multisided tubular members are not permitted.

The structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, and plates in the truss to tower connection shall be made of steel that conforms to the requirements of ASTM A709, Grade 50T2.

The handholes shall be fabricated from either steel plate or rectangular tubular steel members. The steel plate shall conform to the requirements of ASTM A709, Grade 50T2. The rectangular tubular steel members shall conform to ASTM A500, Grade B.

Anchorage plates shall conform to the requirements of ASTM A709, Grade 50T2.

The non-structural components, such as hand hole covers, cap plates and sign panel support members, shall conform to the requirements of ASTM A709, Grade 50T2.

The use of steel plate or rolled shapes with a tabulated yield stress less than 50 ksi is not permitted.

The steel for tower posts, truss chord members, structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, and plates in the truss to tower connection; and handholes shall meet the following Charpy V-notch impact testing requirements:

Yield Strength	Thickness in.	Minimum Test Value Energy ft.-lbs.	Minimum Average Energy, ft.-lbs.
$F_y \leq$ 50 ksi	$\leq$ 2	20	25 at 40ºF
50 ksi < $F_y \leq$ 70 ksi	$\leq$ 4	28	35 at -10ºF

Charpy V-notch sampling and testing shall be in accordance with ASTM A673, "P" piece frequency.

The filler metal shall have a matching strength relationship with the base metal.

All high strength bolts shall conform to ASTM A325, Type 1. Nuts shall conform to ASTM A563, Grade DH. Circular, flat, hardened steel washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Grade 50. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The high strength bolts shall conform to the requirements of Subarticle M.06.02-3.

Compressible-washer-type direct tension indicators shall conform to ASTM F959, Type 325, and shall be galvanized in accordance with ASTM B695, Class 50.

U-bolts and threaded rods shall conform to ASTM A449. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Grade 50. The nuts shall be overtapped to the minimum amount required for the fastener assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The threaded ends of all U-bolts and threaded rods shall be supplied with 1 washer and 2 nuts, unless otherwise noted.

The anchor bolts shall conform to ASTM F1554, Grade 105. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing.

All steel components, including anchor bolts, shall be completely hot-dip galvanized, after fabrication, in accordance with ASTM A123 or ASTM A153, as applicable. Repairs to damaged areas of the hot-dip galvanized coatings shall conform to the requirements of ASTM A780 amended as follows:

> Paints containing zinc dust, if used for repairs, shall contain either between 65% to 69% metallic zinc by weight or greater than 92% metallic zinc by weight in dry film.

The silicone sealant shall be a 1-component, 100% silicone sealant recommended for use with galvanized steel.

Neoprene gasket material for the access openings shall conform to ASTM D1056, Grade 2A2 or 2A3. Other grades of neoprene approved by the Engineer may be used.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be galvanized steel with a hex head.

All materials used in the finished structure shall be new. The use of materials that have been previously used in a structure or salvaged from a structure is not permitted.

The Contractor shall submit Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for the steel used in the tower and truss members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers). The Certified Test Reports shall include the following:

a. Mill test reports that indicate the place where the material was melted and manufactured.

b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.

c. Galvanized material test results that indicate the thickness of the galvanizing.

Prior to incorporation into the work, the Contractor shall submit samples in conformance with Article 1.06.02 for the steel used in the support members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers).

Construction Methods: The design and fabrication of the sign support structure, including its anchorage (into the foundation) and the hardware and structural members required to support the traffic appurtenances, shall conform to the requirements of the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, including the latest interim specifications, amended as follows:

- The dead load of the sign panels, sign panel support members and hardware shall be no less than the 8 psf.

- The design wind speed shall be 120 mph. The computation of wind pressures in accordance with Appendix C is not permitted.

- The minimum design life for the structures shall be 50 years.

- The wind importance factor, I_r, for wind pressure shall be 1.00.

- The wind drag coefficient, C_d, for traffic signs shall be 1.3.

- The height and exposure factor, K_z, shall be determined based on the highest elevation of the structure or the supported sign panels. The factor shall be considered constant in all pressure calculations required for the design of the structure. The height and exposure factor shall be no less than 1.05.

- The sign structure shall be designed for fatigue category I for noncantilevered structures. The sign structure shall be designed for the wind load effects due to

natural wind gusts and truck-induced gusts. The design pressure for the truck-induced gust shall be based on a truck speed of 65 mph. The sign structure shall be designed assuming that vibration mitigation devices will not be installed.

- The vertical deflection of the truss due to the wind load effects of truck-induced gusts shall not exceed 8".

- The fixity of the structure connections shall be as follows:

  Welded gusset plate, bracing member to chord connections shall be considered rigid in the plane of the gusset plate and pinned perpendicular to the plane of the gusset plate.

  Flange plate chord to chord connections shall be considered rigid with respect to both axes.

  Baseplate to anchor bolt connection shall be considered rigid with respect to both axes.

- The minimum effective length factor, K, shall be as follows:

  For the tower posts, $k = 2.1$

  For truss chord and bracing, and tower bracing, $k \geq 1.0$

- The fatigue stress categories at the gusset plate to chord fillet welded connection shall be conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, Table 11-2, Note a .

- The maximum stress ratio (the ratio of the computed stress to the allowable stress) or combined stress ratio in any sign structure component due to each group load shall not exceed 0.90.

- The maximum vertical deflection of the overhead truss due to dead load and ice load effects shall be no greater than $^{L}/_{150}$, where L is the span length of the truss measured from centerline to centerline of the tower posts.

- The truss shall be cambered to compensate for the dead load deflections. The truss shall have a permanent camber no less than $^{L}/_{1000}$ and no greater than $^{L}/_{500}$. L is the span length of the truss measured from centerline to centerline of the tower posts. The permanent camber is in addition to the dead load camber.

- Truss chords shall be fabricated in sections from a single piece of pipe connected with chord flange splices. Chords within sections composed of multiple pieces of

pipe are not permitted. All chords within a section shall have the same cross-section properties. All chords in a truss shall have the same material designations.

- Tower posts shall be fabricated from a single piece of pipe. Posts composed of multiple pieces of pipe are not permitted. All tower posts shall have the same cross-sectional properties and material designations.

- The minimum pipe wall thickness of the towers posts and truss chords shall be $^{5}/_{16}$".

- Tower and truss bracing shall be fabricated from steel pipe. All tower bracing shall have the same cross-sectional properties. All truss bracing shall have the same cross-sectional properties. The cross-sectional properties of the tower and truss bracing may differ. All bracing shall have the same material designations. The steel pipe bracing shall have a minimum nominal diameter of 2½". The steel pipe bracing shall have a minimum thickness of 0.203". The steel pipe bracing shall be connected to tower post and truss chord gusset plates with slotted tube connections. The bracing slot shall have a coped hole at the end of the slot. A minimum of 10% of the bracing gusset plate to tower post connections, 100% of the fillet welds on each side of the connection, shall be non-destructively tested in accordance with the magnetic particle method. A minimum of 10% of the bracing gusset plate to truss chord connections, 100% of the fillet welds on each side of the connection, shall be non-destructively tested in accordance with the magnetic particle method.

- One pair of crossing diagonal bracing members shall be provided at each end each truss section to stabilize the truss.

- All tubular member to transverse plate connections shall be made with a complete joint penetration groove weld with a backing ring attached to the plate with a continuous fillet weld. 100% of the complete joint penetration groove welds shall be non-destructively tested by the ultrasonic method. After galvanizing, the joint between the backing ring and tubular member shall be sealed with silicone sealant.

- The use of stiffeners at tubular member to transverse plate connections is not permitted.

- The strength of a connection made with a complete joint penetration groove weld shall be no greater than the strength of the base metal. In connections joining base metal with different yield strengths, the base metal with the lower yield strength shall govern the design.

- The minimum base plate and flange splice plate thickness shall be 2". The determination of the plate thickness in the tubular member to transverse plate

connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.

- All high-strength bolted connections shall be designed as slip critical connections with standard holes, unless otherwise noted. The high-strength bolts shall conform to the maximum spacing requirements for sealing and stitch fasteners. The high-strength bolts shall conform to the edge distance requirement for fasteners. Consideration should be given to the use of smaller diameter bolts since they require lower specified minimum bolt tensions.

- The minimum number of high-strength bolts in flange splices shall be 6.

- The minimum thickness of the plates in the tower and truss bracing connections shall be ½".

- The minimum size fillet weld shall be ¼", unless noted otherwise. The use of seal and tack welds is not permitted. No welding shall be performed after galvanizing.

- The anchor bolt to base plate connection shall be designed as a double-nut connection with shear holes. The anchor bolts shall use an embedded anchorage plate, ¾" minimum thickness, to transmit loads from the pole base to the concrete foundation. The use of hooked anchor bolts is not permitted. The minimum number of anchor bolts at each post shall be 4. The minimum anchor bolt diameter shall be 1 ½". The minimum anchor bolt embedment, the distance from the top of the foundation to the top of the embedded anchorage plate, shall be 3'-6" or the tension development length of the vertical foundation reinforcement plus the end concrete cover, which ever is greater. Each anchor bolt shall be supplied with 5 nuts and 4 washers. Washers shall be placed on the top and bottom surfaces of the pole base plate and anchorage plate. Welding to the anchor bolts is not permitted.

The approximate dimensions of the truss and the tower post heights are shown in plan and elevation on the traffic sheets. The actual sign support dimensions shall be determined by the Contractor based on a the horizontal and vertical clearances shown on the plans, a field survey of the finished grade at the site, the elevation of the top of the finished foundation, the locations of overhead and subsurface utilities, the location of the drainage facilities and noise barrier wall locations.

The minimum vertical clearance from the top of the finished road to the bottom of the sign panels and the centerline of the truss shall be as shown on the sign support drawings as amended by the sign support elevation on the traffic sheets.

Sign panels shall be installed symmetrically about the centerline of the truss. The bottom of all signs shall be level. Sign panels shall be installed at an angle of 5° from the vertical, with the top edge tilting toward oncoming traffic.

The sign panels and crown panels, if applicable, shall be connected to sign panel support members. The support members shall extend full height of the sign and crown panels. The number and spacing of support members shall be determined by the Contractor based on the width of the sign and crown panels and the support member spacing parameters shown on the plans. Sign panels shall be supported by no less than 3 support members. Crown panels shall be supported by no less than 2 support members. The faying surface between the sign panel support member and the rear face of the sign panel shall be a flange so that panel clips may be placed on both sides of the flange to connect the panel. The outside support members for each sign panel shall include a sign stop at the bottom of the member and a sign hook at the top of the member to support and carry the sign panels.

The sign panel support members shall be designed to be vertically adjustable to compensate for the truss camber. The supports members shall be designed to be installed at any location along the truss. The use of U-bolts and threaded rods is permitted. No less than 2 U-bolts or 4 threaded rods shall be used at each chord connection. The threaded ends of these fasteners shall have double nuts.

The minimum thickness of the sign panel support members and the plate and rolled shape components used in the connection to the sign support shall be ¼".

The sign support shall be designed for the load effects due to the actual sign panels that it will carry unless otherwise shown on the plans. The sign supports shall also be designed for the load effects of sign panels during all stages of construction which may exist during the project under which the supports are installed. The load effects on the sign support from the sign and crown panels shall include forces and moments due to the eccentricity of the sign and crown panels and the unbalanced lateral loads on the crown panel. The sign support and its component parts shall also be designed for the load effects resulting from the transportation and erection of the support.

The sign support shall be designed so that the 4 chords of the truss fit within the tower posts. Each truss chord shall be connected to a tower post. 100% of the fillet welds used in the truss to post connection shall be non-destructively tested in accordance with the magnetic particle method. All bolts, nuts and washers used in the connection shall be visible. The use of tapped holes in the plates of the connection is not permitted.

Vent and drain holes shall be provided for galvanizing. The number, size and location of vent and drain holes should be coordinated with the galvanizer prior to the submission of the sign support design. The area of vent and drain holes at each end of a member shall be at least 30% of the inside area of the member for members 3" in diameter and greater and 45% of the inside area of the member for members smaller than 3" in diameter. The vent and drain holes shall be strategically located for reducing stress and for proper galvanizing. The holes shall be made by drilling. Flame cut holes are not permitted. The edges of all holes shall be rounded by grinding.

After galvanizing, exposed holes placed in the sign support components for galvanizing shall be sealed with neoprene plugs.

One post in each tower shall have a handhole centered 2'-9" from the top of the base plate. The post handhole shall be located away from traffic.

Handholes shall be reinforced with a frame having a minimum 4" wide by minimum 6" high clear opening. The minimum thickness of the handhole frame shall be no less than the thickness of the tubular member. The handhole frame shall be connected to the tubular member with a partial joint penetration groove weld reinforced with a fillet weld. The weld shall be non-destructively tested in accordance with the magnetic particle method. Each handhole shall have a cover connected to the handhole frame with no less than 4 stainless steel screws. The cover shall be installed with a neoprene gasket. A stainless steel chain shall be bolted to the cover inside face of the cover with a stainless steel bolt with a lock nut and bolted to the inside side face of the handhole frame with a stainless steel bolt. On post hand hole frames, the opposite side face of the handhole shall have a hole with a nut welded to outside face for a stainless steel grounding bolt.

Handhole frames fabricated from steel plate and bent to form a closed shape shall be joined with a complete joint penetration groove weld. All surfaces of the groove weld shall be ground smooth and flush with the adjacent base metal.

The ends of each chord member shall be sealed with a removable end cap plate attached to the member with a threaded fastener. The joint between the member and plate shall be sealed with a neoprene gasket.

The design of the sign support and the anchorage shall be coordinated with the design of the foundation to ensure that the foundation is adequate for the support reactions and to avoid conflicts between the embedded anchorage and the foundation reinforcement.

Prior to performing a field survey for each sign support, the Contractor shall coordinate with the Engineer to locate and stake each support foundation. The foundations shall be located to avoid conflicts with both subsurface and overhead utilities and subsurface drainage structures. In accordance with Article 1.05.15, the Contractor shall contact “Call Before You Dig” to identify the subsurface utilities that are located in the vicinity of each foundation. Once the location of each foundation has been found acceptable to the Engineer, the Contractor shall perform a field survey to obtain the information necessary to prepare a roadway cross-section with details of each sign support and supporting foundation(s).

The Contractor shall prepare and submit one copy of a cross-section (elevation) drawing based on a field survey for each sign support to the Engineer for review and approval. Each cross-section drawing shall be submitted in paper form and shall be printed on an ANSI B (11” x 17”; Ledger/Tabloid) sheet. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼” wide x 1 ¾” high, for the reviewers stamp. On the ANSI B sheets, the minimum text

height and width shall be $^{1}/_{16}$". All letter characters shall be uppercase. Only one sign support cross-section shall be shown on each drawing.

The cross-sections shall include, but not be limited to the following:

- Project number, town, location (route number, direction, mileage), station, structure number, sign location number, and site number
- Location and dimensions of travel lanes and shoulders
- Location and elevation of the high point of the road
- Top and bottom of slope elevations. Slope of finished grade at foundations
- Locations of utilities (both overhead and subsurface)
- Locations of drainage facilities
- Locations of noise barriers, including elevation of top of wall
- Type of protection (metal beam rail/barrier), and the dimension from the front face of metal beam rail /barrier to the edge of the foundation and centerline of the foundation
- Elevation of the top of the foundation(s). The top of the foundation(s) shall project 6" to 12" above the level ground or 6" to 12" above the finished grade at the high side of a sloping grade.
- Dimension from top foundation to finish grade (existing or proposed as applicable).
- Span, dimension from centerline to centerline of foundations
- Dimensions of sign panel(s)
- Location of sign panel(s) relative to the centerline of the foundations/posts
- Location of sign panel(s) relative to the roadway travel lanes
- Dimension from top of foundation to centerline of truss
- Minimum dimensions from high point of the road to the centerline of the truss and the bottom of the sign panel(s)

- Elevation of centerline of truss

The Contractor shall submit the cross-section drawings to the project's "Engineer of Record" for review and approval. The project's "Engineer of Record" is identified in the signature block on the sign support traffic cross-section contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped cross-section drawings shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. The approval of cross-section drawings does not relieve the Contractor from verifying that all dimensions are correct. If there are any changes to the proposed location of the sign support and foundations prior to the construction of the foundations, the cross-section shall be re-submitted for review and approval.

Prior to fabrication, the Contractor shall submit working drawings and design computations for each sign support, based on the approved cross-section, to the Engineer for review in accordance with Article 1.05.02. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and erection of the structure and its components, including a copy of the certificate of insurance, shall be prepared and submitted for **each** support. **A single set of drawings with tabulated data for multiple sign support locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units.

The packaged set of working drawings and computations for each support shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf) with appropriate bookmarks. The packaged set submitted in paper form shall be bound with a staple. The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer, fabricator and galvanizer – contact information should include name and address of each firm and the name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of fabricator's AISC certification
- copy of the **approved** cross-section
- sign support working drawings
- sign support design computations
- welding procedures
- sign support installation procedure, including the method to plumb the tower posts

Combining of a non-approved cross-section with the sign support working drawings and calculations into one packaged set for review is not permitted.

The working drawings and design computations shall be **signed, dated and sealed** by a Professional Engineer licensed in the State of Connecticut, who shall also be available for consultation in interpreting his computations and drawings, and in the resolution of any problems which may occur during the performance of the work. Each working drawing shall be signed, dated and sealed. The cover/first sheet for the computations shall be signed, dated and sealed.

Working drawings submitted in paper form shall be printed on ANSI B (11" x 17"; Ledger/Tabloid) sheets. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI B sheets, the minimum text height and width shall be $^{1}/_{16}$". All letter characters shall be uppercase. Design computations, procedures and other supporting data shall be submitted on ANSI A (8 ½" x 11"; Letter) sheets.

Working drawings submitted in an electronic portable document format (.pdf) shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2¼" wide x 1¾" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be $^{1}/_{8}$". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 ½" x 11"; Letter) sheets.

The working drawings shall include complete details of all sign support components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- reference to the design specifications design criteria, such as design wind speed, minimum design life, etc.
- material specifications/designations for all components
- non-destructive weld testing requirements
- vent and drain holes for galvanizing
- dead load and permanent camber
- a plan view of the anchor bolt layout relative to the orientation of the span

- anchor bolt dimensions, including embedment and projection
- support installation procedure, including the method to plumb the post

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design
- drawings/models of the structure, components and connections, with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- Tabulation of the section properties of the tubular members at each analyzed section. The tabulated values should include the diameter, D; wall thickness, t; cross-sectional area, A; moment of inertia, I; section modulus, S; radius of gyration, r. AASHTO Table B-1 may be used to determine the section properties. If Table B-1 is used, the radius measured to the mid-thickness of the wall shall also be provided.
- coefficients and factors used in the design
- results of all group loads and load combinations
- stress ratios and combined stress ratios for all group loads and load combinations
- maximum vertical deflection due to dead loads
- maximum vertical deflection due to ice loads
- vertical deflection of the truss due to the wind load effects of truck-induced gusts
- total camber and permanent camber

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature

block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the following Department offices:

Bridge Safety and Evaluation
Research and Materials
Traffic Engineering
Engineer of Record

If the as-built condition of the foundation(s), such as the location or elevation, will impact the design, final erection or assembly of the sign support for conformance with the requirements herein, the cross-section shall be re-submitted for review and approval. Subsequently, the working drawings and calculations shall be resubmitted to conform to the revised cross-section and the requirements herein.

The support shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication of Simple Steel Bridges (SBR).

Fabrication of the support may begin only after the working drawings and design computations have been reviewed and the Engineer has authorized fabrication to begin. The Contractor shall submit to the Engineer, no less than 2 weeks prior to the start of fabrication, the name and location of the fabrication shop where the work will be done so that arrangements can be made for an audit of the facility and the assignment of the Department Quality Assurance (QA) inspector. No fabrication will be accepted unless the QA inspector is present during fabrication. No changes may be made during fabrication without prior written approval by the Department.

The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide QA inspection at the fabrication shop to assure that all applicable Quality Control plans and inspections are adequately adhered to and maintained by the Contractor during all phases of the fabrication. A thorough inspection of a random selection of elements at the fabrication shop may serve as the basis of this assurance.

Prior to shipment to the project, each individual piece of steel shall be marked in a clear and permanent fashion by a representative of the fabricators' Quality Control (QC) Department to indicate complete final inspection by the fabricator and conformance to the project specifications for that piece. The mark must be dated. A Materials Certificate in accordance with Article 1.06.07 may be used in lieu of individual stamps or markings, for all material in a single shipment. The Materials Certificate must list each piece within the shipment and accompany the shipment to the project site.

Following the final inspection by the fabricator's QC personnel, the Engineer may select pieces of steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

Fabrication of the supports shall conform to the requirements of Articles 6.03.04, 6.03.05, 6.03.06 and 6.03.10, 6.03.11, 6.03.12 and 6.03.13.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

All members and components shall be hot-dip galvanized in a single dip. Double-dipping of members and components is not permitted. All exterior and interior surfaces of the sign support members and components shall be completely galvanized.

Galvanized members and components shall be free from uncoated areas, blisters, flux deposits, and gross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

All damaged areas of the hot-dip galvanized surfaces shall be repaired in accordance with the requirements of ASTM A780. If paint containing zinc dust is used for repairs, the dry coating thickness shall be at least 50% greater than the thickness of the adjacent hot-dip galvanized coating, but no greater than 4.0 mils. The paint shall be brush applied. The use of aerosol spray cans shall not be permitted. The color of the finished repair area shall match the color of the adjacent hot-dip galvanized surface at the time of the repair to the satisfaction of the Engineer.

