LOTCIP #L079-0004
Replacement of Oregon Road Bridge (Bridge No. 04184)
Over Quinnipiac River – Meriden, CT

TABLE OF CONTENTS OF SPECIAL PROVISIONS

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

Notice To Contractor - Procurement of Materials

Notice To Contractor - LOTCIP Project Sign Requirements

Section 1.07 – Legal Relations and Responsibilities

Section 1.08 – Prosecution and Progress

Section 1.10 – Environmental Compliance

0100600A Construction Access

0202216A Excavation and Reuse of Existing Channel Bottom Material

0204001A Cofferdam and Dewatering

0204151A Handling Water

0219011A Sedimentation Control at Catch Basin

0406194A Joint and Crack Sealing of Bituminous Concrete Pavement

0406312A Gutter Line Sealing for Bridges

0520036A Asphaltic Plug Expansion Joint System

0520041A Preformed Joint Seal

0521021A Steel-Laminated Elastomeric Bearings

0601054A Ultra High-Performance Concrete

0601088A Concrete Form Liners

0602865A #5 Mechanical Couplers

0602867A #6 Mechanical Couplers

0602869A #8 Mechanical Couplers

0602872A #11 Mechanical Couplers

0603474A Metallizing Structural Steel (Site No. 1)

0686002.24A 24in. R.C. Pipe (Class V) 0' To 10' Deep

0707009A Membrane Waterproofing (Cold Liquid Elastomeric)

0714999A Monitoring Structures

0728032A	No. 6 Crushed Stone
0819002A	Penetrating Sealer Protective Compound
0904051A	3 Tube Curb Mounted Bridge Rail
0950019A	Turf Establishment – Lawn
0950043A	Wetland Grass Establishment
0952051A	Control and Removal of Invasive Vegetation
0969064A	Construction Field Office Large
0971001A	Maintenance & Protection of Traffic
0979005A	Pedestrian Barricade
1020037A	Temporary Lighting
1117111A	Rectangular Rapid Flashing Beacon RRFB
1117115A	Temporary Rectangular Rapid Flashing Beacon (RRFB) – Type B
1117116A	Removal of Existing Flashing Beacon
1208931A	Sign Face - Sheet Aluminum (Type IX Retroreflective Sheeting)
1208937A	Sign Face - Sheet Aluminum (Type XI Retroreflective Sheeting)
1301771A	Furnish and Install Pre-insulated 12” Ductile Iron Water Main on Bridge
1301861A	Furnishing and Installing 12in Ductile Iron Pipe, Valves and Miscellaneous Fittings
1301952A	Steel Pipe Sleeve
1401246A	10” Ductile Iron Pipe (Sanitary Sewer)
1401662A	Sanitary Manhole (4’ Dia.) 0’ to 10’ Deep
1401947A	Remove Existing Pipe (Sanitary Sewer)
1403030A	Doghouse Manhole (Sanitary Sewer)
1403501A	Reset Manhole (Sanitary Sewer)
1403517A	Remove Sanitary Manhole (Sanitary Sewer)
1507000A	Protection and Support of Existing Utilities

NOTICE TO CONTRACTOR - PROCUREMENT OF MATERIALS

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

NOTICE TO CONTRACTOR – LOTCIP PROJECT SIGN REQUIREMENTS

Project Sign Requirements:

SIGN PANEL: Signs should be made from suitable materials to perform effectively for a minimum of 3 years. Example of allowable materials include ¾" MDO-EXT-APA Plywood or 0.125-gauge sheet aluminum. The following types of materials shall not be used: mesh, non-rigid, roll-up, corrugated or waffle board type substrates, foam core and composite aluminum sign substrates.

Suitable attachments shall be provided so that the signs can be firmly attached to the sign supports without causing damage to the signs.

Signs may be painted or use non-reflective plastic sheeting. Paint shall be extremely durable, high quality, semi-gloss enamel resistant to air, sun and water. Non-reflective plastic sheeting shall be permanently adhered to the backing. The material shall withstand 3 years' vertical, south-facing exterior exposure.

COLORS: All letters and symbols shall be blue code #0000FF, rgb (0, 0, 255), pantone 294, or approved equal. Background shall be white code #FFFFFF, rgb (255, 255, 255), or approved equal. If plywood is used for the sign panel, the back of the panel shall be painted matte black.

TYPEFACE: Helvetica Medium

SIGN SUPPORT: Sign panels shall be attached to vertical sign support posts. All sign supports shall have breakaway features that meet AASHTO requirements contained in the current "Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals". The breakaway features shall be structurally adequate to carry the sign panel at 60-mph wind loading. Installation shall be in accordance with the manufacturer's recommendations. A minimum 2-ft embedment depth below the ground line is required.