Prior to shipping, all galvanized surfaces of the members and components shall be inspected, in the presence of the Engineer, to determine the acceptability of the galvanized coating. Galvanized coatings may be found acceptable by the Engineer if all surfaces of the members and components meet the galvanizing requirements herein. Only sign support members and components with acceptable galvanized coatings shall be shipped. If the galvanized coating on any member or component is found not acceptable, the Contractor shall submit a repair procedure to the Engineer for review.

The sign support structure number shall be stenciled in black paint on the one post of the right side tower (as determined by the direction of traffic traveling below the structure) centered approximately 5’ off the ground and visible from the roadway. The numeric characters shall be 3” to 4” high and placed vertically so that they may be read from top to bottom.

After fabrication, the sign support components shall be assembled in the fabricator's shop, in the presence of the Engineer, to determine the acceptability of the bolted connections and to confirm the permanent camber. The faying surfaces of the connections shall be free of dirt, loose scale, burrs, other foreign material and other defects that would prevent solid seating of the parts. Prior to assembly, the galvanized faying surfaces shall be scored by wire brushing. The faying surfaces of the connection plates shall be checked with a straight edge to ensure that the surfaces are not distorted and the entire faying surface of each plate will be in contact when assembled. The high-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). A connection may be found acceptable by the Engineer if the faying surfaces of the connection plates are in firm, continuous contact after properly tensioning the bolts. Only sign supports with acceptable connections shall be shipped. If a bolted connection is found not acceptable, the Contractor shall submit a procedure to repair the connection to the Engineer for review. Galvanized surfaces damaged by the repair procedure shall be hot dip galvanized. Repair of the damaged galvanized surfaces in accordance with the requirements of ASTM A780 or with a galvanizing repair stick is not permitted. Bolts, nuts and washers used for the trial shop fit-up shall not be reused in the final field assembly. The permanent camber shall be measured at mid-span and the member shall be rejected if the camber does not meet the following:

$$L/1000 \leq \text{Permanent Camber} \geq L/500$$

where L is the span length of the overhead member measured from centerline to centerline of the tower posts.

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the project site. All costs associated with any corrective action will be borne by the Contractor.

Following delivery to the project site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the project site.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-4(f).

The support shall be erected, assembled and installed in accordance with these specifications and the procedures and methods submitted with the working drawings. The Contractor and the support designer are responsible to ensure that the erection and assembly procedures and methods in this specification are acceptable for use with the support. Changes to these methods and procedures shall be submitted with the working drawings and computations.

Prior to installation of the support, the threads of the embedded anchor bolts shall be cleaned of accumulated dirt and concrete. The anchor bolt nuts shall be re-lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. On each anchor bolt, all the nuts shall be run down by hand on the anchor bolt threads.

The space between the bottom of the baseplate and the top of the foundation shall not be sealed with closed cell elastomer or filled with grout, unless otherwise noted.

During the erection of the towers, the leveling nuts and washers shall be inspected, and if necessary adjusted, so that they are in full contact with the bottom surface of the baseplate. Subsequently, the top nuts and washers shall be inspected, and if necessary adjusted, so that they are snug tight (in full contact with the baseplate). Snug tight is defined as the condition where the nuts and washers are in full contact with the baseplate and the snug tight condition was the result of the full effort of a person using a 12” wrench.

With the top nuts snug tight, the top nuts shall be tightened one-sixth of a turn beyond snug tight. After the top nuts are tightened, the leveling nuts should be retightened to assure the full contact has been maintained. After tightening, lock nuts shall be installed over the top anchor nuts. The top nuts shall have full thread engagement. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1".

High-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). The truss shall be temporarily and fully supported while all the high-strength bolts are installed and tensioned. The temporary support of the truss shall not be removed until the Engineer has confirmed that the faying surfaces of the connection/flange plates are in firm, continuous contact and the high-strength bolts were properly installed and tensioned. All high-strength bolts in the bolted connections shall be inspected (in accordance with Subarticle 6.03.03-4(f)) to confirm the high-strength bolts were properly tensioned.

After erecting the support, the support shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a galvanized steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

After erection of the support and before the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall immediately stabilize the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of a portion of the structure or the entire structure.

The sign panels shall be located and mounted on the truss as shown in the working drawings. The time between erecting the support and installation of the sign panels shall be kept to a minimum since supports without sign panels may be susceptible to vibrations due to vortex shedding. If the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor is responsible for immediately stabilizing the structure to the satisfaction of the Engineer.

After installation of the sign panels, the anchor bolts nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the post baseplate and the centerline of the post shall be plumb.

After erection of the support and after the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall design and construct devices to mitigate the movements. The Contractor is responsible for immediately stabilizing the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of the sign panels or the entire structure. Prior to installation of any mitigation device, the Contractor shall submit drawings, design computations other documentation to the Engineer for review in accordance with Article 1.05.02.

Method of Measurement: This work will be measured for payment by the number of bridge sign structures, completed and accepted in place.

Basis of Payment: This work will be paid for at the contract unit price each for "4 Chord Truss Bridge Sign Structure", complete in place, which price shall include the field survey, equipment, materials, tools and labor incidental to the design, fabrication and installation, including

anchorage materials, sign panel support members and mitigation devices, if required, of the supports at the locations specified on the plans.

ITEM #1201804A – 4 CHORD TRUSS CANTILEVER SIGN STRUCTURE

Description: Work under this item shall consist of designing, fabricating and installing a sign support structure to carry extruded aluminum traffic signs, on a prepared foundation, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. For the purposes of this specification, the sign support structure shall be composed of a cantilevered 4 chord truss supported by a single linear tubular pole member**.**

Materials: The poles shall be tubular members with either a round or multisided cross-section. The round tubular members shall be fabricated from steel pipe with a tabulated yield stress no less than 35,000 psi. The multisided tubular members shall be fabricated from steel plate conforming to the requirements of ASTM A709, Grade 50T2.

The truss chord members shall be tubular members with a round cross-section fabricated from steel pipe with a tabulated yield stress no less than 35,000 psi. Truss chord members fabricated from tubular members with a multisided cross-section are not permitted.

The truss bracing members shall be tubular members with a round cross-section fabricated from steel pipe with a tabulated yield stress no less than 35,000 psi.

The structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, and plates in the truss to pole connection shall be made of steel that conforms to the requirements of ASTM A709, Grade 50T2.

The handholes shall be fabricated from either steel plate or rectangular tubular steel members. The steel plate shall conform to the requirements of ASTM A709, Grade 50T2. The rectangular tubular steel members shall conform to ASTM A500, Grade B.

Anchorage plates shall conform to the requirements of ASTM A709, Grade 50T2.

The non-structural components, such as hand hole covers, cap plates and sign panel support members, shall conform to the requirements of ASTM A709, Grade 50T2.

The use of steel plate or rolled shapes with a tabulated yield stress less than 50 ksi is not permitted.

The steel for pole, truss chord members, structural plate components, such as the baseplates, connection/flange/splice plates, gusset plates, and plates in the truss to pole connection; and handholes shall meet the following Charpy V-notch impact testing requirements:

Yield Strength	Thickness in.	Minimum Test Value Energy ft.-lbs.	Minimum Average Energy, ft.-lbs.
$F_y \leq$ 50 ksi	$\leq$ 2	20	25 at 40°F
50 ksi < $F_y \leq$ 70 ksi	$\leq$ 4	28	35 at -10°F

Charpy V-notch sampling and testing shall be in accordance with ASTM A673, "P" piece frequency.

The weld filler metal shall have a matching strength relationship with the base metal.

All high strength bolts shall conform to ASTM A325, Type 1. Nuts shall conform to ASTM A563, Grade DH. Circular, flat, hardened steel washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Class 50. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The high strength bolts shall conform to the requirements of Subarticle M.06.02-3.

Compressible-washer-type direct tension indicators shall conform to ASTM F959, Type 325, and shall be galvanized in accordance with ASTM B695, Class 50.

U-bolts and threaded rods shall conform to ASTM A449. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153 or ASTM B695, Class 50. The nuts shall be overtapped to the minimum amount required for the fastener assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. The threaded ends of all U-bolts and threaded rods shall be supplied with 1 washer and 2 nuts, unless otherwise noted.

The anchor bolts shall conform to ASTM F1554, Grade 105. The nuts shall conform to ASTM A563, Grade DH. The washers shall conform to ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM A153. The nuts shall be overtapped to the minimum amount required for the bolt assembly and all surfaces of the nuts shall be lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing.

All steel components, including anchor bolts, shall be completely hot-dip galvanized, after fabrication, in accordance with ASTM A123 or ASTM A153, as applicable. Repairs to damaged areas of the hot-dip galvanized coatings shall conform to the requirements of ASTM A780 amended as follows:

Paints containing zinc dust, if used for repairs, shall contain either between 65% to 69% metallic zinc by weight or greater than 92% metallic zinc by weight in dry film.

The silicone sealant shall be a 1-component, 100% silicone sealant recommended for use with galvanized steel.

Neoprene gasket material for the access openings shall conform to ASTM D1056, Grade 2A2 or 2A3.

Bare copper grounding conductor shall be #8 AWG stranded bare copper wire conforming to M.15.13. The grounding bolt shall be galvanized steel with a hex head.

All materials used in the finished structure shall be new. The use of materials that have been previously used in a structure or salvaged from a structure is not permitted.

The Contractor shall submit Certified Test Reports and Materials Certificates in conformance with Article 1.06.07 for the steel used in the support members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers). In addition, the following shall be submitted:

a. Mill test reports that indicate the place where the material was melted and manufactured.

b. High-strength bolt test results for proof load tests, wedge tests, and rotational-capacity tests that indicate where the tests were performed, date of tests, location of where the components were manufactured and lot numbers.

c. Galvanized material test results that indicate the thickness of the galvanizing.

Prior to incorporation into the work, the Contractor shall submit samples in conformance with Article 1.06.02 for the steel used in the support members and components, high-strength bolts (including nuts and washers), anchor bolts (including nuts and washers), U-bolts (including nuts and washers) and threaded rods (including nuts and washers).

Construction Methods: The design and fabrication of the sign support structure, including its anchorage (into the foundation) and the hardware and structural members required to support the traffic appurtenances, shall conform to the requirements of the latest edition of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, including the latest interim specifications, amended as follows:

- The dead load of the sign panels, sign panel support members and hardware shall be no less than the 8 psf.

- The design wind speed shall be 120 mph. The computation of wind pressures in accordance with Appendix C is not permitted.

- The minimum design life for the structures shall be 50 years.

- The wind importance factor, I_r, for wind pressure shall be 1.00.

- The wind drag coefficient, C_d, for traffic signs shall be 1.3.

- The height and exposure factor, K_z, shall be determined based on the highest elevation of the structure or the supported sign panels. The factor shall be considered constant in all pressure calculations required for the design of the structure. The height and exposure factor shall be no less than 1.05.

- The sign structure shall be designed for fatigue category I. The sign structure shall be designed for the wind load effects due to natural wind gusts and truck-induced gusts. The design pressure for the truck-induced gust shall be based on a truck speed of 65 mph. The sign structure shall be designed assuming that vibration mitigation devices will not be installed.

- The vertical deflection of the free end of the truss due to the wind load effects of truck-induced gusts shall not exceed 8".

- The fixity of the structure connections shall be as follows:

  Welded gusset plate, bracing member to chord connections shall be considered rigid in the plane of the gusset plate and pinned perpendicular to the plane of the gusset plate.

  Flange plate chord to chord connections shall be considered rigid with respect to both axes.

  Baseplate to anchor bolt connection shall be considered rigid with respect to both axes.

- The minimum effective length factor, K, shall be as follows:

  For the pole, $k = 2.1$

  For truss chord and bracing, $k \geq 1.0$

- The fatigue stress categories at the gusset plate to chord fillet welded connection shall be conform to AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, Table 11-2, Note a .

- The maximum stress ratio (the ratio of the computed stress to the allowable stress) or combined stress ratio in any sign structure component due to each group load shall not exceed 0.90.

- The truss shall be cambered to compensate for the dead load deflections. The truss shall have a permanent camber no less than $^{L}/_{1000}$ and no greater than $^{L}/_{500}$. L is the span length of the cantilever truss measured from centerline of the pole to the end of the truss. The permanent camber is in addition to the dead load camber. The total camber shall be obtained with the use of through chord connection plates installed at an angle.

- The maximum span length of the truss shall be 45'-0", measured from the centerline of the pole to the end of the truss.

- The truss chord members shall be tubular members with a round cross-section. Truss chord members fabricated from tubular members with a multisided cross-section are not permitted. All truss chords shall have the same cross-sectional properties and material designations. The minimum wall thickness of the truss chord members shall be $^{5}/_{16}$".

- The truss bracing members shall be tubular members with a round cross-section. All truss bracing shall have the same cross-sectional properties and material designations. The steel pipe bracing shall have a minimum nominal diameter of 2½". The steel pipe bracing shall have a minimum thickness of 0.203". The steel pipe bracing shall be connected to tower post and truss chord gusset plates with slotted tube connections. The bracing slot shall have a coped hole at the end of the slot. A minimum of 10% of the bracing gusset plate to truss chord connections, 100% of the fillet welds on each side of the connection, shall be non-destructively tested in accordance with the magnetic particle method.

- One pair of crossing diagonal bracing members shall be provided at each end of the truss to provide stability of the structure. Also if the span of the arm is longer then 25'-0", a pair of crossing diagonal bracing members shall be placed at a panel point at midspan of the truss.

- The minimum diameter of the pole shall be 2'-0". The maximum diameter of the pole shall be 2'-6". The minimum wall thickness of the pole member shall be $^{5}/_{16}$".

- The pole shall be a tubular member with either a round or multisided cross-section. Multisided tubular members with other than 16 sides are not permitted. Multisided tubular member with fluted sides are not permitted.

- The pole shall be fabricated from a single piece of material. Splicing 2 or more pieces together to form one member is not permitted.

- The tubular members may be fabricated with no more than 1 longitudinal seam weld.

- The longitudinal seam welds within 6" of the member ends shall be complete joint penetration groove welds. The seam welds shall be ground smooth and flush with the adjacent base metal.

- Partial joint penetration longitudinal seam welds shall be non-destructively tested in accordance with the magnetic particle method. Complete joint penetration longitudinal seam welds shall be non-destructively tested in accordance with the ultrasonic method.

- Slip-type field splices are not permitted in any member. The wall thickness of the component members shall be uniform throughout their lengths. The use of multiple plies (laminations) to obtain the required member thickness is not permitted. The use of shop-fabricated stepped members is not permitted.

- All tubular member to transverse plate connections shall be made with a complete joint penetration groove weld with a backing ring attached to the plate with a continuous fillet weld. 100% of the complete joint penetration groove welds shall be non-destructively tested by the ultrasonic method. After galvanizing, the joint between the backing ring and tubular member shall be sealed with silicone sealant.

- The use of stiffeners at tubular member to transverse plate connections is not permitted.

- The strength of a connection made with a complete joint penetration groove weld shall be no greater than the strength of the base metal. In connections joining base metal with different yield strengths, the base metal with the lower yield strength shall govern the design.

- The minimum base plate and splice plate thickness shall be 2". The determination of the plate thickness in the tubular member to transverse plate connections shall consider the potential for the plate to warp due to the heat from welding. Consideration should be given to the use of thicker plates to allow for subsequent machining of warped plates to a flat surface so that removal of material will not compromise the required strength of the plate.

- All high-strength bolted connections shall be designed as slip critical connections with standard holes, unless otherwise noted. The high-strength bolts shall conform to the maximum spacing requirements for sealing and stitch fasteners. The high-strength bolts shall conform to the edge distance requirement for fasteners. Consideration should be given to the use of smaller diameter bolts since they require lower specified minimum bolt tensions.

- The minimum number of high-strength bolts in flange splices shall be 6.

- The minimum thickness of the truss to pole connection plates shall be ¾". The minimum thickness of the truss bracing gusset plates and the stiffener plates shall be ½".

- The minimum size fillet weld shall be ¼", unless noted otherwise. The use of seal and tack welds is not permitted. No welding shall be performed after galvanizing.

- The anchor bolt to base plate connection shall be designed as a double-nut connection with shear holes. The anchor bolts shall use an embedded anchorage plate, ¾" minimum thickness, to transmit loads from the pole base to the concrete foundation. The use of hooked anchor bolts is not permitted. The minimum number of anchor bolts shall be 12. The minimum anchor bolt diameter shall be 2". The minimum anchor bolt embedment, the distance from the top of the foundation to the top of the embedded anchorage plate, shall be 3'-6" or the tension development length of the vertical foundation reinforcement plus the end concrete cover, which ever is greater. Each anchor bolt shall be supplied with 5 nuts and 4 washers. Washers shall be placed on the top and bottom surfaces of the pole base plate and anchorage plate. Welding to the anchor bolts is not permitted.

The approximate dimensions of the truss and the pole heights are shown in plan and elevation on the traffic sheets. The actual sign support dimensions shall be determined by the Contractor based on a the horizontal and vertical clearances shown on the plans, a field survey of the finished grade at the site, the elevation of the top of the finished foundation, the locations of overhead and subsurface utilities, the location of the drainage facilities and noise barrier wall locations.

The minimum vertical clearance from the top of the finished road to the bottom of the sign panels and the centerline of the truss shall be as shown on the sign support drawings as amended by the sign support elevation on the traffic sheets.

Sign panels shall be installed symmetrically about the centerline of the truss. The bottom of all signs shall be level. Sign panels shall be installed at an angle of 5° from the vertical, with the top edge tilting toward oncoming traffic.

The sign panels and crown panels, if applicable, shall be connected to sign panel support members. The support members shall extend full height of the sign and crown panels. The number and spacing of support members shall be determined by the Contractor based on the width of the sign and crown panels and the support member spacing parameters shown on the plans. Sign panels shall be supported by no less than 3 support members. Crown panels shall be supported by no less than 2 support members. The faying surface between the sign panel support member and the rear face of the sign panel shall be a flange so that panel clips may be placed on both sides of the flange to connect the panel. The outside support members for each sign panel shall include a sign stop at the bottom of the member and a sign hook at the top of the member to support and carry the sign panels.

The sign panel support members shall be designed to be vertically adjustable to compensate for the truss camber. The supports members shall be designed to be installed at any location along the truss. The use of U-bolts and threaded rods is permitted. No less than 2 U-bolts or 4 threaded rods shall be used at each chord connection. The threaded ends of these fasteners shall have double nuts.

The minimum thickness of the sign panel support members and the plate and rolled shape components used in the connection to the sign support shall be ¼".

The sign support shall be designed for the load effects due to the actual sign panels that it will carry unless otherwise shown on the plans. The sign supports shall also be designed for the load effects of sign panels during all stages of construction which may exist during the project under which the supports are installed. The load effects on the sign support from the sign and crown panels shall include forces and moments due to the eccentricity of the sign and crown panels and the unbalanced lateral loads on the crown panel. The sign support and its component parts shall also be designed for the load effects resulting from the transportation and erection of the support.

The sign support shall be designed so that the pole extends into the truss and is connected at each chord. Connection plates, through each chord, shall be fastened with high-strength bolts to stiffened connection plates fillet welded to the pole. 100% of the fillet welds used in the truss to pole connection shall be non-destructively tested in accordance with the magnetic particle method. All bolts, nuts and washers used in the connection shall be visible. The use of tapped holes in the plates of the connection is not permitted.

Vent and drain holes shall be provided for galvanizing. The number, size and location of vent and drain holes should be coordinated with the galvanizer prior to the submission of the sign support design. The area of vent and drain holes at each end of a member shall be at least 30% of the inside area of the member for members 3" in diameter and greater and 45% of the inside area of the member for members smaller than 3" in diameter. The vent and drain holes shall be strategically located for reducing stress and for proper galvanizing. The holes shall be made by drilling. Flame cut holes are not permitted. The edges of all holes shall be rounded by grinding. After galvanizing, exposed holes placed in the sign support components for galvanizing shall be sealed with neoprene plugs.

The pole shall have a handhole centered 2'-9" from the top of the base plate. The pole handhole shall be located away from traffic.

Handholes shall be reinforced with a frame having a minimum 4" wide by minimum 6" high clear opening. The minimum thickness of the handhole frame shall be no less than the thickness of the tubular member. The handhole frame shall be connected to the tubular member with a partial joint penetration groove weld reinforced with a fillet weld. The weld shall be non-destructively tested in accordance with the magnetic particle method. Each handhole shall have a cover connected to the handhole frame with no less than 4 stainless steel screws. The cover shall be installed with a neoprene gasket. A stainless steel chain shall be bolted to the cover

inside face of the cover with a stainless steel bolt with a lock nut and bolted to the inside side face of the handhole frame with a stainless steel bolt. On pole hand hole frames, the opposite side face of the handhole shall have a hole with a nut welded to outside face for a stainless steel grounding bolt.

Handhole frames fabricated from steel plate and bent to form a closed shape shall be joined with a complete joint penetration groove weld. All surfaces of the groove weld shall be ground smooth and flush with the adjacent base metal.

The ends of each chord member shall be sealed with a removable end cap plate attached to the member with a threaded fastener. The joint between the member and plate shall be sealed with a neoprene gasket.

The design of the sign support and the anchorage shall be coordinated with the design of the foundation to ensure that the foundation is adequate for the support reactions and to avoid conflicts between the embedded anchorage and the foundation reinforcement.

Prior to performing a field survey for each sign support, the Contractor shall coordinate with the Engineer to locate and stake each support foundation. The foundations shall be located to avoid conflicts with both subsurface and overhead utilities and subsurface drainage structures. In accordance with Article 1.05.15, the Contractor shall contact "Call Before You Dig" to identify the subsurface utilities that are located in the vicinity of each foundation. Once the location of each foundation has been found acceptable to the Engineer, the Contractor shall perform a field survey to obtain the information necessary to prepare a roadway cross-section with details of each sign support and supporting foundation(s).

The Contractor shall prepare and submit one copy of a cross-section (elevation) drawing based on a field survey for each sign support to the Engineer for review and approval. Each cross-section drawing shall be submitted in paper form and shall be printed on an ANSI B (11" x 17"; Ledger/Tabloid) sheet. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI B sheets, the minimum text height and width shall be $^{1}/_{16}$". All letter characters shall be uppercase. Only one sign support cross-section shall be shown on each drawing.

The cross-sections shall include, but not be limited to the following:

- Project number, town, location (route number, direction, mileage), station, structure number, sign location number, and site number
- Location and dimensions of travel lanes and shoulders
- Location and elevation of the high point of the road
- Top and bottom of slope elevations. Slope of finished grade at foundations

- Locations of utilities (both overhead and subsurface)
- Locations of drainage facilities
- Locations of noise barriers, including elevation of top of wall
- Type of protection (metal beam rail/barrier), and the dimension from the front face of metal beam rail /barrier to the edge of the foundation and centerline of the foundation
- Elevation of the top of the foundation(s). The top of the foundation(s) shall project 6" to 12" above the level ground or 6" to 12" above the finished grade at the high side of a sloping grade.
- Dimension from top foundation to finish grade (existing or proposed as applicable).
- Span, dimension from centerline to centerline of foundations
- Dimensions of sign panel(s)
- Location of sign panel(s) relative to the centerline of the foundations/poles
- Location of sign panel(s) relative to the roadway travel lanes
- Dimension from top of foundation to centerline of truss
- Minimum dimensions from high point of the road to the centerline of the truss and the bottom of the sign panel(s)
- Elevation of centerline of truss

The Contractor shall submit the cross-section drawings to the project's "Engineer of Record" for review and approval. The project's "Engineer of Record" is identified in the signature block on the sign support traffic cross-section contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped cross-section drawings shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. The approval of cross-section drawings does not relieve the Contractor from verifying that all dimensions are correct. If there are any changes to the proposed location of the sign support and foundations prior to the construction of the foundations, the cross-section shall be re-submitted for review and approval.

Prior to fabrication, the Contractor shall submit working drawings and design computations for each sign support, based on the approved cross-section, to the engineer for review in accordance with Article 1.05.02. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and erection of the structure and its components, including a copy of the certificate of insurance, shall be prepared and submitted for **each** support. **A single set of drawings with tabulated data for multiple sign support locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units.

The packaged set of working drawings and computations for each support shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf) with appropriate bookmarks. The packaged set submitted in paper form shall be bound with a staple. The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file and the file shall be enabled for commenting. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer, fabricator and galvanizer – contact information should include name and address of each firm and the name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of fabricator's AISC certification
- copy of the **approved** cross-section
- sign support working drawings
- sign support design computations
- welding procedures
- sign support installation procedure, including the method to plumb the poles

Combining of a non-approved cross-section with the sign support working drawings and calculations into one packaged set for review is not permitted.

The working drawings and design computations shall be **signed, dated and sealed** by a Professional Engineer licensed in the State of Connecticut, who shall also be available for consultation in interpreting his computations and drawings, and in the resolution of any problems which may occur during the performance of the work. Each working drawing shall be signed, dated and sealed. The cover/first sheet for the computations shall be signed, dated and sealed.

Working drawings submitted in paper form shall be printed on ANSI B (11" x 17"; Ledger/Tabloid) sheets. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI B sheets, the minimum text

height and width shall be $^{1}/_{16}$". All letter characters shall be uppercase. Design computations, procedures and other supporting data shall be submitted on ANSI A (8 ½" x 11"; Letter) sheets.

Working drawings submitted in an electronic portable document format (.pdf) shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be $^{1}/_{8}$". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 ½" x 11"; Letter) sheets.

The working drawings shall include complete details of all sign support components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- reference to the design specifications design criteria, such as design wind speed, minimum design life, etc.
- material specifications/designations for all components
- non-destructive weld testing requirements
- details of the location of the longitudinal seam weld in the pole
- vent and drain holes for galvanizing
- dead load and permanent camber
- a plan view of the anchor bolt layout relative to the orientation of the span
- anchor bolt dimensions, including embedment and projection
- support installation procedure, including the method to plumb the pole

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number

- references to design specifications, including interim specifications, and the applicable code section and articles

- description/documentation for all computer programs used in the design

- drawings/models of the structure, components and connections, with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results

- Tabulation of the section properties of the tubular members at each analyzed section. The tabulated values should include the diameter, D (if round member); effective width, b (if multisided member, AASHTO 5.5.2); equivalent diameter (if multisided member, AASHTO 5.6), wall thickness, t; inside bend radius, r_b (if multisided member, AASHTO 5.5.2), cross-sectional area, A; moment of inertia, I; section modulus, S; radius of gyration, r. AASHTO Table B-1 may be used to determine the section properties. If Table B-1 is used, the radius measured to the mid-thickness of the wall shall also be provided.

- coefficients and factors used in the design

- results of all group loads and load combinations

- stress ratios and combined stress ratios for all group loads and load combinations

- maximum vertical deflection due to dead loads

- maximum vertical deflection due to ice loads

- vertical deflection of the free end of the truss due to the wind load effects of truck-induced gusts

- total camber and permanent camber

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found

the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the following Department offices:

Bridge Safety and Evaluation
Research and Materials
Traffic Engineering
Engineer of Record

If the as-built condition of the foundation(s), such as the location or elevation, will impact the design, final erection or assembly of the sign support for conformance with the requirements herein, the cross-section shall be re-submitted for review and approval. Subsequently, the working drawings and calculations shall be resubmitted to conform to the revised cross-section and the requirements herein.

The support shall be fabricated in accordance with the latest edition of the AASHTO LRFD Bridge Construction Specifications, including the latest interim specifications, amended herein.

The steel fabricator shall be AISC certified for the fabrication of Simple Steel Bridges (SBR).

Fabrication of the support may begin only after the working drawings and design computations have been reviewed and the Engineer has authorized fabrication to begin. The Contractor shall submit to the Engineer, no less than 2 weeks prior to the start of fabrication, the name and location of the fabrication shop where the work will be done so that arrangements can be made for an audit of the facility and the assignment of the Department Quality Assurance (QA) inspector. No fabrication will be accepted unless the QA inspector is present during fabrication. No changes may be made during fabrication without prior written approval by the Department.

The Contractor shall furnish facilities for the inspection of material and workmanship in the shop by the Engineer. The Engineer and his representative shall be allowed free access to the necessary parts of the premises.

The Engineer will provide QA inspection at the fabrication shop to assure that all applicable Quality Control plans and inspections are adequately adhered to and maintained by the Contractor during all phases of the fabrication. A thorough inspection of a random selection of elements at the fabrication shop may serve as the basis of this assurance.

Prior to shipment to the project, each individual piece of steel shall be marked in a clear and permanent fashion by a representative of the fabricators' Quality Control (QC) Department to indicate complete final inspection by the fabricator and conformance to the project specifications for that piece. The mark must be dated. A Materials Certificate in accordance with Article 1.06.07 may be used in lieu of individual stamps or markings, for all material in a single shipment. The Materials Certificate must list each piece within the shipment and accompany the shipment to the project site.

Following the final inspection by the fabricator's QC personnel, the Engineer may select pieces of steel for re-inspection by the Department's QA inspector. Should non-conforming pieces be identified, all similar pieces must be re-inspected by the fabricator and repair procedure(s) submitted to the Engineer for approval. Repairs will be made at the Contractor's expense.

The pieces selected for re-inspection and found to be in conformance, or adequately repaired pieces, may be marked by the QA inspector. Such markings indicate the Engineer takes no exception to the pieces being sent to the project site. Such marking does not indicate acceptance or approval of the material by the Engineer.

Fabrication of the supports shall conform to the requirements of Articles 6.03.04, 6.03.05, 6.03.06 and 6.03.10, 6.03.11, 6.03.12 and 6.03.13.

All welding details, procedures and nondestructive testing shall conform to the requirements of AWS D1.1 Structural Welding Code - Steel.

Personnel performing the nondestructive testing shall be certified as a NDT Level II technician in accordance with the American Society for Non Destructive Testing (ASNT), Recommended Practice SNT-TC-1A and approved by the Engineer.

All nondestructive testing shall be witnessed by Engineer. Certified reports of all tests shall be submitted to the Engineer for examination. Each certified report shall identify the structure, member, and location of weld or welds tested. Each report shall also list the length and location of any defective welds and include information on the corrective action taken and results of all retests of repaired welds.

The Department reserves the right to perform additional testing as determined by the Engineer. Should the Engineer require nondestructive testing on welds not designated in the contract, the cost of such inspection shall be borne by the Contractor if the testing indicates that any weld(s) are defective. If the testing indicates the weld(s) to be satisfactory, the actual cost of such inspection will be paid by the Department.

All members and components shall be hot-dip galvanized in a single dip. Double-dipping of members and components is not permitted. All exterior and interior surfaces of the sign support members and components shall be completely galvanized.

Galvanized members and components shall be free from uncoated areas, blisters, flux deposits, and gross inclusions. Lumps, projections, globules, or heavy deposits of zinc which will interfere with the intended use of the material will not be permitted.

All damaged areas of the hot-dip galvanized surfaces shall be repaired in accordance with the requirements of ASTM A780. If paint containing zinc dust is used for repairs, the dry coating thickness shall be at least 50% greater than the thickness of the adjacent hot-dip galvanized coating, but no greater than 4.0 mils. The paint shall be brush applied. The use of aerosol spray

cans shall not be permitted. The color of the finished repair area shall match the color of the adjacent hot-dip galvanized surface at the time of the repair to the satisfaction of the Engineer.

Prior to shipping, all galvanized surfaces of the members and components shall be inspected, in the presence of the Engineer, to determine the acceptability of the galvanized coating. Galvanized coatings may be found acceptable by the Engineer if all surfaces of the members and components meet the galvanizing requirements herein. Only sign support members and components with acceptable galvanized coatings shall be shipped. If the galvanized coating on any member or component is found not acceptable, the Contractor shall submit a repair procedure to the Engineer for review.

The sign support structure number shall be stenciled in black paint on the pole centered approximately 5' off the ground and visible from the roadway. The numeric characters shall be 3" to 4" high and placed vertically so that they may be read from top to bottom.

After fabrication, the sign support components shall be assembled in the fabricator's shop, in the presence of the Engineer, to determine the acceptability of the bolted connections and to confirm the permanent camber. The faying surfaces of the connections shall be free of dirt, loose scale, burrs, other foreign material and other defects that would prevent solid seating of the parts. Prior to assembly, the galvanized faying surfaces shall be scored by wire brushing. The faying surfaces of the connection plates shall be checked with a straight edge to ensure that the surfaces are not distorted and the entire faying surface of each plate will be in contact when assembled. The high-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). A connection may be found acceptable by the Engineer if the faying surfaces of the connection plates are in firm, continuous contact after properly tensioning the bolts. Only sign supports with acceptable connections shall be shipped. If a bolted connection is found not acceptable, the Contractor shall submit a procedure to repair the connection to the Engineer for review. Galvanized surfaces damaged by the repair procedure shall be hot dip galvanized. Repair of the damaged galvanized surfaces in accordance with the requirements of ASTM A780 or with a galvanizing repair stick is not permitted. Bolts, nuts and washers used for the trial shop fit-up shall not be reused in the final field assembly. The permanent camber shall be measured at the end of the truss and the structure shall be rejected if the camber does not meet the following:

$$L/1000 \leq \text{Permanent Camber} \geq L/500$$

where L is the span length of the overhead member measured from centerline to the end of the truss.

The finished members and components shall be protected with sufficient dunnage and padding to protect them from damage and distortion during transportation. Damage to any material during transportation, improper storage, faulty erection, or undocumented fabrication errors may be cause for rejection of said material at the project site. All costs associated with any corrective action will be borne by the Contractor.

Following delivery to the project site, the Engineer will perform a visual inspection of all material to verify shipping documents, fabricator markings, and that there was no damage to the material or coatings during transportation and handling.

The Engineer is not responsible for approving or accepting any fabricated materials prior to final erection and assembly at the project site.

High-strength bolts, nuts and washers shall be stored in accordance with Subarticle 6.03.03-4(f).

The support shall be erected, assembled and installed in accordance with these specifications and the procedures and methods submitted with the working drawings. The Contractor and the support designer are responsible to ensure that the erection and assembly procedures and methods in this specification are acceptable for use with the support. Changes to these methods and procedures shall be submitted with the working drawings and computations.

Prior to installation of the support, the threads of the embedded anchor bolts shall be cleaned of accumulated dirt and concrete. The anchor bolt nuts shall be re-lubricated with a lubricant containing a visible dye of any color that contrasts with the color of the galvanizing. On each anchor bolt, all the nuts shall be run down by hand on the anchor bolt threads.

The space between the bottom of the baseplate and the top of the foundation shall not be sealed with closed cell elastomer or filled with grout, unless otherwise noted.

During the erection of the pole, the leveling nuts and washers shall be inspected, and if necessary adjusted, so that they are in full contact with the bottom surface of the baseplate. Subsequently, the top nuts and washers shall be inspected, and if necessary adjusted, so that they are snug tight (in full contact with the baseplate). Snug tight is defined as the condition where the nuts and washers are in full contact with the baseplate and the snug tight condition was the result of the full effort of a person using a 12” wrench.

With the top nuts snug tight, the top nuts shall be tightened one-sixth of a turn beyond snug tight. After the top nuts are tightened, the leveling nuts should be retightened to assure the full contact has been maintained. After tightening, lock nuts shall be installed over the top anchor nuts. The top nuts shall have full thread engagement. The distance from the bottom of the leveling nuts to the top of the foundation shall not exceed 1".

High-strength bolts, including nuts and washes, shall be installed and tensioned in accordance with Subarticle 6.03.03-4(f). The truss shall be temporarily and fully supported while all the high-strength bolts are installed and tensioned. The temporary support of the truss shall not be removed until the Engineer has confirmed that the faying surfaces of the connection/flange plates are in firm, continuous contact and the high-strength bolts were properly installed and tensioned. All high-strength bolts in the bolted connections shall be inspected (in accordance with Subarticle 6.03.03-4(f)) to confirm the high-strength bolts were properly tensioned.

After erecting the support, the support shall be electrically grounded by attaching the bare copper grounding conductor to the inside of the handhole frame with a galvanized steel bolt and to the ground rod with a ground clamp. The rigid metal conduit shall be electrically grounded by attaching the bare copper grounding conductor to the insulated bonding bushing and to the ground rod with a ground clamp.

After erection of the support and before the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall immediately stabilize the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of a portion of the structure or the entire structure.

The sign panels shall be located and mounted on the truss as shown in the working drawings.

After installation of the sign panels, the anchor bolts nuts (leveling and top anchor nut) and washers shall be in full contact with the top and bottom surfaces of the pole baseplate and the centerline of the pole shall be plumb.

After erection of the support and after the installation of the sign panels, if the structure exhibits excessive vibration, oscillations or deflections as determined by the Engineer, the Contractor shall design and construct devices to mitigate the movements. The Contractor is responsible for immediately stabilizing the structure to the satisfaction of the Engineer. Stabilizing the structure may require the removal of the sign panels or the entire structure. Prior to installation of any mitigation device, the Contractor shall submit drawings, design computations other documentation to the Engineer for review in accordance with Article 1.05.02.

Method of Measurement: This work will be measured for payment by the number of cantilever sign structures, completed and accepted in place.

Basis of Payment: This work will be paid for at the contract unit price each for "4 Chord Truss Cantilever Sign Structure", complete in place, which price shall include field survey, equipment, materials, tools and labor incidental to the design, fabrication and installation, including anchorage materials, sign panel support members and mitigation devices, if required, of the supports at the locations specified on the plans.

ITEM #1202239A – OVERHEAD TRUSS SIGN SUPPORT FOUNDATION

Description: Work under this item shall consist of the subsurface investigation, design and construction of foundations to support a 4 chord truss bridge sign structure, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. The foundation may be either a spread footing foundation or a drilled shaft foundation as selected by the Contractor.

For the purpose of bidding this item, the Contractor shall assume that the subsurface conditions for each foundation location consists of cohesionless medium dense granular soil (AASHTO A-1 or A-2) with cobbles present and a high groundwater table which requires the use of wet construction/concreting methods.

Materials: The reinforcing steel shall be uncoated, ASTM A615, Grade 60 reinforcement conforming to the requirements of Article M.06.01.

Granular fill shall conform to M.02.01.

Temporary Earth Retaining System: Materials of steel sheet piling shall conform to the requirements of ASTM A328. Timber sheet piling shall conform to the requirements of Subarticle M.09.01-1. Materials other than steel or timber, or a combination of these may be used provided they are properly designed for the purpose intended. Systems utilizing other material(s) shall conform to the manufacturer's specifications and project specifications. The parts list shall be furnished for the proprietary system and the Contractor shall provide the material certificates for the parts.

Concrete for the spread footing foundation, both footing and pedestal, and for the formed pedestals of the drilled shaft foundation shall be Class "F" Concrete, with a minimum 28 day compressive strength of 4,000 psi, conforming to Article M.03.01.

Concrete for drilled shafts shall be a Contractor designed Portland cement concrete with a 3/8" (No. 8) maximum coarse aggregate size and minimum 28 day compressive strength of 4,000 psi. The Contractor shall design concrete mixes for both dry and wet drilled shaft construction. The concrete mixes shall be designed so that the concrete remains in a workable plastic state throughout the 2 hour placement limit. For dry construction, the initial concrete slump shall be from 6" to 8". For wet construction, the initial concrete slump shall be from 7" to 8". The concrete shall maintain a slump of 4" or greater for the duration of the concrete placement. The mix concrete designs, including admixtures, shall be submitted to the Engineer for approval.

Slurry for drilled shafts shall be a Contractor designed mineral slurry that meets the range of values listed herein. The slurry mix design, including admixtures, shall be submitted to the Engineer for approval.

Rigid metal conduit, ground rod sleeves and related hardware, and end caps shall be galvanized steel conduit, conforming to the Plans and Article M.15.09.

Ground rods shall be 5/8" in diameter by 12'-0" long copper clad steel. The copper cladding shall be a minimum thickness of 0.128". The ground clamp shall be a square-head bolt type, approved for direct burial.

Bare copper wire shall conform to Article M.15.13.

Topsoil shall conform to Article M.13.01.

Fertilizer shall conform to Article M.13.03.

Seed mixture shall conform to Article M.13.04.

Mulch shall conform to Article M.13.05.

Erosion control matting shall conform to Article M.13.09.

Construction Methods:

Subsurface Conditions for Foundation Design: The Contractor shall perform a subsurface investigation for **each** sign foundation location. The subsurface investigation program should be prepared and executed in accordance with the most recent editions of the AASHTO Manual on Subsurface Investigations and ConnDOT Geotechnical Engineering Manual. The Contractor shall provide a full-time inspector to oversee the subsurface exploration program. The subsurface investigations and all related cost will not be measured for payment and shall be included in the cost of the foundation.

The Contractor shall review results of their subsurface investigation to determine if subsurface conditions for sign locations differ materially from those assumed at the time of bid. Should the subsurface investigation(s) encounter conditions that differ materially, the Contractor shall notify the Engineer in writing prior to the submission of the working drawings and calculations. All matters regarding increased cost relating to agreed upon change in subsurface conditions will be handled per Section 1.04.04 – Differing Site Conditions.

Design Requirements for Spread Footing Foundations: The Contractor's traffic structure foundation designer shall be a Professional Engineer licensed in the State of Connecticut. The Contractor's designer shall obtain a Professional Liability Insurance Policy in accordance with the requirements of Article 1.05.02-2a. The Contractor shall submit a copy of the certificate of insurance to the Engineer in accordance with the requirements of Article 1.05.02-2a.

The design of spread footing traffic structure foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, amended as follows:

- The footing and pedestal shall be designed for the traffic structure support reactions of all group loads and load combinations. No reduction of the reactions or increase in the allowable stresses of the materials is permitted.

- The minimum concrete cover for the reinforcement in the footing and pedestal shall be 3".

- The footing shall have a top and bottom mat of reinforcement. The reinforcement in each mat shall extend full length and width of the footing. Splicing of the footing reinforcement is not permitted. The minimum size and spacing of reinforcement in each direction of each mat shall be #5 @ 12".

- The foundation shall have a single rectangular pedestal connected to the footing with dowels cast into the footing. The minimum size and spacing of reinforcement in each face of the pedestal shall be #5 @ 12".

- The minimum factor of safety against overturning shall be 2.0. Resistance to overturning shall be based solely on applicable dead loads.

- The minimum factor of safety against sliding and torsion shall be 1.5. The maximum value for the coefficient of friction to be used in determining the sliding resistance shall be 0.6. Resistance to sliding and torsion shall be based solely on applicable dead loads.

- The use of soil or rock anchors to increase overturning or sliding resistance is not permitted.

- If ground water is present, the design of the foundation shall include the effects of buoyancy.

- The footing shall be founded on entirely on either level soil or level rock. Constructing a footing on a sloping substrate is not permitted. Footings founded on a combination of soil and rock and soil are not permitted.

- Footings on soil shall be placed on a minimum of 12" of granular fill.