LOCATION: The signs SHALL be installed parallel to the travelway, so they are NOT easily viewable by drivers, as the signs are not MUTCD compliant and not intended to be roadway signs.

The lateral offset from the edge of road to the face of sign should be 6-12 feet. 12 feet is preferred where space is available for installation. When installed on a trail, the lateral offset should be 2 feet.

The bottom of the sign should be mounted 7 feet above the edge of road.

One sign shall be placed along Route 70 and one sign shall be placed along Oregon Road and shall be field located as directed by the Engineer.

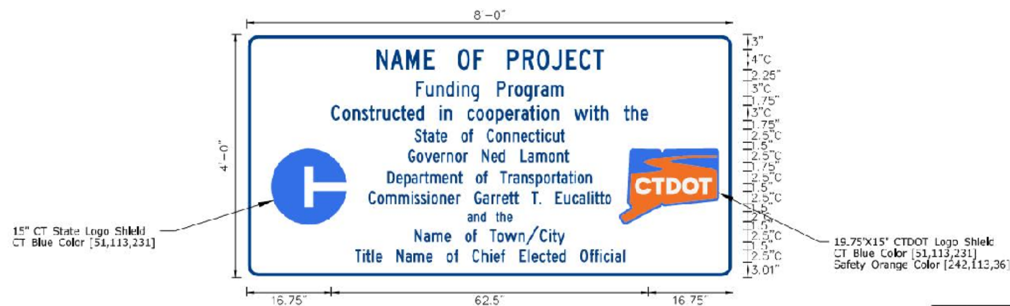
DURATION: The signs shall be erected for the life of the construction project. This means that they should be erected only after Notice to Proceed has been given to the contractor and should be removed with all other construction related signs at the end of the project considered to be the point that acceptance of the construction work is given.

NAME OF PROJECT: Oregon Road Bridge Replacement

FUNDING PROGRAM: Local Transportation Capital Improvement Program

SIGN DETAILS: The signs shall meet the requirements of the following details:

SIGN DETAIL
1:20



SIGN NUMBER	80-5956
PANEL SIZE	8'-0" x 4'-0"
TOTAL AREA	32 Sq.Ft.
MUTCD	N/A
BDR INSET/WIDTH	0.25"/0.65"
CORNER RADIUS	2"
BACKGROUND	TYPE: XI
	COLOR: White
LEGEND/BORDER	TYPE: XI
	COLOR: Blue/Blue

SYMBOL	ROTATION	X	Y	WID	HT
CT State Logo	0	4.78	10.42	14.95	15
CT DOT Logo	0	73.45	10.42	19.74	15