- The minimum embedment for a foundation, founded entirely on soil, shall be no less than 4' below the finished grade at the low side of a sloping grade. The minimum embedment for a foundation, founded entirely on rock, shall be no less than 6" below the finished grade at the low side of a sloping grade.

- The design of the foundation shall account for the slope of the finished grade.

- The top of the pedestal shall project 6” to 12” above the level ground or 6” to 12” above the finished grade at the high side of a sloping grade.

- The design of the foundation shall be coordinated with the traffic structure support to avoid conflicts between the embedded support anchorage and the reinforcement.

Design Requirements for Drilled Shaft Foundations: The design of drilled shaft traffic structure foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, amended as follows:

- The foundation shall be designed for the soils and rock properties and parameters based on the subsurface conditions (character of the soil and rock, presence of ground water, etc.) in the location of, adjacent to and below the drilled shaft foundation excavation determined by the subsurface investigation.

- The concrete for the foundation shall have a compressive strength, f'_c, of 4,000 psi at 28 days. The concrete cover for reinforcing in a drilled shaft shall conform to the following:

Shaft Diameter	Minimum Cover
Less than or equal to 3’-0”	3”
Greater than 3’-0” and less than 5’-0”	4”
Greater than or equal to 5’-0”	6”

- The reinforcement shall be uncoated and conform to ASTM A615, Grade 60.

- The foundation shall be designed for the traffic structure support reactions of all group loads and load combinations. The reactions shall include axial, shear, flexural and torsional load effects. No reduction of the reactions or increase in the allowable stresses of the materials is permitted.

- For sign support foundations, the minimum drilled shaft diameter shall be 3’-0”.

- The design of the drilled shaft foundation shall include embedment of the foundation in soil, the embedment of the foundation in rock or the embedment of the foundation partially in soil and partially in rock, as applicable.

- The design of the drilled shaft embedment depth shall account for the slope of the finished grade.

- The minimum embedment for a drilled shaft foundation, excavated entirely in soil, shall be no less than 15’-0” below the finished grade at the low side of a

sloping grade. The minimum embedment for a drilled shaft foundation, excavated entirely in rock shall be no less than 10'-0" below the finished grade at the low side of a sloping grade.

- For sign support foundations, the top of the drilled shaft pedestal shall project 6" to 12" above the level ground or 6" to 12" above the finished grade at the high side of a sloping grade.

- The embedment depth for a drilled shaft foundation, determined by the Brom's design method, shall have a minimum factor of safety of 3.25 applied to the shear and moment load effects. The factor of safety applied to the torsional load effect shall be no less than 1.3.

- The load factor method shall be used for the structural design of the drilled shaft. The load factor applied to all loads, dead, wind and ice, and their effects, axial, shear, flexure and torsion, shall be no less than 1.6. The drilled shaft may be designed in accordance with the load factor method presented in the latest edition of the Building Code Requirements for Reinforced Concrete", ACI 318.

- The drilled shaft foundation shall be reinforced with longitudinal and transverse reinforcement. The area of longitudinal reinforcement should be no less than the sum of the reinforcement required for flexure and the longitudinal reinforcement required for torsion. The area of transverse reinforcement should be no less than the sum of the reinforcement required for shear and the transverse reinforcement required for torsion. Additional transverse reinforcement may be required at the top of the drilled shaft within the limits of the pedestal due to the torsional load on the anchor bolt group.

- The minimum number and size of longitudinal reinforcing bars shall be 16 - #8. The reinforcement shall extend full length of the drilled shaft, including the pedestal. Splicing of the longitudinal reinforcement is not permitted.

- The drilled shaft shall be transversely reinforced with spirals or circular, one piece, enclosed ties. The minimum size of the reinforcement shall be #4. The maximum spacing/pitch of the reinforcement shall be no more than 6". The spiral reinforcement shall be terminated at the top and the bottom with 1 ½ turns of the reinforcing and a 135° standard hook. Spirals may be spliced with lap splices or mechanical connectors. For spirals, the minimum lap splice length shall be 1.7 times the tension development length (including modification factors) of the bar or 48 bar diameters, whichever is greater. For spirals, the mechanical connectors shall develop both in tension and compression 125% of the specified yield strength of the bar and conform to the latest edition of the AASHTO LRFD Bridge Design Specifications, including the latest interim specifications. For ties, the minimum lap splice length shall be no less than 1.7 times the tension development length (including modification factors) of the bar. Tie lap splices

shall be alternated. The ends of the bars in lap splices shall be anchored with a 135° standard hook around longitudinal reinforcement.

- For sign support foundations, the top of the drilled shaft shall be designed with a square pedestal to facilitate the installation of the anchor bolts and rigid metal conduits. The dimensions of the pedestal shall equal the diameter of the drilled shaft. The top and sides of the pedestal shall be reinforced with a grillage of reinforcement. The minimum size reinforcement shall be #5. The minimum concrete cover shall be 3"

- The design of the foundation shall be coordinated with the traffic structure support to avoid conflicts between the embedded support anchorage and the foundation reinforcement.

The Contractor's foundation designer shall obtain a Professional Liability Insurance Policy in accordance with the requirements of Article 1.05.02-2a. A Contractor shall submit a copy of the certificate of insurance to the Engineer in accordance with the requirements of Article 1.05.02-2a.

Prior to excavating for the foundation, the Contractor shall submit working drawings and design computations for the foundation(s) at each sign support, based on the approved cross-section, to the Engineer for review in accordance with Article 1.05.02. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and construction, including a copy of the certificate of insurance, shall be prepared and submitted for the foundation(s) at **each** support. **A single set of drawings with tabulated data for multiple foundation locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units.

The packaged set of working drawings and computations for the foundation(s) at each support shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf) with appropriate bookmarks. The packaged set submitted in paper form shall be bound with a staple. The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file and the file shall be enabled for commenting. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer – contact information should include name and address of design firm, name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of the **approved** cross-section
- results of subsurface investigation, including boring logs and geotechnical design recommendations

- foundation working drawings
- foundation design computations

Combining the foundation working drawings and calculations with sign support working drawings and calculations into one packaged set for review is not permitted.

The working drawings and design computations shall be **signed, dated and sealed** by a Professional Engineer licensed in the State of Connecticut, who shall also be available for consultation in interpreting his computations and drawings, and in the resolution of any problems which may occur during the performance of the work. Each working drawing shall be signed, dated and sealed. The cover/first sheet for the computations shall be signed, dated and sealed.

Working drawings submitted in paper form shall be printed on ANSI B (11" x 17"; Ledger/Tabloid) sheets. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI B sheets, the minimum text height and width shall be 1/16". All letter characters shall be uppercase. Design computations, procedures and other supporting data shall be submitted on 8 ½" x 11" (Letter) sheets.

Working drawings submitted in an electronic portable document format (.pdf) shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 ½" x 11") letter sheets.

The working drawings shall include complete details of all foundation components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- selected type of foundation (spread footing or drilled shaft)
- reference to the design specifications, including interim specifications
- material specifications for all components
- embedment depths for foundation in soil, rock and a combination of soil and rock
- anchor bolt details, including dimensions, embedment and projection

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design
- drawings/models of the foundation with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results
- sign support reactions of all group loads and load combinations
- soil and rock design parameters
- computations demonstrating the geotechnical and structural capacity of the foundation for all applicable axial and lateral load combinations

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the project's "Engineer of Record".

Foundation Construction: The Contractor performing the work described in this specification shall have installed drilled shafts of both diameter and length similar to those required for the traffic structures for a minimum of 3 years prior to the bid date for this project. The Contractor shall submit a list containing at least 3 projects completed in the last 3 years on which the Contractor has installed drilled shafts of a diameter and length similar to those shown on the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractors' participation on those projects. The Contractor shall provide a list identifying the on-site supervisor(s) and drill operator(s) for approval by the Engineer. The on-site supervisor(s) shall have a minimum 2 years experience in supervising the construction of drilled shafts of a diameter and length similar to those shown on the plans. The drill operator(s) shall have a minimum 1 year experience in drilling for the construction of drilled shafts of a diameter and length similar to those shown on the plans. The list shall contain a summary of each individual's experience. Should the Contractor elect to change personnel during

construction of the shaft, the same approval process will need to be completed for the new personnel prior to them starting work on the project. The Contractor shall not be compensated for any delays resulting from their changing of personnel.

Prior to excavating for the foundation, the Contractor shall submit the following:

Reinforcing Steel Shop Drawings: Based on the accepted foundation design, the Contractor shall prepare reinforcing steel shop drawings for each foundation in accordance with Subarticle 1.05.02-3. The drawings shall be reviewed and stamped approved (or approved as noted) by the foundation designer. Four copies of each reviewed and stamped drawing shall be submitted to the Engineer at the District Construction office. One copy of each reviewed and stamped drawing shall be submitted to the project's "Engineer of Record".

Concrete and Slurry Mix Designs: The Contractor shall submit to the Engineer at the District Construction office the concrete mix designs and the slurry mix design, including admixtures, for review.

Construction Procedure: The Contractor shall submit to the Engineer at the District Construction office a written foundation construction procedure outlining the equipment; drilling procedure for soil and rock, including how spoils will be handled; temporary casing placement and removal; slurry placement; reinforcement, anchor bolt and conduit placement; and concrete placement required for the drilled shaft foundation construction for review. The procedure should include contingencies for the various soil, rock and subsurface water conditions that may be encountered during the foundation construction. Also required in this submission are the following:

- list of proposed equipment to be used, including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casing, etc.

- details of overall construction operation sequence and the sequence of shaft construction in bents or groups

- details of shaft excavation methods

- when the use of slurry is anticipated, details of the mix design and its suitability for the subsurface conditions at the construction site, mixing and storage methods, maintenance methods, and disposal procedures

- details of methods to clean the shaft excavation

- details of reinforcement placement, including support and centralization methods

- details of concrete mix design and test results of both a trial mix and a slump loss test. The tests shall be conducted by an approved testing laboratory using approved methods to demonstrate that the concrete meets slump loss requirements

- details of concrete placement, including proposed operational procedures for free fall, tremie or pumping methods, proposed concreting log form and computations for time duration of shaft pour estimates

- details of casing installation and removal methods

- details of methods for removal of obstructions. Obstructions the Contractor shall provide details of methods for removal include, but are not necessarily be limited to, boulders, concrete, riprap, steel, timber, etc.

The Engineer will evaluate the foundation construction procedure for conformance with the plans, specifications and special provisions and will then notify the Contractor of any additional information required and/or changes necessary to meet the contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the plans and specifications. The Contractor shall not commence construction of the drilled shafts until the Engineer has accepted the foundation construction procedure.

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations in the working drawings or as ordered by the Engineer. The methods and equipment used shall be suitable for the intended purpose and materials encountered. Shaft excavation may be performed by combinations of augering, rotary drilling, down-the-hole hammer, reverse circulation drilling, claming, scraping, or other means approved by the Engineer. Generally, either the dry method, wet method, or temporary casing method may be used, as necessary, to produce sound, durable concrete foundation shafts free of defects. The Contractor shall select and use the method that is needed to properly accomplish the work, as determined by site conditions and subject to the approval of the Engineer. The Contractor is responsible for maintaining the stability of the shaft excavation during all phases of construction.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, and placing the shaft concrete in a relatively dry excavation. The dry construction method shall be used only at sites where the groundwater table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete. The use of the dry construction method is permitted if less than one foot of water

accumulates in the bottom of a hole without pumping over a one hour period, the excavation remains stable and any loose material and water can be removed prior to placement of concrete.

The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. Wet construction methods consist of using a mineral slurry to maintain stability of the hole perimeter while advancing the excavation to final depth, placing the reinforcing cage and shaft concrete. This procedure may require desanding and cleaning the slurry; final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump or other devices; and placing the shaft concrete with a tremie. Unless it is demonstrated to the satisfaction of the Engineer that the surface casing is not required, temporary surface casings shall be provided to aid shaft alignment and position, and to prevent sloughing of the top of the shaft excavation. Surface casing is defined as the amount of casing required from the ground surface to a point in the shaft excavation where sloughing of the surrounding soil does not occur.

The temporary casing construction method shall be used at all sites where the dry or wet construction methods are inappropriate. Temporary casing construction method consists of advancing the excavation through caving material by the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. When a nearly impervious formation is reached, a casing is placed in the hole and sealed in the nearly impervious formation. After the drilling fluid is removed from the casing, drilling may proceed as with the dry method except that the casing is withdrawn when the shaft concrete is placed. If seepage conditions prevent use of the dry method, excavation is completed using the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. Slurry may be omitted if the casing can be installed with only minor caving of the hole.

If the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the shaft, or if rock is encountered at an unanticipated elevation, the Contractor's foundation designer shall determine if the foundation embedment should be revised from that shown on the working drawings. If rock is encountered, the Engineer shall be notified to inspect and determine the elevation of the top of competent rock. Any revisions to the foundation embedment during construction shall be reviewed by the Engineer.

Excavated materials which are removed from the shaft excavation and any drilled fluids used shall be disposed of by the Contractor as directed by the Engineer and in accordance with Section 1.10.

Casings shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of the shaft. Temporary casings shall be removed while the concrete remains workable (i.e., a slump of 4" or greater). Before the casing is withdrawn and while the casing is being withdrawn, a 5'-0" minimum head of fresh concrete in the casing shall be maintained so that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. The required

minimum concrete head may have to be increased to counteract groundwater head outside the casing. Separation of the concrete by hammering or otherwise vibrating the casing, during withdrawal operations, shall be avoided. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis.

Slurry used in the drilling process shall be a mineral slurry. The slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. The level of the slurry shall be maintained at a height sufficient to prevent caving of the hole.

The mineral slurry shall be premixed thoroughly with clean fresh water at a temperature above 41° F and adequate time allotted for hydration prior to introduction into the shaft excavation. The elevation of the slurry within the shaft foundation shall be maintained within 24" of the top casing and at least 48" above the existing water level during drilling and until the concrete placement is essentially complete. The slurry properties shall be maintained at all times, including non-working periods and stoppages. The slurry shall be circulated and agitated, continuously if necessary, to maintain the slurry properties and to prevent it from setting up in the shaft.

The Contractor, in the presence of the Engineer, shall perform control tests on the slurry to ensure that the density, viscosity, and pH fall within the acceptable limits tabulated below. The Contractor shall provide all equipment required to perform the tests. If desanding is required, sand content shall not exceed 4% (by volume) at any point in the shaft excavation as determined by the American Petroleum Institute sand content test.

Range of Values (at 68°F)

Property (Units)	Time of Slurry Introduction	Time of Concreting (in Hole)	Test Method
Density (pcf)	64.3 to 69.1	64.3 to 75.0	Density Balance
Viscosity (seconds per quart)	28 to 45	28 to 45	Marsh Cone
pH	8 to 11	8 to 11	pH paper or meter

The control tests to determine unit weight (density), viscosity, and pH values of the slurry shall be done during the shaft excavation to establish a consistent working pattern.

Prior to placing shaft concrete, slurry samples shall be taken from the bottom and at intervals not exceeding 10'-0" for the full height of slurry. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be eliminated. The mineral slurry shall be within specification requirements immediately before shaft concrete placement.

The hole shall be covered when left unattended.

After completing the shaft excavation, all loose material existing at the bottom of the hole shall be removed.

Prior to placing the reinforcement into the shaft, the Contractor, in the presence of the Engineer, shall determine the shaft dimensions, depth and alignment of the shaft. The concrete shaft shall not be out of plumb by more than ¼ inch per foot of depth. The Contractor shall provide all equipment necessary for checking the shaft excavation. The Engineer shall inspect the shaft and verify that it has been properly cleaned.

The reinforcing steel shall be fabricated and assembled in accordance with Article 6.02.03. All reinforcement shall be assembled with wire ties. Welding to assemble the reinforcement is not permitted.

Immediately after the shaft excavation has been inspected and approved by the Engineer and prior to placement of the concrete, the assembled reinforcing steel cage, including cage stiffener bars, spacers, centralizers, and other necessary appurtenances, shall be carefully placed into the shaft excavation as a unit. Dropping or forcing cages into the shaft will not be allowed. The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances of its intended position until the concrete will support the reinforcing steel. When concrete is placed by tremie methods, temporary hold-down devices shall be used to prevent uplifting of the reinforcing steel cage during concrete placement. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals not exceeding 5’-0” along the shaft to insure concentric location of the cage within the shaft excavation. When the size of the longitudinal reinforcing steel is larger than a #8 bar, such spacing shall not exceed 10’-0”. After placement of the reinforcing cage, the Engineer shall inspect the shaft to ensure that it has remained clean. If the inspection indicates that loose material has accumulated at the bottom of shaft excavation, the Contractor shall remove the reinforcing cage and reclean the shaft.

Concrete shall be placed in the shaft excavation as soon as possible, but no more than 4 hours after completion of excavation and cleaning of the bottom of the excavation, and no more than 2 hours after placement of the reinforcing steel cage. Concrete shall be placed in a continuous operation to the top of the shaft. The concrete level shall be horizontal during the pouring operations. Concrete placement shall continue after the shaft is full until good quality concrete is evident at the top of the shaft. The elapsed time from the beginning of concrete placement in the shaft to the completion of placement shall not exceed 2 hours.

In dry construction, concrete shall be placed in a single continuous operation with the flow of concrete down the center of the shaft excavation so as to consolidate the concrete on impact. During placement operations, the concrete is not permitted to hit the reinforcing steel. A dropchute, consisting of a hopper and flexible hose, may be used to direct the concrete down the center of the foundation and prevent the concrete from hitting the reinforcing steel.

Accumulated water shall be removed before placing the concrete. At the time of concrete placement, no more than 2" of water may exist at the bottom of the excavation and loose sediment no more than ½" over one-half the base is acceptable.

In wet (slurry) construction, concrete to be placed by the tremie method, where the concrete displaces the slurry from bottom of the excavation to the top. The concrete shall be placed through a top metal hopper and into a rigid leak-proof elephant trunk tremie tube, sufficiently large enough to permit free flow of concrete. The tremie tube shall be positioned so that it can be removed without disturbing the reinforcing. Initially, the discharge end of the tremie tube shall be sealed closed (plugged) to prevent slurry from entering the tube after it is placed in the excavation and before the tube is filled with concrete. After concrete placement has started, the tremie tube shall be kept full of concrete to the bottom of the hopper to maintain a positive concrete head. The flow of concrete shall be induced by slightly raising the discharge end of the tube, always keeping the tube end in the deposited concrete. No horizontal movement of the tremie tube will be permitted.

The shaft concrete shall be vibrated or rodded to a depth of 5'-0" below the ground surface except where soft uncased soil or slurry remaining in the excavation will possibly mix with the concrete.

Exposed concrete shall be cured and finished in accordance with Subarticle 6.01.03-21.

No construction operations that would cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted for at least 48 hours after shaft concrete has been placed.

The top of the foundations shall be backfilled and the adjacent disturbed ground surfaces restored to match the surrounding area after the concrete has cured and the forms are removed. Placement of topsoil shall conform to Articles 9.44.01 and 9.44.03. Turf establishment shall conform to Article 9.50.03.

Construction of Spread Footing Foundations: Construction methods for spread footing foundations shall conform to the following:

> Temporary Earth Retaining Systems: Temporary earth retaining system shall be safely designed and shall be carried to adequate depths and braced as necessary for proper performance of the work. Construction shall be such as to permit excavation or fill as required. Interior dimensions shall be such as to give sufficient clearance for construction of forms and their inspection and for battered pile clearance when necessary. Movements of the system or bracing which prevent the proper completion of the substructure shall be corrected at the sole expense of the Contractor. No part of the temporary earth retaining system or bracing shall be allowed to extend into the substructure without written permission of the Engineer.

Working drawings and design calculations for temporary earth retaining system shall be submitted in accordance with the requirements of Article 1.05.02(2). 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.

Unless otherwise ordered by the Engineer, all parts of the temporary earth retaining system shall be removed upon completion of the work for which it was provided. The excavation shall be backfilled and properly compacted, prior to removal of the system unless otherwise permitted by the Engineer. Temporary earth retaining system may be left in place at the option of the Contractor if so permitted by the Engineer, provided that it is cut off at an elevation as directed by the Engineer and the cutoffs removed from the site.

Excavation: Article 2.03.03.

Granular Fill: Article 2.13.03.

Class "F" Concrete: Article 6.01.03.

Deformed Steel Bars: Subarticles 6.02.03-2,3,4,7, and 8.

Additional construction provisions for all foundation types: Anchor bolt assemblies shall be embedded in the concrete as shown on the working drawings. A template plate shall be used to hold the anchor bolt assemblies, conduits and ground rod sleeve in the correct position. The anchor bolts shall be installed plumb.

All conduit ends terminating below grade shall be capped with a malleable iron caps. All above-grade conduit ends shall be terminated with an insulated bonding bushing with tinned insert.

Ground rod and ground wire shall be installed as shown on the plans.

After the foundation has cured, the Contractor shall submit the top of foundation elevations based on a field survey.

The traffic structures shall not be erected on the foundation unit until **all** concrete has reached a compressive strength of 4000 psi.

Method of Measurement: This work will be measured for payment by the number of foundation units, each completely installed and accepted.

Basis of Payment: The work will be paid for at the contract unit price each for "Overhead Truss Sign Support Foundation," completed and accepted in place, which price shall include all

equipment, materials, tools and labor incidental to the design, fabrication, construction and disposal of drilling spoils, of the foundations at the locations specified on the plans.

No additional payment will be made for the Contractor to test the slurry when it is used to construct a drilled shaft foundation. No additional payment will be made for subsurface investigations performed by the Contractor.

The removal of existing roadside barrier systems, installation and removal of temporary roadside barrier systems and resetting existing roadside barrier systems will not be paid for separately, but will be included as part of the work.

The support of excavation areas by temporary earth retaining system will not be paid for separately, but will be included as part of the work.

The temporary support, protection and restoration of utilities (if necessary), including existing underground wiring, conduits, drainage structures, pipes and underdrain systems within the excavation limits will not be paid for separately, but will be included as part of the work.

Backfilling and restoration of adjacent ground surfaces (pavement, slope protection, topsoil & seed, etc.) in all areas disturbed by the work will not be paid for separately, but will be included as part of the work. The Engineer will determine the type, thickness and horizontal limits of the surface treatments to be restored.

The installation of new or upgraded permanent roadside barrier systems, if required, will not be paid for as part of this work, but will be paid for under separate items.

ITEM #1202999A – DRILLED SHAFT TRAFFIC STRUCTURE FOUNDATION

Description: Work under this item shall consist of the subsurface investigation, design and construction of drilled shaft foundations for traffic structures, in accordance with the details shown on the plans, in accordance with these specifications and as ordered by the Engineer. For the purposes of this specification, a traffic structure support may be an overhead cantilever or bridge type sign support structure.

Materials: The reinforcing steel shall be uncoated, ASTM A615, Grade 60 reinforcement conforming to the requirements of Article M.06.01.

The concrete for the drilled shaft shall be a Contractor designed Portland cement concrete with a 3/8" (No. 8) maximum coarse aggregate size and minimum 28 day compressive strength of 4,000 psi. The Contractor shall design concrete mixes for both dry and wet drilled shaft construction. The concrete mixes shall be designed so that the concrete remains in a workable plastic state throughout the 2 hour placement limit. For dry construction, the initial concrete slump shall be from 6" to 8". For wet construction, the initial concrete slump shall be from 7" to 8". The concrete shall maintain a slump of 4" or greater for the duration of the concrete placement. The mix concrete designs, including admixtures, shall be submitted to the Engineer for approval.

The concrete for the formed pedestal shall be Class "F" Concrete, with a minimum 28 day compressive strength of 4,000 psi, conforming to Article M.03.01.

The slurry shall be Contractor designed mineral slurry that meets the range of values listed herein. The slurry mix design, including admixtures, shall be submitted to the Engineer for approval.

Rigid metal conduit, ground rod sleeves and related hardware, and end caps shall be galvanized steel conduit, and shall conform to Article M.15.09.

Ground rods shall be 5/8" in diameter by 12'-0" long copper clad steel. The copper cladding shall be a minimum thickness of 0.128". The ground clamp shall be a square-head bolt type, approved for direct burial.

Bare copper wire shall conform to Article M.15.13.

Topsoil shall conform to Article M.13.01.

Fertilizer shall conform to Article M.13.03.

Seed mixture shall conform to Article M.13.04.

Mulch shall conform to Article M.13.05.

Erosion control matting shall conform to Article M.13.09.

Construction Methods:

Subsurface Conditions for Bidding: For the purpose of bidding this item, the Contractor shall assume that the subsurface conditions for each foundation location consists of cohesionless medium dense granular soil (AASHTO A-1 or A-2) with cobbles present and a high groundwater table which requires the use of wet construction/concreting methods.

Subsurface Conditions for Foundation Design: As early as possible and prior to preparation of the foundation design, the Contractor **shall** perform a subsurface investigation for **each** sign foundation location. The subsurface data obtained in the exploration program at each site shall be used in the design of the foundation at that site. Use of the assumed subsurface condition (that was provided for the purpose of bidding), an assumed conservative subsurface condition or any other assumed subsurface condition shall not be allowed for use in the foundation design nor shall any assumed subsurface condition relieve the Contractor from their responsibility of obtaining a test boring at each foundation site. The subsurface investigation program should be prepared and executed in accordance with the most recent editions of the AASHTO Manual on Subsurface Investigations and ConnDOT Geotechnical Engineering Manual. The Contractor shall provide a full-time inspector to oversee the subsurface exploration program. The subsurface investigations and all related cost will not be measured for payment and shall be included in the cost of the foundation.

The Contractor shall review results of their subsurface investigation to determine if subsurface conditions for sign foundation locations differ materially from those assumed at the time of bid. Should the subsurface investigation(s) encounter conditions that differ materially, the Contractor shall notify the Engineer in writing prior to the submission of the working drawings and calculations. All matters regarding increased cost relating to agreed upon change in subsurface conditions will be handled per Section 1.04.04 – Differing Site Conditions.

Foundation Design: The design of drilled shaft traffic structure foundations shall conform to the requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals – latest edition, including the latest interim specifications, amended as follows:

- The foundation shall be designed for the soils and rock properties and parameters based on the subsurface conditions (character of the soil and rock, presence of ground water, etc.) in the location of, adjacent to and below the drilled shaft foundation excavation determined by the subsurface investigation.

- The concrete for the foundation shall have a compressive strength, f'_c, of 4,000 psi at 28 days. The concrete cover for reinforcing in a drilled shaft shall conform to the following:

Shaft Diameter	Minimum Cover
Less than or equal to 3’-0”	3”
Greater than 3’-0” and less than 5’-0”	4”
Greater than or equal to 5’-0”	6”

- The reinforcement shall be uncoated and conform to ASTM A615, Grade 60.

- The foundation shall be designed for the traffic structure support reactions for all group loads and load combinations. The reactions shall include axial, shear, flexural and torsional load effects. No reduction of the reactions or increase in the allowable stresses of the materials is permitted.

- For sign support foundations, the minimum drilled shaft diameter shall be 3’-0”.

- The design of the drilled shaft foundation shall include embedment of the foundation in soil, the embedment of the foundation in rock or the embedment of the foundation partially in soil and partially in rock, as applicable.

- The design of the drilled shaft foundation embedment depth shall account for the slope of the finished grade.

- The minimum embedment for a drilled shaft foundation, excavated entirely in soil, shall be no less than 15’-0” below the finished grade at the low side of a sloping grade. The minimum embedment for a drilled shaft foundation, excavated entirely in rock shall be no less than 10’-0” below the finished grade at the low side of a sloping grade.

- For sign support foundations, the top of the drilled shaft pedestal shall project 6” to 12” above the level ground or 6” to 12” above the finished grade at the high side of a sloping grade.

- The embedment depth for a drilled shaft foundation, determined by the Brom’s design method, shall have a minimum factor of safety of 3.25 applied to the shear and moment load effects. The factor of safety applied to the torsional load effect shall be no less than 1.3.

- The load factor method shall be used for the structural design of the drilled shaft foundation. The load factor applied to all loads, dead, wind and ice, and their effects, axial, shear, flexure and torsion, shall be no less than 1.6. The drilled shaft may be designed in accordance with the load factor method presented in the latest edition of the Building Code Requirements for Reinforced Concrete”, ACI 318.

- The drilled shaft foundation shall be reinforced with longitudinal and transverse reinforcement. The area of longitudinal reinforcement should be no less than the sum of the reinforcement required for flexure and the longitudinal reinforcement required for torsion. The area of transverse reinforcement should be no less than the sum of the reinforcement required for shear and the transverse reinforcement required for torsion.

- In drilled shaft foundations for cantilever sign structures, the area of transverse reinforcement provided shall prevent the concrete breakout at the edge of the foundation due to the torsional load on the anchor bolt group. The area of transverse reinforcement provided shall be considered adequate to prevent this condition if the nominal torsional strength of the foundation is greater than the concrete breakout strength. The concrete breakout strength shall be determined in accordance with the latest edition of the Building Code Requirements for Reinforced Concrete", ACI 318, Appendix D.

- The minimum number of longitudinal reinforcing bars shall be 16. The minimum size of longitudinal reinforcing bars shall be #8. The minimum area of longitudinal reinforcing bars shall be no less than 1% of the gross cross-sectional area of the shaft. The reinforcement shall extend full length of the drilled shaft foundation, including the pedestal. Splicing of the longitudinal reinforcement is not permitted.

- The drilled shaft foundation shall be transversely reinforced with spirals or circular, one piece, enclosed ties. The minimum size of the transverse reinforcement shall be #4. The maximum spacing/pitch of the transverse reinforcement shall be no more than 6", except in the top 2'-0" of the foundation where the maximum spacing/pitch of the transverse reinforcement shall be no more than 4". The spiral reinforcement shall be terminated at the top and the bottom with 1 ½ turns of the reinforcing and a 135° standard hook. Spirals may be spliced with lap splices or mechanical connectors. For spirals, the minimum lap splice length shall be 1.7 times the tension development length (including modification factors) of the bar or 48 bar diameters, whichever is greater. For spirals, the mechanical connectors shall develop both in tension and compression 125% of the specified yield strength of the bar and conform to the latest edition of the AASHTO LRFD Bridge Design Specifications, including the latest interim specifications. For ties, the minimum lap splice length shall be no less than 1.7 times the tension development length (including modification factors) of the bar. Tie lap splices shall be alternated. The ends of the bars in lap splices shall be anchored with a 135° standard hook around longitudinal reinforcement.

- For sign support foundations, the top of the drilled shaft shall be designed with a square pedestal to facilitate the installation of the anchor bolts and rigid metal conduits. The plan dimensions of the pedestal shall equal the diameter of the drilled shaft. The top and sides of the pedestal shall be reinforced with a grillage

of reinforcement. The minimum size reinforcement shall be #5. The minimum concrete cover shall be 3”

- The design of the foundation shall be coordinated with the traffic structure support to avoid conflicts between the embedded support anchorage and the foundation reinforcement.

The Contractor’s foundation designer shall obtain a Professional Liability Insurance Policy in accordance with the requirements of Article 1.05.02-2a. A Contractor shall submit a copy of the certificate of insurance to the Engineer in accordance with the requirements of Article 1.05.02-2a.

Prior to excavating for the foundation, the Contractor shall submit working drawings and design computations for the foundation(s) at each sign support, based on the approved cross-section, to the Engineer for review in accordance with Article 1.05.02. An individual, independently packaged set of working drawings and computations, with all details and documents necessary for fabrication and construction, including a copy of the certificate of insurance, shall be prepared and submitted for the foundation(s) at **each** support. **A single set of drawings with tabulated data for multiple foundation locations is not permitted.** The alpha-numeric support identifier shall be included on these documents. The working drawings and computations shall be prepared in Customary U.S. units.

The packaged set of working drawings and computations for the foundation(s) at each support shall be submitted either in paper (hard copy) form or in an electronic portable document format (.pdf) with appropriate bookmarks. The packaged set submitted in paper form shall be bound with a staple. The packaged set submitted in an electronic portable document format (.pdf) shall be in an individual file and the file shall be enabled for commenting. The packaged set shall include the following:

- title sheet
- table of contents
- contact information for designer – contact information should include name and address of design firm, name of contact person with phone number and email address
- copy of the certificate of insurance
- copy of the **approved** cross-section
- results of subsurface investigation, including boring logs and geotechnical design recommendations
- foundation working drawings
- foundation design computations

Combining the foundation working drawings and calculations with sign support working drawings and calculations into one packaged set for review is not permitted.

The working drawings and design computations shall be **signed, dated and sealed** by a Professional Engineer licensed in the State of Connecticut, who shall also be available for consultation in interpreting his computations and drawings, and in the resolution of any problems which may occur during the performance of the work. Each working drawing shall be signed, dated and sealed. The cover/first sheet for the computations shall be signed, dated and sealed.

Working drawings submitted in paper form shall be printed on ANSI B (11" x 17"; Ledger/Tabloid) sheets. Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI B sheets, the minimum text height and width shall be 1/16". All letter characters shall be uppercase. Design computations, procedures and other supporting data shall be submitted on 8 ½" x 11" (Letter) sheets.

Working drawings submitted in an electronic portable document format (.pdf) shall be created on ANSI D (22" x 34") full scale (1" electronic file = 1" paper) sheets. (The purpose of creating the drawings on ANSI D sheets is so that the sheets may be printed/plotted at that size or smaller without loss of legibility.) Each drawing shall have a border and title block. Located in the lower right hand corner of the drawing adjacent to the title block, each drawing shall have a rectangular box, 2 ¼" wide x 1 ¾" high, for the reviewers stamp. On the ANSI D full scale sheets, the minimum text height and width shall be 1/8". All letter characters shall be uppercase. The electronic files for the design computations, procedures and other supporting data shall be created on ANSI A (8 ½" x 11") letter sheets.

The working drawings shall include complete details of all foundation components. The drawings shall include, but not be limited to the following:

- the project number, town and support identification number
- reference to the design specifications, including interim specifications
- material specifications for all components
- embedment depths for foundation in soil, rock and a combination of soil and rock
- anchor bolt details, including dimensions, embedment and projection

The design computations shall include, but not be limited to the following:

- the project number, town and support identification number
- references to design specifications, including interim specifications, and the applicable code section and articles
- description/documentation for all computer programs used in the design

- drawings/models of the foundation with dimensions, loads and references to the local and global coordinate systems used (as applicable), to facilitate review of the results

- sign support reactions of all group loads and load combinations

- soil and rock design parameters

- computations demonstrating the geotechnical and structural capacity of the drilled shaft for all applicable axial and lateral load combinations

The Contractor shall submit the packaged set of working drawings and calculations to the project's "Engineer of Record". The project's "Engineer of Record" is identified in the signature block on the sign support structural contract plans. A copy of the transmittal shall be sent to the District Construction office administering the project.

The reviewed and stamped working drawings and calculations shall be sent by the reviewer, along with a recommendation regarding acceptance, to the District Construction office for review, comment and distribution. After the District Construction office has reviewed the working drawings and calculations, ensured all comments have been addressed and have found the submittal to be acceptable, in addition to distributing copies of the working drawings and calculations to the Contractor and District offices, a copy of each packaged set of working drawings and calculations shall be sent to the project's "Engineer of Record".

Foundation Construction: The Contractor performing the work described in this specification shall have installed drilled shafts of both diameter and length similar to those required for the traffic structures for a minimum of 3 years prior to the bid date for this project. The Contractor shall submit a list containing at least 3 projects completed in the last 3 years on which the Contractor has installed drilled shafts of a diameter and length similar to those shown on the plans. The list of projects shall contain names and phone numbers of owner's representatives who can verify the Contractors' participation on those projects. The Contractor shall provide a list identifying the on-site supervisor(s) and drill operator(s) for approval by the Engineer. The on-site supervisor(s) shall have a minimum 2 years experience in supervising the construction of drilled shafts of a diameter and length similar to those shown on the plans. The drill operator(s) shall have a minimum 1 year experience in drilling for the construction of drilled shafts of a diameter and length similar to those shown on the plans. The list shall contain a summary of each individual's experience. Should the Contractor elect to change personnel during construction of the shaft, the same approval process will need to be completed for the new personnel prior to them starting work on the project. The Contractor shall not be compensated for any delays resulting from their changing of personnel.

Prior to excavating for the foundation, the Contractor shall submit the following:

Reinforcing Steel Shop Drawings: Based on the accepted foundation design, the Contractor shall prepare reinforcing steel shop drawings for each foundation

in accordance with Subarticle 1.05.02-3. The drawings shall be reviewed and stamped approved (or approved as noted) by the foundation designer. Four copies of each reviewed and stamped drawing shall be submitted to the Engineer at the District Construction office. One copy of each reviewed and stamped drawing shall be submitted to the project's "Engineer of Record".

Concrete and Slurry Mix Designs: The Contractor shall submit to the Engineer at the District Construction office the concrete mix designs and the slurry mix design, including admixtures, for review.

Foundation Construction Procedure: The Contractor shall submit to the Engineer at the District Construction office a written foundation construction procedure outlining the equipment; drilling procedure for soil and rock, including how spoils will be handled; temporary casing placement and removal; slurry placement; reinforcement, anchor bolt and conduit placement; and concrete placement required for the drilled shaft foundation construction for review. The procedure should include contingencies for the various soil, rock and subsurface water conditions that may be encountered during the foundation construction. Also required in this submission are the following;

- list of proposed equipment to be used, including cranes, drills, augers, bailing buckets, final cleaning equipment, desanding equipment, slurry pumps, core sampling equipment, tremies or concrete pumps, casing, etc.

- details of overall construction operation sequence and the sequence of shaft construction in bents or groups

- details of shaft excavation methods

- when the use of slurry is anticipated, details of the mix design and its suitability for the subsurface conditions at the construction site, mixing and storage methods, maintenance methods, and disposal procedures

- details of methods to clean the shaft excavation

- details of reinforcement placement, including support and centralization methods

- details of concrete mix design and test results of both a trial mix and a slump loss test. The tests shall be conducted by an approved testing laboratory using approved methods to demonstrate that the concrete meets slump loss requirements

- details of concrete placement, including proposed operational procedures for free fall, tremie or pumping methods, proposed concreting log form and computations for time duration of shaft pour estimates

- details of casing installation and removal methods

- details of methods for removal of obstructions. Obstructions the Contractor shall provide details of methods for removal include, but are not necessarily be limited to, boulders, concrete, riprap, steel, timber, etc.

The Engineer will evaluate the foundation construction procedure for conformance with the plans, specifications and special provisions and will then notify the Contractor of any additional information required and/or changes necessary to meet the contract requirements. All procedural approvals given by the Engineer shall be subject to trial in the field and shall not relieve the Contractor of the responsibility to satisfactorily complete the work as detailed in the plans and specifications. The Contractor shall not commence construction of the drilled shafts until the Engineer has accepted the foundation construction procedure.

Excavations required for shafts shall be performed through whatever materials are encountered, to the dimensions and elevations in the working drawings or as ordered by the Engineer. The methods and equipment used shall be suitable for the intended purpose and materials encountered. Shaft excavation may be performed by combinations of augering, rotary drilling, down-the-hole hammer, reverse circulation drilling, claming, scraping, or other means approved by the Engineer. Generally, either the dry method, wet method, or temporary casing method may be used, as necessary, to produce sound, durable concrete foundation shafts free of defects. The Contractor shall select and use the method that is needed to properly accomplish the work, as determined by site conditions and subject to the approval of the Engineer. The Contractor is responsible for maintaining the stability of the shaft excavation during all phases of construction.

The dry method consists of drilling the shaft excavation, removing accumulated water and loose material from the excavation, and placing the shaft concrete in a relatively dry excavation. The dry construction method shall be used only at sites where the groundwater table and site conditions are suitable to permit construction of the shaft in a relatively dry excavation, and where the sides and bottom of the shaft are stable and may be visually inspected prior to placing the concrete. The use of the dry construction method is permitted if less than one foot of water accumulates in the bottom of a hole without pumping over a one hour period, the excavation remains stable and any loose material and water can be removed prior to placement of concrete.

The wet construction method shall be used at sites where a dry excavation cannot be maintained for placement of the shaft concrete. Wet construction methods consist of using a mineral slurry to maintain stability of the hole perimeter while advancing the excavation to final depth, placing the reinforcing cage and shaft concrete. This procedure may require desanding and cleaning the slurry; final cleaning of the excavation by means of a bailing bucket, air lift, submersible pump

or other devices; and placing the shaft concrete with a tremie. Unless it is demonstrated to the satisfaction of the Engineer that the surface casing is not required, temporary surface casings shall be provided to aid shaft alignment and position, and to prevent sloughing of the top of the shaft excavation. Surface casing is defined as the amount of casing required from the ground surface to a point in the shaft excavation where sloughing of the surrounding soil does not occur.

The temporary casing construction method shall be used at all sites where the dry or wet construction methods are inappropriate. Temporary casing construction method consists of advancing the excavation through caving material by the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. When a nearly impervious formation is reached, a casing is placed in the hole and sealed in the nearly impervious formation. After the drilling fluid is removed from the casing, drilling may proceed as with the dry method except that the casing is withdrawn when the shaft concrete is placed. If seepage conditions prevent use of the dry method, excavation is completed using the wet method. Temporary casing may be installed by driving or vibratory procedures in advance of excavation to the lower limits of the caving material. Slurry may be omitted if the casing can be installed with only minor caving of the hole.

If the Engineer determines that the foundation material encountered during excavation is unsuitable or differs from that anticipated in the design of the shaft, or if rock is encountered at an unanticipated elevation, the Contractor's foundation designer shall determine if the foundation embedment should be revised from that shown on the working drawings. If rock is encountered, the Engineer shall be notified to inspect and determine the elevation of the top of competent rock. Any revisions to the foundation embedment during construction shall be reviewed by the Engineer.

Excavated materials which are removed from the shaft excavation and any drilled fluids used shall be disposed of by the Contractor as directed by the Engineer and in accordance with Section 1.10.

Casings shall be metal, smooth, clean, watertight, and of ample strength to withstand both handling and driving stresses and the pressure of both concrete and the surrounding earth materials. The outside diameter of casing shall not be less than the specified size of the shaft. Temporary casings shall be removed while the concrete remains workable (i.e., a slump of 4" or greater). Before the casing is withdrawn and while the casing is being withdrawn, a 5'-0" minimum head of fresh concrete in the casing shall be maintained so that all the fluid trapped behind the casing is displaced upward without contaminating the shaft concrete. The required minimum concrete head may have to be increased to counteract groundwater head outside the casing. Separation of the concrete by hammering or otherwise vibrating the casing, during withdrawal operations, shall be avoided. Casing extraction shall be at a slow, uniform rate with the pull in line with the shaft axis.

Slurry used in the drilling process shall be a mineral slurry. The slurry shall have both a mineral grain size that will remain in suspension and sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity

of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement. The level of the slurry shall be maintained at a height sufficient to prevent caving of the hole.