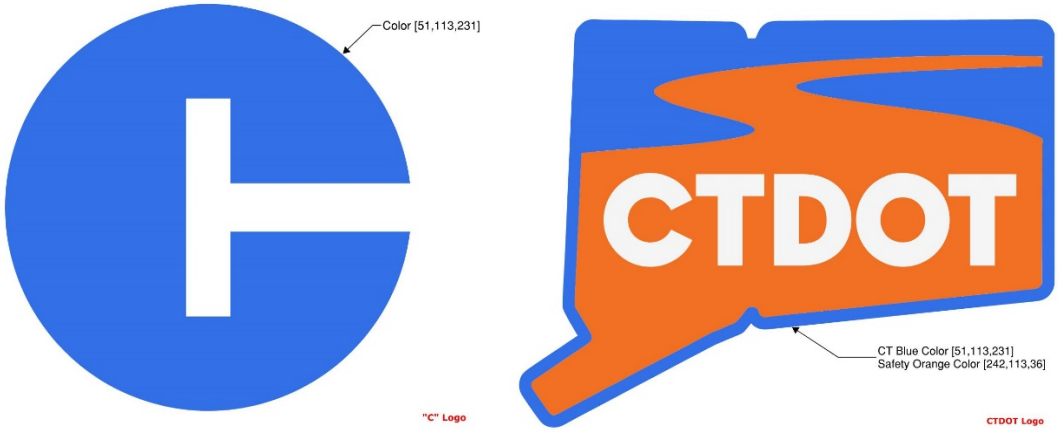
REV'D /

File name: 80-5956

Printed: 3/1/2024

Material : 0.125" Thick Sheet Aluminum
Ground Mounted

LETTER POSITIONS (X)																																								LENGTH	SERIES(FONT) / SIZE
N	A	M	E		O	F		P	R	O	J	E	C	T																											C 2000
25.57	28.37	31.49	35.01	37.29	41.65	44.81	46.97	51.41	54.45	57.29	60.13	63.05	65.69	68.41																										44.88	4
F	u	n	d	i	n	g		P	r	o	g	r	a	m																											C 2000
33.48	35.34	37.41	39.36	41.43	42.39	44.34	46.14	49.47	51.69	52.92	54.81	56.88	58.05	60																										29.04	3/2.25
C	o	n	s	t	r	u	c	t	e	d		i	n		c	o	o	p	e	r	a	t	i	o	n		w	i	t	h		t	h	e							C 2000
16.74	18.87	20.85	22.74	24.12	25.5	26.79	28.77	30.39	31.68	33.51	35.04	38.04	39	40.53	43.53	45.3	47.19	49.17	51.06	52.98	54.15	55.86	57.24	58.11	60.09	61.62	64.62	67.77	68.49	69.87	71.4	74.4	75.78	77.73						62.52	3/2.25
S	t	a	t	e		o	f		C	o	n	n	e	c	t	i	c	u	t																						C 2000
33.18	34.75	35.78	37.2	38.28	39.65	42.3	43.83	44.65	47.36	49.15	50.8	52.5	54.13	55.65	57	58.15	58.88	60.4	61.93																					29.65	2.5/1.88
G	o	v	e	r	n	o	r		N	e	d		L	a	m	o	n	t																							C 2000
31.87	33.64	35.12	36.79	38.39	39.49	41.12	42.77	43.64	46.42	48.24	49.77	51.27	54.04	55.49	57.12	59.57	61.22	62.72																						31.75	2.5/1.88
D	e	p	a	r	t	m	e	n	t		o	f		T	r	a	n	s	p	o	r	t	a	t	i	o	n														C 2000
27.79	29.53	31.1	32.6	34.18	35.07	36.2	38.61	40.18	41.66	42.58	45.21	46.71	47.53	50.1	51.65	52.61	54.19	55.73	57.05	58.6	60.21	61.1	62.12	63.52	64.64	65.33	66.94													40.43	2.5/1.88
C	o	m	m	i	s	s	i	o	n	e	r		G	a	r	r	e	t	t		T	.		E	u	c	a	l	i	t	t	o									C 2000
24	25.78	27.43	29.95	32.48	33.15	34.38	35.73	36.45	38.1	39.73	41.33	42.2	44.93	46.65	48.28	49.38	50.4	51.8	52.75	53.68	56.25	57.7	58.2	60.98	62.6	64.25	65.88	67.3	68.1	68.7	69.65	70.73								48	2.5/1.88
a	n	d		t	h	e																																			C 2000
43.58	44.88	46.18	47.2	49.2	50.12	51.42																																		8.86	2/1.5
N	a	m	e		o	f		T	o	w	n	/	C	i	t	y																									C 2000
33.21	34.98	36.61	39.06	40.43	43.08	44.61	45.43	48.01	49.51	50.98	53.61	55.08	57.86	59.71	60.31	61.28																								29.63	2.5/1.88
T	i	t	l	e		N	a	m	e		o	f		C	h	i	e	f		E	l	e	c	t	e	d		O	f	f	i	c	i	a	l						C 2000
21.37	22.94	23.54	24.69	25.42	26.79	29.57	31.34	32.97	35.42	36.79	39.44	40.97	41.79	44.52	46.37	48.07	48.79	50.27	51.09	53.87	55.52	56.24	57.77	59.12	60.19	61.72	63.22	65.94	67.74	68.67	69.72	70.44	71.99	72.67	74.29					53.28	2.5/1.88



Method of Measurement:

The work to furnish, install and remove LOTCIP signs will be measured for payment by the number of square feet of sign face delivered and used on the Project. Sign supports will not be measured for payment.

Basis of Payment:

This item will be paid for at the Contract unit price per square foot for "**Construction Signs**," delivered and used on the Project, which price shall include the signs, portable sign supports, metal sign posts, and all hardware required to attach the sign to the support or posts. Each sign and support or posts furnished will be paid for once, regardless of the number of times used on the Project.

Pay Item	Pay Unit
Construction Signs	s.f.