The mineral slurry shall be premixed thoroughly with clean fresh water at a temperature above 41° F and adequate time allotted for hydration prior to introduction into the shaft excavation. The elevation of the slurry within the shaft foundation shall be maintained within 24" of the top casing and at least 48" above the existing water level during drilling and until the concrete placement is essentially complete. The slurry properties shall be maintained at all times, including non-working periods and stoppages. The slurry shall be circulated and agitated, continuously if necessary, to maintain the slurry properties and to prevent it from setting up in the shaft.

The Contractor, in the presence of the Engineer, shall perform control tests on the slurry to ensure that the density, viscosity, and pH fall within the acceptable limits tabulated below. The Contractor shall provide all equipment required to perform the tests. If desanding is required, sand content shall not exceed 4% (by volume) at any point in the shaft excavation as determined by the American Petroleum Institute sand content test.

Range of Values (at 68°F)

Property (Units)	Time of Slurry Introduction	Time of Concreting (in Hole)	Test Method
Density (pcf)	64.3 to 69.1	64.3 to 75.0	Density Balance
Viscosity (seconds per quart)	28 to 45	28 to 45	Marsh Cone
pH	8 to 11	8 to 11	pH paper or meter

The control tests to determine unit weight (density), viscosity, and pH values of the slurry shall be done during the shaft excavation to establish a consistent working pattern.

Prior to placing shaft concrete, slurry samples shall be taken from the bottom and at intervals not exceeding 10'-0" for the full height of slurry. Any heavily contaminated slurry that has accumulated at the bottom of the shaft shall be eliminated. The mineral slurry shall be within specification requirements immediately before shaft concrete placement.

The hole shall be covered when left unattended.

After completing the shaft excavation, all loose material existing at the bottom of the hole shall be removed.

Prior to placing the reinforcement into the shaft, the Contractor, in the presence of the Engineer, shall determine the shaft dimensions, depth and alignment of the shaft. The concrete shaft shall

not be out of plumb by more than ¼ inch per foot of depth. The Contractor shall provide all equipment necessary for checking the shaft excavation. The Engineer shall inspect the shaft and verify that it has been properly cleaned.

The reinforcing steel shall be fabricated and assembled in accordance with Article 6.02.03. All reinforcement shall be assembled with wire ties. Welding to assemble the reinforcement is not permitted.

Immediately after the shaft excavation has been inspected and approved by the Engineer and prior to placement of the concrete, the assembled reinforcing steel cage, including cage stiffener bars, spacers, centralizers, and other necessary appurtenances, shall be carefully placed into the shaft excavation as a unit. Dropping or forcing cages into the shaft will not be allowed. The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances of its intended position until the concrete will support the reinforcing steel. When concrete is placed by tremie methods, temporary hold-down devices shall be used to prevent uplifting of the reinforcing steel cage during concrete placement. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals not exceeding 5'-0" along the shaft to insure concentric location of the cage within the shaft excavation. When the size of the longitudinal reinforcing steel is larger than a #8 bar, such spacing shall not exceed 10'-0". After placement of the reinforcing cage, the Engineer shall inspect the shaft to ensure that it has remained clean. If the inspection indicates that loose material has accumulated at the bottom of shaft excavation, the Contractor shall remove the reinforcing cage and reclean the shaft.

Concrete shall be placed in the shaft excavation as soon as possible, but no more than 4 hours after completion of excavation and cleaning of the bottom of the excavation, and no more than 2 hours after placement of the reinforcing steel cage. Concrete shall be placed in a continuous operation to the top of the shaft. The concrete level shall be horizontal during the pouring operations. Concrete placement shall continue after the shaft is full until good quality concrete is evident at the top of the shaft. The elapsed time from the beginning of concrete placement in the shaft to the completion of placement shall not exceed 2 hours.

In dry construction, concrete shall be placed in a single continuous operation with the flow of concrete down the center of the shaft excavation so as to consolidate the concrete on impact. During placement operations, the concrete is not permitted to hit the reinforcing steel. A dropchute, consisting of a hopper and flexible hose, may be used to direct the concrete down the center of the foundation and prevent the concrete from hitting the reinforcing steel. Accumulated water shall be removed before placing the concrete. At the time of concrete placement, no more than 2" of water may exist at the bottom of the excavation and loose sediment no more than ½" over one-half the base is acceptable.

In wet (slurry) construction, concrete to be placed by the tremie method, where the concrete displaces the slurry from bottom of the excavation to the top. The concrete shall be placed through a top metal hopper and into a rigid leak-proof elephant trunk tremie tube, sufficiently large enough to permit free flow of concrete. The tremie tube shall be positioned so that it can

be removed without disturbing the reinforcing. Initially, the discharge end of the tremie tube shall be sealed closed (plugged) to prevent slurry from entering the tube after it is placed in the excavation and before the tube is filled with concrete. After concrete placement has started, the tremie tube shall be kept full of concrete to the bottom of the hopper to maintain a positive concrete head. The flow of concrete shall be induced by slightly raising the discharge end of the tube, always keeping the tube end in the deposited concrete. No horizontal movement of the tremie tube will be permitted.

The shaft concrete shall be vibrated or rodded to a depth of 5'-0" below the ground surface except where soft uncased soil or slurry remaining in the excavation will possibly mix with the concrete.

Exposed concrete shall be cured and finished in accordance with Subarticle 6.01.03-21.

Anchor bolt assemblies shall be embedded in the concrete as shown on the working drawings. A template plate shall be used to hold the anchor bolt assemblies, conduits and ground rod sleeve in the correct position. The anchor bolts shall be installed plumb.

All conduit ends terminating below grade shall be capped with a malleable iron caps. All above-grade conduit ends shall be terminated with an insulated bonding bushing with tinned insert.

Ground rod and ground wire shall be installed as shown on the plans.

No construction operations that would cause soil movement adjacent to the shaft, other than mild vibration, shall be conducted for at least 48 hours after shaft concrete has been placed.

The top of the foundations shall be backfilled and the adjacent disturbed ground surfaces restored to match the surrounding area after the concrete has cured and the forms are removed. Placement of topsoil shall conform to Articles 9.44.01 and 9.44.03. Turf establishment shall conform to Article 9.50.03.

After the foundation has cured, the Contractor shall obtain the as-built top of foundation elevations based on a field survey.

The traffic structures shall not be erected on the foundation until the concrete in the shaft and pedestal has reached a compressive strength of 4000 psi.

Method of Measurement: This work will be measured for payment by the number of foundation units, each completely installed and accepted. One foundation unit is required to support each cantilever sign support. Two foundation units are required to support each bridge sign support.

Basis of Payment: The work will be paid for at the contract unit price each for "Drilled Shaft Traffic Structure Foundation," completed and accepted in place, which price shall include all

equipment, materials, tools and labor incidental to the design, fabrication, construction and disposal of drilling spoils, of the foundations at the locations specified on the plans.

No additional payment will be made for the Contractor to test the slurry when it is used to construct a drilled shaft foundation. No additional payment will be made for subsurface investigations performed by the Contractor.

The removal of existing roadside barrier systems, installation and removal of temporary roadside barrier systems and resetting existing roadside barrier systems will not be paid for separately, but will be included as part of the work.

The temporary support, protection and restoration of utilities (if necessary), including existing underground wiring, conduits, drainage structures, pipes and underdrain systems within the excavation limits will not be paid for separately, but will be included as part of the work.

Backfilling and restoration of adjacent ground surfaces (pavement, slope protection, topsoil & seed, etc.) in all areas disturbed by the work will not be paid for separately, but will be included as part of the work. The Engineer will determine the type, thickness and horizontal limits of the surface treatments to be restored.

The installation of new or upgraded permanent roadside barrier systems, if required, will not be paid for as part of this work, but will be paid for under separate items.

ITEM # 1401021A –DROP MANHOLE (1.2M DIA.) 3M TO 6M DEEP (SANITARY SEWER)
ITEM # 1401023A –DROP MANHOLE (1.2M DIA.) 9M TO 12M DEEP (SANITARY SEWER)
ITEM # 1401027A –DROP MANHOLE (1.5M DIA.) 9M TO 12M DEEP (SANITARY SEWER)
ITEM # 1401029A – DROP MANHOLE (1.8M DIA.) 9M TO 12M DEEP (SANITARY SEWER)
ITEM # 1401661A – SANITARY MANHOLE (1.2M DIA.) 3M TO 6M DEEP
ITEM # 1401662A –SANITARY MANHOLE (1.2M DIA.) 0 TO 3M DEEP
ITEM # 1401663A – SANITARY MANHOLE (1.5M DIA.) 3M TO 6M DEEP
ITEM # 1401664A – SANITARY MANHOLE (1.2M DIA.) 6M TO 9M DEEP
ITEM # 1401665A – SANITARY MANHOLE (1.2M DIA.) 9M TO 12M DEEP
ITEM # 1401670A – SANITARY MANHOLE (1.5M DIA.) 6M TO 9M DEEP
ITEM # 1401671A – SANITARY MANHOLE (1.5M DIA.) 9M TO 12M DEEP
ITEM # 1401675A – SANITARY MANHOLE (1.8M DIA.) 3M TO 6M DEEP

The work under these items shall consist of the construction of sanitary sewer manholes in conformity with the lines, grades, dimensions and details shown on the plans or as directed by the Engineer.

Materials:

Article 5.07.02 shall apply except that aluminum manhole rungs shall be forged aluminum safety rung, alloy 6061-T6.

Castings shall be thoroughly cleaned, heated, and dipped in black asphaltum paint.

Dampproofing shall conform to the requirements of M.12.05.

Construction Methods:

Article 5.07.03 shall apply except that dampproofing shall conform to Section 7.08.

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Manhole steps, as shown on drawings, shall be built into manhole walls and elsewhere as indicated, and shall be aligned to form a continuous ladder with rungs equally spaced vertically at a maximum distance of 300 mm apart. The top steps should be between 300 mm and 400 mm below the manhole cover. Steps shall be embedded in the manhole wall a minimum distance of 75 mm and rungs or cleats shall project a minimum clear distance of 100 mm from the interior manhole wall, measured from the point of embedment. Additional steps shall be furnished and set as shown on the plans, or where ordered by the Engineer.

Manhole frames and covers as detailed on the plans shall be provided. The sanitary sewer manhole covers for the manholes shall be marked "SEWER" in a manner similar to the detail shown on the plans.

In order to prevent cover rocking or rattling and to insure proper fit and interchangeability between different frames and covers, the lower surface of the cover and the corresponding upper surface of the frame shall be machine-finished in a lathe to provide a round, smooth, flat contact with the dimensions and clearances called for on the plans.

Method of Measurement:

The construction of sanitary manholes complete shall be measured as a unit.

Basis of Payment:

The construction of sanitary manholes complete will be paid for the contract unit price each for "Sanitary Manhole (Diameter and Depth)" or "Sanitary Drop Manhole (Diameter and Depth)" which price shall include the cost of all labor, tools, materials and equipment necessary to construct the sanitary manholes complete including damp proofing, rungs, frame and cover, reinforcing steel, concrete, formed inverts (temporary and permanent), removing temporary pipes, plugging manhole walls, removing temporary formed inverts, flushing, maintenance of existing sanitary sewer flows and any other incidentals necessary to construct the sanitary manholes complete as shown on the plans or as ordered by the Engineer. Excavation, backfill, pumping, etc., shall be paid for under Trench Excavation in accordance with Article 2.05.05. Sheeting shall be paid for under Temporary sheet Piling and the base course under Granular Fill.

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ITEM # 1401671A
ITEM # 1401675A

ITEM #0507001A - TYPE "C" CATCH BASIN
ITEM #0507021A- TYPE "C" DOUBLE GRATE TYPE I
ITEM #0507051A - TYPE "C" CATCH BASIN OVER 3 M DEEP
ITEM #0507056A - TYPE "C" CATCH BASIN DOUBLE GRATE TYPE II (1.2M SUMP)
ITEM #0507072A - TYPE "C" CATCH BASIN DOUBLE GRATE - TYPE II OVER 3 M DEEP
ITEM #0507216A - SPECIAL TYPE "C-L" CATCH BASIN OVER 3 METERS DEEP
ITEM #0507201A - TYPE "C-L" CATCH BASIN
ITEM #0507161A - MODIFIED TYPE "C-L" CATCH BASIN QUAD GATE – TYPE II
ITEM #0507222A - TYPE "C-L" CATCH BASIN DOUBLE GRATE TYPE II

ITEM #0507251A - TYPE "C-L" CATCH BASIN OVER 3 M DEEP

ITEM #0507268A - TYPE "C-L" SPECIAL CATCH BASIN OVER 3 METERS DEEP
ITEM #0507269A - TYPE "C-L" SPECIAL CATCH BASIN DOUBLE GRATE TYPE II
ITEM #0507272A - TYPE "C-L" CATCH BASIN DOUBLE GRATE TYPE II OVER 3 M DEEP

ITEM #0507443A - TYPE "C-M" SPECIAL CATCH BASIN
ITEM #0507444A -TYPE "C-M" SPECIAL CATCH BASIN OVER 3 METERS DEEP
ITEM #0507445A - TYPE "C-M" SPECIAL CATCH BASIN DOUBLED GRATE TYPE II OVER 3 M DEEP
ITEM #0507449A - TYPE "C-M" CATCH BASIN
ITEM #0507452A - TYPE "C-M" CATCH BASIN OVER 3 M DEEP
ITEM #0507463A - TYPE "C-M" CATCH BASIN DOUBLE RATE TYPE II OVER 3 M DEEP

ITEM #0507474A - RESET TYPE "C-M" CATCH BASIN
ITEM #0507687A - MANHOLE – 1220 MM DIAMETER
ITEM #0507688A - MANHOLE - 1220 MM DIAMETER OVER 3 M DEEP
ITEM #0507672A - MANHOLE – 1525 MM DIAMETER OVER 3 M DEEP
ITEM #0507682A - MANHOLE – 1525 MM DIAMETER
ITEM #0507685A - MANHOLE – 1830 MM DIAMETER
ITEM #0507701A - RESET TYPE "C" CATCH BASIN
ITEM #0507831A - CONVERT CATCH BASIN TO MANHOLE

Work under this item shall conform to the requirements of Section 5.07 supplemented and amended as follows.

ARTICLE 5.07.01

Description:

ITEM # 507001A
THRU APPROX
ITEM # 507831A

Add the following:

Unless specifically noted otherwise on the plans, all catch basins shall be constructed with a sump depth of 1.2 meters, measured from the invert of lowest pipe to the inside bottom of the units.

ARTICLE 5.07.02

Materials:

Add the following:

Joint Sealers shall conform to the requirements of Article M.03.01-8.
Joint Filler shall conform to the requirements of Article M.03.01-5.

ARTICLE 5.07

Construction Methods:

Add the following:

Prior to construction of Catch Basins, the Contractor shall submit shop drawings for the Basins. These drawings shall show all reinforcement, materials, and construction methods, and be submitted in accordance with Section 1.05.02 - Shop Drawings.

Add the following after the last paragraph:

Rebuild manholes shall consist of the removal of the existing manhole riser (chimney) on the existing chamber in part or in its entirety and the construction of a new riser to the lines and grades required as shown on the plans or as directed by the Engineer. The existing manhole frame and cover shall be removed, cleaned, and reset to the required surface elevation.
Where rebuild manhole is called for or the plans and where the existing surface elevation is to raised or lowered, the Contractor shall remove the existing riser a minimum 1.321 meters (1.83 meters maximum) below the proposed grade and shall construct a new riser to the required elevation. Where an offset is required in the manhole opening from the existing locating at the roadway surface, the Contractor shall remove the existing riser down to the top slab of the existing manhole chamber and construct a new eccentric riser to the required elevation.
All catch basins having a depth of more than 3 m shall be constructed with step or ladder rungs conforming to the requirements of AASHTO M199 and Sub-article M.08.02-5. Steps shall be uniformly spaced 305 mm apart starting no more than 600 mm below the top of frame and ending no more than 600 mm above the bottom of the

catch basin. Steps shall project a uniform distance from the inside face of the catch basin wall, typically a distance of 180 mm.

ARTICLE 5.07.04

Method of Measurement:

Add the following after the last paragraph:

Rebuild manhole shall be measured as a unit. There will be no measurement or direct payment for excavation and backfill, removal and replacement of the risers or the removal, cleaning and resetting the manhole frames and covers.

ARTICLE 5.07.05

Basis of Payment:

Add the following:

The price for catch basins having a depth of more than 3 m shall include providing and installing steps or ladder rungs.

Add the following to the end of Paragraphs 2 and 3:

Joint Sealer and Joint Filler shall also be included in the price for "Catch Basin" of the type specified.

Add the following after Paragraph 9:

10 - Rebuild Manhole will be paid for at the contract unit price each for "Rebuild Manhole" which price shall include all alterations to manhole, all materials, equipment, tools and labor incidental thereto.

ITEM # 507001A
THRU APPROX
ITEM # 507831A

RECONSTRUCTION OF I-84
WATERBURY, CONNECTICUT
STATE PROJECT NO. 151-273

PROJECT LABOR AGREEMENT

BETWEEN

Prime Contractor

AND

WATERBURY BUILDING AND CONSTRUCTION TRADES COUNCIL

AND

SIGNATORY UNIONS

June 11, 2014

PROJECT LABOR AGREEMENT

This Project Labor Agreement (hereinafter referred to as the "Agreement") is entered into this __ day of _____, 2014, by and between the _____ as Prime Contractor (hereinafter referred to as the "Prime Contractor") and the Waterbury Building and Construction Trades Council (hereinafter referred to as the "Council") and each of the seven (7) affiliated local Unions signatory hereto (hereinafter individually and collectively referred to as "Union" or "Unions" or "Local Union"), with respect to the site preparation, demolition, and construction of the Reconstruction of I-84 Waterbury, Connecticut, State Project No. 151-273 (hereinafter referred to as the "Project).

It is understood by the parties to this Agreement (collectively "Parties"; individually "Party") that it is the intention of the Project owner, the Connecticut Department of Transportation (the "Owner"), that work within the scope of the Agreement shall be performed by Contractors (hereinafter referred to as "Contractors" and as more particularly described in the next paragraph) who agree to execute and be bound by the terms of this Agreement. Therefore, the Unions agree that Contractors may execute an Acceptance of Agreement in the form attached to this Agreement as Exhibit A, which Exhibit is incorporated herein, for the purpose of performing work on the Project. The Prime Contractor for the Owner shall monitor and enforce compliance with this Agreement by the Unions and by all Contractors who, through their execution of the Acceptance of Agreement, together with their subcontractors, have become bound hereto.

The term "Contractors" shall include the Prime Contractor, all subcontractors and sub-subcontractors of whatever tier engaged in on-site construction work within the scope of this

Agreement. The Unions, the Prime Contractor and all the Contractors agree to abide by the terms and conditions contained in this Agreement with respect to the administration of the Agreement by the Prime Contractor and the performance of all Contractors on the Project. All Contractors shall become parties to this Agreement whether or not they operate their businesses as union or non-union companies on work not covered by this Agreement. The Unions, the Prime Contractor and all other Contractors agree that this Agreement applies only to this Project and nothing in this Agreement requires either the Owner or any Contractor to become party to or to be required to sign any collective bargaining agreement as a condition of performing work within the scope of this Agreement. This Agreement and the local collective bargaining agreements attached as Exhibit B represent the complete understanding of the Parties.

ARTICLE I.

PURPOSE

The timely and successful completion of the Project is of paramount importance to the Owner. Therefore, it is essential that the Project work be done in an efficient and economical manner in order to secure optimum productivity and to eliminate any delays in the work. In recognition of the needs of this Project and to maintain a spirit of harmony, labor-management peace, and stability during the term of this Agreement, the Parties agree to binding methods for the settlement of all misunderstandings, disputes or grievances which may arise as set forth in Articles VII and VIII of this Agreement. This Agreement will foster the achievement of these goals by: (1) prohibiting strikes, slowdowns, walkouts, lockouts, picketing and other disruptions and delays arising from work disputes, and promoting labor harmony and peace for the duration of the Project; (2) standardizing and stabilizing certain basic terms and conditions governing the

employment of hourly craft employees on the Project, and thereby promoting labor harmony and peace for the duration of the Project; (3) permitting flexibility in scheduling work and shift hours and times to enhance coordination of work among the various crafts on the Project and to promote efficiency and economy of operations; (4) adjusting work rules and staffing requirements from those which otherwise might pertain to enhance coordination of the work among the various crafts on the Project, and to promote efficiency and economy of operations; (5) providing comprehensive and standardized mechanisms for the settlement of disputes that can be implemented without delay, including those relating to grievances, job disputes and trade jurisdiction; (6) ensuring a reliable source of skilled and experienced labor, whether unionized or non-unionized; (7) encouraging the use of local residents by Contractors; (8) establishing goals for and encouraging the use of apprentices by all Contractors, whenever and wherever possible and feasible; (9) expediting the project work and otherwise minimizing potential disruptions for the duration of the Project; (10) inviting all Contractors to bid on the Project without regard to whether the employees are members of a labor organization as defined in section 31-101 of the Connecticut General Statutes; (11) permitting the selection of the lowest responsible bidder without regard to labor organization affiliation; (12) not requiring compulsory labor organization membership of employees working on the Project; and (13) binding all Contractors to the terms of the Agreement.

ARTICLE II.

SCOPE OF THE AGREEMENT

SECTION 1. This Agreement shall apply and is limited to all site preparation, demolition, construction, and dedicated off-site work within the scope of the Project under the direction of the Contractors who have contracts awarded for such work by the Prime Contractor or other Contractors on and after the effective date of this Agreement.

SECTION 2. (a) The Prime Contractor has the absolute right to award sub-contracts on this Project without reference to the existence or non-existence of any collective bargaining agreements between such Contractor and any signatory Union to this Agreement; provided that such Contractor is willing, ready and able to execute the attached Acceptance of Agreement and comply with this Agreement.

(b) It is agreed that no Contractor shall be awarded contracts for work covered by this Agreement until such Contractor has duly executed the attached Acceptance of Agreement, thereby becoming bound by the terms and conditions of this Agreement. All Contractors shall promptly provide copies of all executed Acceptance of Agreement forms to the Prime Contractor.

SECTION 3. (a) Incorporated into this Agreement by reference are the local collective bargaining agreements or standard agreements between the Unions and their respective employer associations and any successor local collective bargaining agreements (hereinafter referred to as "Schedule A's").

The provisions of this Agreement (including the Schedule A's) shall apply to the construction of the Project, notwithstanding the provisions of any local, area and/or national bargaining or standard agreements which may conflict or differ from the terms of this

Agreement. Where a subject covered by the provisions of this Agreement is also covered by provisions of one of the Schedule A's, the provisions of this Agreement shall prevail. Where a subject is covered by the provisions of one of the Schedule A's and not covered by this Agreement, the Schedule A's provisions shall apply.

(b) Any dispute as to whether this Agreement or the applicable Schedule A determines the wages, hours and working conditions of employees on the Project shall be resolved pursuant to Article VIII of this Agreement by an arbitrator selected by the Parties at the time of signing the PLA in accordance with the procedures of the American Dispute Resolution Center (ADRC), who shall act as arbitrator. A Party invoking such arbitration shall notify the arbitrator by written notice delivered via hand delivery or UPS overnight delivery with a copy to the other Party or Parties to such dispute delivered via hand delivery or UPS overnight delivery. In the event the arbitrator is unable to hear any such dispute within ten (10) days of receipt of notice, the Parties to such dispute shall choose an alternative arbitrator. It is understood that this Agreement, together with the attached Schedule A's, constitutes a self-contained, standalone agreement and that by virtue of having become bound to this Agreement, the Contractor will not be obligated to sign or in any way be bound by any other local, area or national agreement.

SECTION 4. This Agreement shall only be binding on the Parties hereto and shall not apply to the parents, affiliates, subsidiaries, or other ventures of any such Party.

SECTION 5. This Agreement shall be limited to work historically or customarily recognized as construction work including, specifically, the site preparation and related demolition work necessary to prepare the site for construction and dedicated off-site work as is directed by the Prime Contractor.

SECTION 6. It is understood that the liability of any individual Contractor and the liability of the separate Unions under this Agreement shall be several and not joint. The Unions agree that this Agreement does not have the effect of creating any joint employment status between or among the Owner, the Prime Contractor, and/or any other Contractor.

SECTION 7. Items specifically excluded from the scope of this Agreement include, but are not limited to, the following:

(a) Work of non-manual employees including, but not limited to, superintendents, supervisors, staff engineers, surveyors, (except where expressly covered by a Schedule A to this Agreement), inspectors, quality control personnel, quality assurance personnel, timekeepers, mail carriers, clerks, office workers, including messengers, guards, emergency medical and first aid technicians, and other professional, engineering, administrative, supervisory and management employees.

(b) Equipment and machinery owned or controlled and operated by the Owner.

(c) All off-site fabrication, assembly, and handling of materials, equipment or machinery; and all deliveries of those items with the exception of concrete, to and from the Project site.

(d) All employees of the Owner or their representative not a party to this agreement, and all employees of the Contractor not performing manual labor.

(e) Any work performed on or near, or leading to or into, the Project site by state, county, municipal or other governmental bodies, or their contractors; or by public utilities, or their contractors, and/or by the Owner , or its contractors (for work which is not part of the Project).

(f) Off-site maintenance on leased equipment and on-site supervision of such work.

(g) Off-site warranty functions and warranty work, on-site supervision of such work.

SECTION 8. None of the provisions of this Agreement shall apply to the Owner and nothing contained herein shall be construed to prohibit or restrict the Owner or its employees or contractors from performing work not covered by the Agreement on the Project site. As areas and systems of the Project are inspected and construction tested by the applicable Contractor and accepted by the Prime Contractor, the Agreement shall not have further force and effect on such items or areas, except when the Contractor is directed by the Prime Contractor to engage in repairs, modifications, check-out, and/or warranty functions required by the contract(s) with the Owner.

ARTICLE III.

UNION RECOGNITION AND EMPLOYMENT

SECTION 1. The Prime Contractor and other Contractors recognize the Unions as the sole and exclusive bargaining representative for all craft employees within their respective jurisdictions working within the scope of this Agreement.

SECTION 2. Applicants for various job classifications covered by the Agreement required by the Contractors on the Project shall be referred to the Contractors by the Local Union. Each Contractor shall have the right to determine the competency of its employees, the right to determine the number of employees required, and shall have the sole responsibility for selecting the employees to be laid off consistent with Article IV of this Agreement and the attached Schedule A's. Each Contractor shall also have the right to reject any applicant referred by the Local Union, subject to the show-up payments required in the applicable Schedule A.

SECTION 3. (a) Recognizing that this is a publicly financed and supported Project for the benefit of the residents of the State of Connecticut, the Parties agree that any special conditions required of the Contractors by the Owner will be observed and accepted for the performance of Project work, including but not limited to:

(i) payment of wages and benefits at least equal to those established by the applicable prevailing wage statute and regulations;

(ii) the encouragement of employment of minorities, women, veterans, and residents of the labor market within which the Project is located;

(iii) the participation in Project work of certified Disadvantaged Business Enterprises (DBE); and

(iv) the encouragement of the utilization of properly trained and qualified apprentices.

Nothing in this Section 3 shall require Contractors to hire workers that such Contractors believe are not qualified for the available work.

(b) The Prime Contractor and the Council acknowledge that this Project is subject to the Federal DBE Program and the Prime Contractor will make good faith efforts to meet or exceed the Project goals for DBE participation contained in the bid requirements.

SECTION 4. For a Local Union having a job referral system in its Schedule A, for the purpose of initial employment only, the Contractor agrees to make use of such system. There shall be no discrimination against any employee or applicant for employment because of his or her membership or non-membership in the Union. Such job referral system must be operated in a non-discriminatory manner and in full compliance with federal, state and local laws and regulations which require equal employment opportunities and non-discrimination, and referrals

shall not be affected in any way by the rules, regulations, by-laws, constitutional provisions or any other aspects or obligations of union membership, policies or requirements and shall be subject to such other conditions as established in this Article.

SECTION 5. All Union employees now in the employ of any Contractor shall remain members in good standing in the Union during the term of this Agreement to the extent permitted by law. All other employees hereinafter employed by a Contractor shall either elect to become members of the Union, or if they do not desire to become members, they shall not be required to join a Union but shall pay the hourly agency fee and shall not be required to pay monthly Union dues. Each Union shall ensure that the union security requirement in this Article shall be in compliance with all applicable federal and state laws, and each Union shall remain solely responsible for any non-compliance therewith.

SECTION 6. In the event that any Union is unable to fill any requisition for employees within a forty-eight (48) hour period after such requisition is made by the Contractor (Saturdays, Sundays and Holidays excepted), the Contractor may employ applicants from any other available source.

SECTION 7. In the event that the Local Union does not have a job referral system as set forth in Section 2 of this Article, the Local Union shall refer qualified applicants pursuant to a non-discriminatory job referral procedure, subject to the provisions of Section 4 of this Article. The Contractor shall notify the Union of employees hired from any source other than referral by the Union.

SECTION 8. The Local Union shall not knowingly refer to a Contractor under this Agreement employees currently employed by another Contractor working under this Agreement.

SECTION 9. (a) The Unions will exert their utmost efforts to recruit and refer sufficient numbers of skilled craftsmen to fulfill the manpower requirements of the Contractors, including any specific employment conditions to which the Contractor is obligated pursuant to the provisions of the statutes and regulations governing development of the Project. Where employees require Occupational Safety and Health Administration approved hazardous materials training, the Unions agree to provide such training at no additional cost to the Contractor.

(b) Each Contractor may cause a reasonable number of its own employees to work on the Project provided that (i) as a general rule such employee complement does not exceed thirty percent (30%) of its workforce in any given month, and (ii) such employee complement is consistent with Federal Equal Employment Opportunity requirements and affirmative action goals contained in the bid specifications. Notwithstanding the above requirements, DBE certified Contractors will be allowed to cause up to 50% of their workforce to work on the Project. The Prime Contractor and the Council will work together to implement procedures and advise the Unions of reasonable means to effectuate the intent of this provision.

SECTION 10. The selection of non-working foremen and/or general foremen and the number of non-working foremen required shall be entirely the responsibility of each Contractor. All employees shall take orders from his or her designated Contractor representative.

SECTION 11. Except as provided in Article IV, Section 3, individual seniority shall be recognized and applied to employees working on the Project as set forth in the attached Schedule A's.

SECTION 12. Helmets to Hardhats.

(a) The Contractors and the Union recognize a desire to facilitate the entry into the building and construction trades of military veterans interested in careers in the building and

construction industry. The Contractors and Unions agree to utilize Connecticut Department of Labor's Jobs Funnel Initiative, the services of the Center for Military Recruitment, Assessment and Veterans Employment (hereinafter "Center") and the Center's Helmets to Hardhats program to serve as a resource for preliminary orientation, assessment of construction aptitude, referral to apprenticeship programs or hiring halls, counseling and mentoring, support network, employment opportunities and other needs as identified by the Parties.

(b) The Union and Contractors agree to coordinate with the Center to create and maintain an integrated database of veterans interested in working on the Project and of apprenticeship and employment opportunities for the Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

ARTICLE IV.
UNION REPRESENTATION

SECTION 1. Authorized representatives of the Union shall have access to the Project, provided they do not interfere with the work of employees and further provided that such representatives comply with safety rules of the Project.

SECTION 2. Stewards.

(a) Each signatory Local Union shall have the right to designate a working journeyman as a steward, and shall notify the Contractor in writing of the identity of the designated steward prior to the assumption of his or her duties as steward. Such designated steward shall not exercise any supervisory functions. Stewards will be allowed to devote a reasonable amount of time to discharge their responsibilities as stewards; however, there will be no non-working stewards. Stewards will receive the regular rate of pay for their respective crafts.

(b) In addition to his or her work as an employee, the steward shall have the right to receive, but not solicit, complaints or grievances and to discuss and assist in the resolution of the same with the employee's appropriate supervisor. Each steward shall be concerned with the employees of the steward's Contractor and not with the employees of any other Contractor. Contractors will not discriminate against the steward in the proper performance of his/her Union duties.

(c) The stewards shall not have the right to determine when overtime shall be worked or who shall work overtime; provided that this subsection shall not be construed to supersede the provisions of any applicable Schedule A, which contains a procedure for establishing equitable distribution of overtime.

SECTION 3. The Contractor agrees to notify the appropriate Union twenty-four (24) hours prior to the layoff of a steward, except in the case of discipline or discharge for just cause. If a steward is protected against such layoff by the provisions of the applicable Schedule A, such provisions shall be recognized to the extent that the steward possesses the necessary qualifications to perform the work remaining. In any case in which a steward is discharged or disciplined for just cause, the appropriate Union shall be notified immediately by the directly employing Contractor which imposed such discharge or discipline.

ARTICLE V.

MANAGEMENT RIGHTS

SECTION 1. The Contractor retains full and exclusive authority for the management of its operation(s). Except as expressly limited by other provisions of this Agreement, the Contractor retains the right to direct the workforce, including the hiring, promotion, transfer, lay-

off, discipline or discharge for just cause of its employees; the selection of foremen; the assignment and scheduling of work; the requirement of overtime work, the determination of when it shall be worked, and the number of employees who shall be engaged for such work. No rules, customs, or practices which limit or restrict productivity, efficiency or the individual and/or joint working efforts of employees shall be permitted or observed. The Contractor may utilize any customary, industry-recognized methods or techniques of construction. Nothing herein shall affect the role and responsibility of the Prime Contractor on this Project.

SECTION 2. Except as otherwise expressly stated in this Agreement, there shall be no limitation or restriction upon the Contractor's choice of materials or design or its choice of methodologies for the installation or use of materials, supplies or equipment. The Contractor may install or otherwise use materials, supplies or equipment according to the Schedule A's or as customarily performed in this area. The on-site installation or application of such items shall be performed by the Union trade crafts having jurisdiction over such work.

SECTION 3. The use of new technology, equipment, machinery, tools and/or labor-saving devices and methods of performing work may be initiated by the Contractor from time to time during the Project. The Unions agree that they will not in any way restrict the implementation of such new devices or work methods and there shall be no limit on production by workers or restrictions on the full use of tools and equipment. If there is any disagreement between a Contractor and the Union concerning the manner or implementation of such devices or method of work, the implementation shall proceed as directed by the Contractor, and the Union shall have the right to initiate a dispute as set forth in Article VIII of this Agreement.

ARTICLE VI.

PRE-JOB CONFERENCE

SECTION 1. There shall be a mandatory pre-job conference initiated by the Prime Contractor which shall address all the specific and substantial issues affecting the Project, at a time and location to be determined by the Prime Contractor. The Parties agree to use such conference to its fullest to avoid unforeseen conflicts which may affect job assignments, productivity, costs, or the Project schedule. Architects and design professionals shall be involved in the pre-job conference to ensure that the Project is fully understood by all Parties involved.

Further, each subcontractor to the Prime Contractor shall conduct a pre-job conference with the appropriate signatory Union(s) prior to commencing work. The Prime Contractor and the Council shall be advised in advance of all such conferences and may participate if they wish.

SECTION 2. A Steering Committee consisting of the President of the Waterbury Building and Construction Trades Council, the Owner or its designee and the Prime Contractor shall be established to ensure smooth implementation of this Agreement. The Committee shall meet on a designated day on a monthly basis, provided nothing herein shall prevent such Committee for meeting more often, as may be necessary. The Steering Committee shall have the authority to recommend amendments to this Agreement for consideration by the Union, the Prime Contractor and the Owner.

ARTICLE VII.

WORK STOPPAGES AND LOCKOUTS

SECTION 1. There shall be no strikes, sympathy strikes, picketing (including but not limited to economic, area standards, or informational), work stoppages, slowdowns or other disruptive activity for any reason by any Union or employees against any Contractor covered under this Agreement or which otherwise disrupts Project work, and there shall be no lockout by any Contractor. Failure of any Union or employee to cross any picket line established by any Union, signatory or non-signatory, or any other organizations, at or in proximity to the Project site is a violation of this Article.

SECTION 2. Any Contractor may discharge any of its employees for violating Section 1 of this Article, and any such employee will not be eligible for employment under this Agreement for a period of ninety (90) working days from the date of his or her discharge. Each Contractor and each Union shall take all steps necessary to obtain compliance with this Article, and neither shall be held liable for conduct for which it is not responsible.

SECTION 3. Any Party may institute the following procedure in lieu of, or in addition to, any other action at law or equity, when a breach of Section 1 of this Article is alleged:

(a) A Party invoking this procedure shall immediately notify the subject Contractor or Union, as applicable. These Parties shall, within two (2) days, agree to a permanent arbitrator ("Arbitrator") for the subject dispute. Notice to the Arbitrator shall be by telephone and fax and/or e-mail with notices by telephone, fax and/or e-mail, or UPS overnight delivery to the Party alleged to be in violation. The Party invoking this procedure shall also give notice to the Prime Contractor.

(b) Upon receipt of said notice, the Arbitrator selected by the Parties to the contract or his or her alternate shall sit and hold a hearing within twenty-four (24) hours if it is contended that the violations still exist.

(c) The Arbitrator shall notify the subject Parties by telephone and fax and/or e-mail of the reasonable place and time he or she has chosen for this hearing. Said hearing shall be completed in one session which, with appropriate recesses at the Arbitrator's discretion, shall not exceed 24 hours unless otherwise agreed upon by the subject Parties. A failure of any such Party or Parties to attend said hearing shall not delay the hearing of evidence or the issuance of any decision by the Arbitrator. The Arbitrator shall provide all notifications and decisions made pursuant to this subsection to the Prime Contractor at the same time as the same are provide to the Parties to the dispute.

(d) The sole issue at the hearing shall be whether or not a violation of Section 1 of this Article has occurred, and the Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violations or to award damages, which issue is reserved for court proceedings, if any. The Arbitrator's decision shall be issued in writing within three (3) hours after the close of the hearing, and may be issued without an opinion. If any Party to the dispute desires an opinion, one shall be issued within fifteen (15) days, but its issuance shall not delay compliance with, or enforcement of, the Arbitrator's decision. The Arbitrator may order cessation of the violation of Section 1 of this Article and other appropriate relief, and such decision shall be served on all Parties to the dispute and the Prime Contractor by hand or fax and/or e-mail and by certified mail, return receipt requested, upon issuance. No Party may authorize the Arbitrator to consider any matter in justification, explanation or mitigation of such violations or to award damages.

(e) The Arbitrator's decision may be enforced by any Court of competent jurisdiction upon the filing of the Arbitrator's decision and all other relevant documents referred to hereinabove in the following manner. Telephonic and fax and/or e-mail notice of the filing of such enforcement proceeding shall be given to the other Parties to the dispute and the Prime Contractor. In the proceeding to obtain a temporary order enforcing the Arbitrator's decision as issued under (d) of this Article, all Parties to the dispute waive the right to a hearing and agree that such proceedings may be ex parte. Such agreement does not waive any such Party's right to participate in the hearing for a final order of enforcement.

(f) Any rights created by statute or law governing arbitration proceedings inconsistent with the above procedure or which interfere with compliance hereto are, to the extent possible, hereby waived by the Parties to whom they accrue.

(g) The fees and expenses of the Arbitrator shall be borne by the Party or Parties found in violation, or in the event no violation is found, such fees and expenses shall be borne by the Party who invokes the arbitration.

(h) It is the responsibility of each Local Union and Contractor to keep on file with the Owner and the Prime Contractor a current address or operating fax number and/or e-mail address to which notices and notifications under this Article may be sent. Any Local Union or Contractor failing to do so hereby waives its rights to claim that it did not receive proper or timely notice or notification of any action taken by a Party or Arbitrator pursuant to this Article.

(i) If the Arbitrator determines that a violation has occurred in accordance with subsection 3(d) of this Article 1, the violating Party(ies) shall, within eight (8) hours of receipt of the Arbitrator's decision, direct a cessation of such activity held to be in violation. If such violation has not ceased and/or work recommenced consistent with the Arbitrator's decision and

this Agreement by the beginning of the next regularly scheduled shift following the expiration of the eight (8) hours, and the violating Union(s) or Contractor(s) has not made all good faith efforts available to comply with the Arbitrator's decision, then the violating Party shall pay the sum of five thousand dollars ($5,000.00) as liquidated damages to the Owner and shall pay, as liquidated damages, an additional five thousand dollars ($5,000.00) per shift for each shift thereafter on which the violation is not ceased and/or work is not recommenced. The Arbitrator shall retain jurisdiction to determine compliance with this Section.

SECTION 4. Procedures contained in Article VIII of this Agreement shall not be applicable to any alleged violations of this Article, with the single exception that any employee discharged for violation of Section 1 of this Article VII may resort to the procedures of Article VIII to determine only if he or she was engaged in that violation. Further, disputes alleging a violation of any other provision of this Agreement, including any underlying dispute(s) alleged to be in justification, explanation or mitigation of any violation of Section 1 of this Article VII, shall be resolved under the procedures of Article VIII of this Agreement.

SECTION 5. In the event of any work stoppage, strike, picketing or any other disruptive activity in violation of Section 1 of this Article, the Prime Contractor may suspend all or any portion of Project work affected by such activity at the Prime Contractor's discretion and without penalty or consequence.

SECTION 6. At its option, the Owner may participate in any proceedings initiated under this Article, and may receive copies of notifications through its Prime Contractor, and no rights or liabilities shall accrue against the Owner pursuant to this Agreement.

ARTICLE VIII.

GRIEVANCES

SECTION 1. The Prime Contractor and the Council shall each assign a representative to this Project for the purpose of assisting the Unions, together with the Contractors, to complete the Project economically, efficiently, continuously and without interruption, delays or work stoppages.

SECTION 2. The Contractors and Unions agree to resolve issues of dispute in accordance with the arbitration provisions set forth in this Article, except as otherwise set forth in Article VII of this Agreement. The Unions and Contractors, by signing this Agreement, shall similarly bind employees to such provisions.

SECTION 3. Any question or dispute arising out of and during the term of this Agreement involving its interpretation and application (other than trade jurisdictional disputes or alleged violations of Article VII, Section 1) shall be considered a grievance and subject to resolution under the following procedures:

Step 1. (a) When any employee subject to the provisions of this Agreement feels he or she is aggrieved by a violation of this Agreement, he or she must, to pursue the grievance, through his or her Local Union business representative or job steward, within seven (7) working days after the individual knew or reasonably should have known of the occurrence of the alleged violation, give notice to the work site representative of the involved Contractor and the work site representative and Prime Contractor stating the provision(s) alleged to have been violated. The business representative of the Local Union or the job steward and the work site representative of the involved Contractor shall meet and endeavor to adjust the matter within seven (7) days after timely notice has been given. If those parties fail to resolve the matter within the prescribed

period, the grieving party may, within seven (7) days thereafter, pursue Step 2 of this grievance procedure provided the grievance is reduced to writing setting forth the relevant information concerning the alleged grievance, including a short description thereof, the date on which the grievance allegedly occurred, and the provision(s) of the Agreement alleged to have been violated. Grievances settled at Step 1 of this Section shall be non-precedential except as to the parties directly involved unless endorsed by the Owner through its Prime Contractor within seven (7) days after resolution has been reached and the terms of the resolution are set forth in writing to the subject Union and the subject Contractor.

(b) Should the Local Union(s) or any Contractor have a grievance with the other party and, if after conferring, a settlement is not reached within seven (7) days, the grievance shall be reduced to writing and proceed to Step 2 of this section in the same manner as (a) above, for the adjustment of an employee complaint.

Step 2. The designee of the involved Local Union, together with the international union representative of that Union, the representative of the involved Contractor, and the a representative of the Prime Contractor (or his designee) shall meet within seven (7) days of the referral of the grievance to this second step to attempt to arrive at a satisfactory settlement thereof. If such parties fail to reach an agreement, the grievance may be appealed in writing in accordance with the provisions of Step 3 of this Section within fourteen (14) calendar days after the initial meeting at Step 2.

Step 3. (a) If the grievance shall have been submitted, but not resolved pursuant to Step 2, any party to the grievance may request, in writing, within fourteen (14) calendar days after the initial Step 2 meeting, that the grievance be submitted to an arbitrator selected by mutual agreement of the parties, but if they are unable to do so within fourteen (14) days after referral to

them for arbitration, they shall request the American Dispute Resolution Center (ADRC) to provide them with a list of arbitrators from which the arbitrator shall be selected. The then-current Labor Arbitration Rules of the American Arbitration Association shall govern the conduct of the arbitration hearing. The decision of the arbitrator shall be final and binding on all parties to the grievance and the fees and expenses of such arbitrations shall be borne equally by the involved Contractor and the involved Union(s).

(b) Failure of the party raising the grievance to adhere to the time limits established herein shall render the grievance null and void. The time limits established herein may be extended only by written consent of the parties to the grievance involved at the particular step where the extension is agreed upon. The arbitrator referenced in Step 3 shall have the authority to make decisions only on issues presented to him or her and he or she shall not have the authority to change, amend, add to or subtract or detract from any of the provisions of this Agreement. No Party may authorize an arbitrator to consider any issue other than an issue raised pursuant to Section 3, Step 1(a) of this Article.

SECTION 4. No adjustment or decision may provide retroactivity exceeding thirty (30) days prior to the date of the filing of a written grievance.

SECTION 5. The Prime Contractor shall be notified by the involved Contractor of all actions at Steps 2 and 3 and shall, upon its request, be permitted to participate in full in all proceedings at these steps.

SECTION 6. To encourage the resolution of disputes and grievances at Steps 1 and 2 of this procedure, the Parties agree that settlements reached at such Steps shall not be precedent setting; and, further, recognizing the unique provisions of this Agreement, any decision issued by

an arbitrator pursuant to Step 3 shall be applicable to work covered by this Agreement only, and may not be used for any purpose regarding works not so covered.

ARTICLE IX.

JURISDICTIONAL DISPUTES

SECTION 1. Work shall be assigned by each Contractor in accordance with area practice and such assignments shall be disclosed by each Contractor at a pre-job conference. All Contractors involved, and representatives of the appropriate Unions shall be invited to attend such conference.

There will be no strikes, work stoppages, slowdowns, interruptions or other disruptive activity arising out of any jurisdictional dispute. Pending the resolution of such dispute pursuant to Article VII of this Agreement, the construction work shall continue in accordance with Section 1 of Article VII.

SECTION 2. In the event of a jurisdiction dispute, an aggrieved signatory Local Union may request the Council to convene a committee comprised of the five (5) signatory Unions uninvolved in the jurisdictional dispute ("Committee") and attempt to make a resolution of the assignment of work in dispute within forty-eight (48) hours of being contacted by the grieving signatory Local Union. Any resolution must be acceptable to all Parties and will be reduced to writing and will affect this Project only and will not be precedent setting. The Contractor that assigned the work at issue may present any evidence or material to the Committee that the Contractor used to make its assignment within this time period. If the Committee of the uninvolved signatory Unions fails to reach a settlement on the matter within the prescribed period, any affected Party may proceed to invoke the jurisdictional dispute procedure set forth in

Section 3(a) or 3(b), as applicable, of this Article within forty-eight (48) hours thereafter.

SECTION 3. (a) All jurisdictional disputes between or among Unions who have agreed to be bound to the procedures provided in the Plan for the Settlement of Jurisdictional Disputes in the Construction Industry (the "Plan") shall be resolved under the Plan and shall be settled and adjusted according to the Procedural Rules and Regulations as set forth in the Plan. The assignments of the Contractor(s) shall be followed until the dispute is resolved in accordance with the Plan. Decisions rendered under the Plan shall be final, binding and conclusive on the affected Contractor or Contractors and the Union or Unions.

(b) For all Unions and Contractors who have not agreed to be bound to provisions of the Plan, all jurisdictional disputes between those Unions or Contractors and any other Union(s) or Contractors shall be settled through arbitration where the arbitrator shall be bound by area practice regarding the assignment of the work. The assignments of the Contactor(s) shall be followed and work shall continue until the dispute is resolved. Decisions rendered by the arbitrator shall be final, binding, and conclusive on the affected Contractor or Contractors and the Union or Unions. The Parties hereby appoint an arbitrator selected in accordance with the rules and regulations of the ADRC to serve as the arbitrator for all disputes under this subsection (b).

SECTION 4. There shall be no authority to assign work to a double crew, that is, to more employees than the minimum required to perform the work involved, or to assign the work to employees who are not qualified to perform the work involved. This does not prohibit agreement by the Parties to any dispute, including the involved Contractor, to establish composite crews where more than one (1) employee is needed for the job, or an arbitrator from

ordering such when appropriate under the Plan. The aforesaid determinations shall decide only to whom the disputed work belongs.

SECTION 5. There shall be no strike, work stoppages, slowdown, interruption or other disruptive activity while any jurisdictional dispute is being resolved. The work shall proceed as assigned by the involved Contractor until finally resolved. The award or resolution shall be confirmed in writing to the involved Parties. There shall be no strike, work stoppage, slowdown, interruption or other disruptive activity in protest of any such award or resolution. The involved Parties shall timely provide the Prime Contractor with a copy of the arbitrator's decision.

ARTICLE X.

WAGES AND BENEFITS

SECTION 1. All employees covered by this Agreement shall be classified in accordance with work performed and paid the base hourly wage rates for those classifications as specified in the appropriate Schedule A; but in no event will such wage rates be less than those established under the provisions of any prevailing wage statute or regulation applicable to the Project.

SECTION 2. Each Contractor agrees to pay contributions to the established employee benefit funds and industry promotion funds and other funds and programs in the amounts designated in the appropriate Schedule A. Bona fide jointly trusteed fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added only at the time a segment of the Project is put out to bid and will not apply to any segments previously put out to bid.

SECTION 3. Each Contractor shall adopt and agree to be bound by the written terms of the legally-established trust agreements specifying the detailed basis on which payments are to be made into, the benefits paid out of, such trust funds; provided, however, that any Contractor

that has posted payment and performance bonds for the full value of its work shall not be required to post additional payment bonds pursuant to the trust agreements. Each Contractor shall authorize the parties to such trust agreements to appoint trustees and successor trustees to administer the trust funds and hereby ratifies and accepts the trustees so appointed as if made by the Contractor. Employees not previously participants in the Taft-Hartley pension fund shall have the option to divert pension hourly contributions made on their behalf to the appropriate annuity fund. Such election by the employee must be done in writing on a form provided by the Council and shall be effective for the duration of the Project.

SECTION 4. (a) Upon written notice from a benefit fund to which Contractors are required to make contributions pursuant to this Agreement (or from the Union co-sponsoring such Benefit Fund), to the Prime Contractor that a Contractor is in arrears on payments of benefit contributions for work performed on this Project, which notice specifies the amount owed by the Contractor for this Project by month, the Prime Contractor will immediately direct the Contractor, in writing, to comply with its contractual obligations. Should the Contractor not provide the Benefit Fund with payment, or a legally enforceable procedure for payment (or enforceable escrow procedure), within five (5) working days after receipt of the written notice from the Prime Contractor, the affected Union(s) may direct employees of such Contractor to engage in work stoppage (provided, however, that such stoppage will not include picketing or otherwise disrupt the work on the Project and provided that any such stoppage will cease upon payment (without violation of Section 1 of Article VII). If the correct payments are not made within thirty (30) days of such notice, the Prime Contractor will withhold moneys owed from its payments to its subject subcontractor sufficient to satisfy the outstanding debt to the benefit fund and/or shall issue joint checks payable to the involved subcontractor and the involved benefit

fund. Upon receipt of any such joint check, the involved Union agrees to execute, or cause the involved benefit fund to execute, the Prime Contractor's partial lien waiver and release.

ARTICLE XI.

HOURS OF WORK, OVERTIME SHIFTS AND HOLIDAYS

SECTION 1. Work Week and Work Day. The standard work week shall consist of forty (40) hours Monday through Friday. The standard work day shall consist of eight (8) hours of work commencing at 7:00 a.m. and ending at 3:30 p.m., with a one-half ($^1/_2$) hour unpaid lunch period to commence between the fourth and fifth hours of work. The standard work day may be changed within a two-hour window to accommodate job conditions or the needs of the Project as determined by the Prime Contractor. Starting time shall commence and quitting time shall occur at the employee's designated work area. The Parties affirm their policy of a fair day's work for a fair day's wage, and the Union Parties agree to cooperate in the implementation and application of reasonable work rules intended to enforce this commitment.

SECTION 2. Overtime. Overtime pay at a rate of time and one-half shall be paid for all work performed after ten hours in a shift, forty hours in a work week or any work performed on Saturdays (unless it is a make-up day), Sundays or holidays. There will be no restriction upon the non-discriminatory designation of employees who shall work the overtime. There shall be no pyramiding of overtime pay under any circumstances. Any abuse of this provision will be referred to the dispute/grievance procedure set forth in Article VIII of this Agreement for resolution.

SECTION 3. It shall not be a violation of this Agreement if the Prime Contractor considers it necessary to suspend all or a portion of the job to protect the life and safety of an employee. In such cases, employees will be compensated only for the actual time worked;

provided, however, that where the Contractor requests employees to remain at the site and available for work, the employees will be compensated for the standby time at their base hourly rate of pay.

SECTION 4. Shifts. Scheduling of shifts by the Prime Contractor shall remain flexible in order to meet the Project schedules and existing Project conditions including the minimization of interference with traffic. It is not necessary to work a day shift in order to schedule a second or third shift. Shifts must work a minimum of five (5) consecutive work days and must be scheduled with not less than five (5) days' notice to the Unions. There will be no premiums paid for shift work.

SECTION 5.

(a) Holidays. Recognized holidays on this Project shall be those set forth below:

New Year's Day	Christmas Day	Memorial Day
Labor Day	Independence Day	
Thanksgiving Day		

b) Holiday pay shall be paid only as set forth in the Schedule A's. Holidays shall be observed on the dates established by the state and federal government.

SECTION 6. Reporting Pay. Reporting pay shall be paid in the manner set forth in the Schedule A's.

SECTION 7. Meal Period. Each Contractor will schedule a meal period of not more than one-half hour's duration at the work location at approximately four (4) hours into the scheduled work shift, consistent with Section 1 of this Article. If an employee is required to work through his or her meal period, he/she shall be compensated.

SECTION 8. (a) If the Prime Contractor determines that it would be beneficial to the

Project, the Contractor may, with the consent of the Union, implement a 4 day-10 hours per day work week (as more fully described in this subsection), after providing a five (5) day notice to the affected Union(s). The standard 4 day-10 hours per day work week shall consist of ten (10) hours of work (plus one-half ($^1/_2$) hour unpaid lunch at approximately the mid-point of the shift), between the hours of 6:00 a.m. and 4:30 p.m., Monday through Thursday. The standard ten (10) hour work day may be changed to accommodate conditions on five (5) days' notice from the Prime Contractor or less notice as is mutually agreed upon.

(b) Should a 4 day-10 hour per day work week schedule be implemented, overtime shall be paid after ten (10) hours of work during a work day within the normal work week. Should five (5) or more hours of a normal ten (10) hour day be lost due to weather or other conditions beyond the control of the Contractor, the Contractor may schedule a Friday make-up day, in the same calendar week, with a minimum of eight (8) hours scheduled and straight time to be paid until the schedule of work exceeds the time lost, after which overtime shall be paid.

SECTION 9. If a day during the normal five day work week or two days during a four day ten hour work week is lost as a result of circumstances beyond the control of the Contractor including severe weather, fire, power failure, or natural disaster, a Saturday make-up day at straight time may be scheduled.

ARTICLE XII.

CLEAN UP

The Unions shall ensure that all union tradesmen clean up their own work area. The removal of debris from the designated work area will be the responsibility of the Union personnel.

ARTICLE XIII.
APPRENTICES

SECTION 1. The Contractor is encouraged to utilize apprentices and such other appropriate classifications as are contained in the applicable Schedule A. Apprentices and such other classifications as are appropriate shall be employed by the Unions utilizing a maximum permissible ratio of. 1:1 or 1:3, depending upon the craft.

SECTION 2. The Parties recognize the need to maintain continuing support of programs designed to develop adequate numbers of competent workers in the construction industry. To these ends, each Contractor will employ apprentices in their respective crafts to perform such work as is within their capabilities and which is customarily performed by the craft in which they are indentured.

SECTION 3. The Parties are made aware that the contract between the Prime Contractor and the Owner requires an On-The–Job (OJT) Training Workforce Development Pilot. Apprentices in the subject Apprentice Program are encouraged to participate in the OJT Pilot.

ARTICLE XIV.

SAFETY, PROTECTION OF PERSON AND PROPERTY

SECTION 1. In accordance with the requirements of the Occupational Safety and Health Act, it shall be the exclusive responsibility of each Contractor on the job site to ensure safe working conditions for its employees and their compliance with any safety rules contained herein or established by the Contractor, and/or Prime Contractor; provided, however, it is understood by the Unions that the employees have an obligation as set forth in Section 2 of this Article below.

SECTION 2. The Unions shall ensure that all employees will use diligent care to perform their work in a safe manner and to protect themselves and the property of the Contractor and the Owner. The Contractors and the Unions agree that the failure of employees to do so will be grounds for discipline, including discharge.

SECTION 3. The Contractors and Unions acknowledge that employees covered by the terms of this Agreement shall at all times while in the employ of the Contractor be bound by the reasonable safety, security, and visitor rules as established by the Contractor with the consent of the Union and with applicable state and federal safety and health statutes and regulations. These rules will be published and posted in conspicuous places throughout the Project.

SECTION 4. For the purpose of providing maximum safety for all concerned, the Prime Contractor may establish and implement, after consultation with the Council, reasonable substance abuse testing procedures and regulations, which may include pre-hire and reasonable cause testing, to the extent permitted or otherwise required by federal and state law.

ARTICLE XV.

SECURITY OF MATERIAL, EQUIPMENT AND TOOLS

The inspection of incoming shipments of equipment, apparatus, machinery and construction materials of every kind shall be performed by individuals selected by the Contractor, at his or her discretion. The Unions shall ensure that all employees comply with the reasonable security procedures established by the Prime Contractor and/or Contractor.

ARTICLE XVI.

NO DISCRIMINATION

SECTION 1. Each Contractor and Union agrees that they will not discriminate against any employee or applicant for employment because of race, color, religious creed, age, sex, sexual orientation, marital status, national origin, ancestry, gender identity or expression, present or past history of physical or mental or intellectual disability or handicap, or veteran's status in any manner prohibited by law or regulation.

SECTION 2. Any complaints regarding application of the provisions of Section 1 of this Article should be brought to the immediate attention of the involved Contractor for consideration and resolution.

SECTION 3. The Contractors and the Unions agree to provide a workforce that complies with all state and federal guidelines regarding minority hiring. Further, it is recognized that the State of Connecticut has certain policies and commitments for the utilization of business enterprises owned and/or controlled by minorities, women, the disadvantaged or others. The Parties shall jointly endeavor to assure that these commitments are fully met and that any provisions of this Agreement which may appear to interfere with any minority, women, or disadvantaged owned business enterprise successfully bidding or subcontracting for work within the scope of this Agreement shall be carefully reviewed, and adjustments made as may be appropriate and agreed upon among the Parties to assure full compliance with the spirit and letter of the policies and commitments of the State of Connecticut and all applicable federal, state and local rules and regulations relating to employment and utilization of such businesses.

SECTION 4. The use of the masculine or feminine gender in this Agreement shall be construed as including both genders.

ARTICLE XVII.

WORKING CONDITIONS

SECTION 1. With the exception of one organized coffee break per day, there will be no rest periods except when necessary for health and safety reasons. Individual coffee containers will be permitted at the employee's work location.

SECTION 2. There shall be no restrictions on the emergency use of any tools or equipment by any qualified employee.

SECTION 3. The Contractor shall provide hard hats, safety glasses, foul weather gear and other required personal protective equipment (PPE). The Unions shall ensure that employees will exercise diligence in the care and custody of such safety gear provided.

SECTION 4. Employees engaging in willful or negligent acts that result in damage to any property or facilities or injury to other employees will be subject to immediate termination.

ARTICLE XVIII.

SAVINGS AND SEPARABILITY

SECTION 1. It is not the intention of the Prime Contractor, any of the other Contractors or the Unions to violate any laws governing the subject matter of this Agreement. The Parties hereto agree that in the event any provisions of the Agreement are finally held or determined to be illegal or void by order of any court of competent jurisdiction as being in contravention of any applicable law, the remainder of the Agreement shall remain in full force and effect. Further, the Prime Contractor, all other Contractors and the Unions agree that if and when any and all provisions of this Agreement are finally held or determined to be illegal or void by a court of

competent jurisdiction, the Parties will promptly enter into negotiations in which the Owner may participate concerning the substance affected by such decision for the purpose of achieving conformity with the requirements of an applicable law and the intent of the Parties hereto.

SECTION 2. The Parties recognize the right of the Prime Contractor to withdraw, at its absolute discretion, the utilization of this Agreement as part of any bid specification should a court of competent jurisdiction issue any order, or any applicable statute be invoked which contains any self-applying provision, either of which could result, temporarily or permanently, in delay of the bidding, awarding and/or constructing of work on the Project. The Parties further recognize the right of the Prime Contractor to terminate this Agreement at the direction of the Owner. Notwithstanding such action by the State of Connecticut, the Owner, or such court order or statutory provision, the Parties agree that the Agreement shall remain in full force and effect on the Project, to the maximum extent legally possible.

SECTION 3. The occurrence of events covered by Sections 1 and 2 of this Article shall not be construed to waive the prohibitions of Article VII.

ARTICLE XIX.

DURATION OF THE AGREEMENT

SECTION 1. This Agreement shall be effective on the date executed by the Parties and shall continue in effect for the duration of the Project site preparation, demolition and construction described in Article II hereof. Site preparation, demolition and construction of any phase, portion, section or segment of the Project shall be deemed complete when such phase, portion, section or segment has been turned over to the Owner and has received the final acceptance from the Owner or the appropriate Owner representative (as designated by the Owner).

SECTION 2. The Schedule A's incorporated into this Agreement shall continue in full force and effect until the Prime Contractor and/or Union Parties to this Agreement and to the Schedule A's notify the Owner of the mutually agreed upon changes in those provisions of such Schedule A's which are applicable to the Project and their effective date(s), which shall become the effective date(s) under this Agreement.

SECTION 3. Notwithstanding Section 2 of this Article, the Parties agree that any provisions negotiated into said collective bargaining agreements will not apply to work on this Project if such provisions are less favorable to the Contractor than those uniformly required of contractors for construction work normally covered by those agreements; nor shall any provision be recognized or applied on this Project if it may be construed to apply exclusively or predominantly to work covered by this Agreement. Any disagreement between parties on this issue shall be referred to an arbitrator as provided in Article VIII.

SECTION 4. This Agreement may be amended or supplemented only by the mutual consent of the Council, the Prime Contractor and the Unions, reduced to writing and duly signed by each.

SECTION 5. The Union agrees that there will be no strikes, work stoppages, sympathy strikes, picketing, slowdowns or other disruptive activity affecting the Project by any Union involved in the negotiation of the subject Schedule A's, nor shall there be any lock-out on this Project affecting the Union during the course of such negotiations. Each Contractor agrees to implement all applicable changes as negotiated in the Schedule A's, except as provided in Section 3 of this Article.

June 11, 2014

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective as of the _____day of _____, 2014.

PRIME CONTRACTOR

_____
Authorized Representative

THE WATERBURY BCTC

By: _____
President, Building and Construction Trades Council

INDIVIDUAL SIGNATORY UNIONS

_____
Operating Engineers, Local 478

_____
Teamsters Local Union No. 677

_____
Laborers' Local 611

_____
New England Regional Council of Carpenters

_____
Bricklayers' Local 1

_____
Ironworkers Local 424

_____
Electricians Local 488

June 11, 2014

RECONSTRUCTION OF I-84
WATERBURY, CONNECTICUT
STATE PROJECT NO. 151-273

PROJECT LABOR AGREEMENT

ACCEPTANCE OF AGREEMENT

The undersigned Contractor who has been awarded work for State Project No. 151-273, acknowledges that it has received and hereby accepts and agrees to be bound by the Project Labor Agreement for the Reconstruction of I-84 Waterbury, Connecticut, State Project No. 151-273 between _____ in its capacity as the Prime Contractor for the Department of Transportation, the Waterbury Building & Construction Trades Council and the individual signatory unions.

NAME OF EMPLOYER _____
ADDRESS _____
CITY, STATE, ZIP CODE _____

_____
Name and Title of Authorized Representative

_____
Signature of Authorized Representative Date

_____

Telephone number _____

Fax Number _____

E-mail _____