SECTION 1.07 - LEGAL RELATIONS AND RESPONSIBILITIES

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

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

City of Meriden – Water and Sanitary Sewer
Mr. Brian Ennis,
City Engineer
Department of Public Works
142 East Main Street, Meriden, CT 06450
Phone: 203-630-4020
bennis@meridenct.gov

The Connecticut Light and Power Company dba Eversource Energy - Electric Distribution
Mrs. Robin Lyons,
Lead Engineer - Distribution Projects and Programs 107
Selden Street, Berlin, CT 06037
Phone: 860-665-4733
Robin.Lyons@eversource.com

The Southern New England Telephone Company dba Frontier Communications of Connecticut
Ms. Lynne DeLucia,
Manager - Engineering & Construction
1441 North Colony Road, Meriden, CT, 06450-4101
Phone: 203-238-5000
Lynne.m.delucia@ftr.com

SECTION 1.08 - PROSECUTION AND PROGRESS

Article 1.08.01 – Transfer of Work or Contract:

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

Article 1.08.04 - Limitation of Operations - Add the following:

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

All Roadways

The Contractor shall maintain and protect a minimum of 1 lane of traffic in each direction with each lane on a paved travel path not less than 11 feet in width during the following times:

Monday through Friday between 6:00 a.m. and 9:00 a.m. & between 2:00 p.m. and 6:00 p.m.
Saturday and Sunday between 10:00 a.m. and 6:00 p.m.

Additional Lane Closure Restrictions

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

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

SECTION 1.10 ENVIRONMENTAL COMPLIANCE

In Article 1.10.03-Water Pollution Control:
REQUIRED BEST MANAGEMENT PRACTICES

Add the following after Required Best Management Practice Number 13:

14. The Contractor is hereby notified that the State listed species of Special Concern wood turtle (*Glyptemys insculpta*), is present within the Project limits. Wood turtles require riparian habitats bordered by floodplain, woodland, or meadows. Their summer habitat includes pastures, fields, woodlands, power line cuts, and railroad beds bordering or adjacent to streams and rivers. Wood turtles spend most of their summer on land and can use areas up to 1500 feet from the streams/rivers where they overwinter. They hibernate submerged in tangled tree roots along riverbanks or in deep pools.

    All construction activities taking place within the Project limits will need to be coordinated with the District Environmental Coordinator (DEC) and Office of Environmental Planning (OEP) through the Engineer. At least 10 days prior to the commencement of any construction activities, the Contractor shall, through the Engineer, arrange a meeting with DEC and CTDOT Environmental Inspector from the OEP (or their authorized delegate) to discuss proper protocol for maintaining environmental commitments made for the protection of this species and habitat. OEP will provide oversight through DEC and Engineer to ensure that the following protocols are followed and maintained during the Project.

    During the wood turtle's dormant period (November 1 to March 31):
    - Construction activities will be allowed in upland areas.
    - Work is not allowed in wetland/watercourse areas unless these areas were in active construction prior to November 1, and additionally, do not contain any areas of turtle habitat (no stream edge vegetation, stumps, or roots).

    For any work done during the wood turtle's active period (April 1 to October 31) the Department will require the following precautionary measures to protect the wood turtle and wood turtle habitat:

    a. All areas within the Project limits must be surveyed to verify the presence of any active wood turtle activity prior to commencement of the initial clearing and grubbing activities.

    b. All construction personnel working within wood turtle habitat must be apprised of the species description and the possible presence of this listed species.

    c. Exclusionary practices will be required in order to prevent any wood turtle to access construction areas. These measures will need to be installed at the limits of disturbance as shown on the plans.

d. Exclusionary fencing shall be at least 20" tall and must be secured to and remain in contact with the ground. The Contractor shall regularly inspect and maintain the fencing to prevent any gaps or openings at ground level. Silt fence with netting shall not be used.

e. The Contractor must search the work area each morning for the presence of this listed species prior to any work being done.

f. Any wood turtles encountered within the Project shall be carefully moved outside of the excluded work area and the Engineer shall be immediately informed in order to contact the DEC and OEP with the location.

When a species is found, the OEP will be responsible for completing and submitting the Natural Diversity Data Base (NDDB) Vertebrate Sheet (https://portal.ct.gov/DEEP/Endangered-Species/Contributing-Data). This completed document allows CTDEEP to update their database.

g. All staging and storage areas within the vicinity of the Project limits of the wood turtle habitat must be submitted to the DEC and Engineer and receive written approval from the OEP.

h. The Contractor shall not park heavy machinery or vehicles within the wood turtle habitat without submitting to the DEC and Engineer and receiving written approval from the OEP.

i. Exclusionary fencing shall be removed at the completion of the Project and when final stabilization has occurred to allow for reptile and amphibian passage to resume.

j. When felling trees adjacent to watercourses, they shall be cut to fall away from the waterway and not dragged across the waterway. Stumps shall be left in waterway banks where possible.

These practices will be applied to the entire Project unless a sketch is attached, which identifies specific areas of concern.

If any wood turtles are observed in or around the Project area, the Engineer will notify the DEC to facilitate further coordination with OEP's Environmental Resource Compliance Unit. If the DEC is unable to be reached, notify OEP at Andrew.Piraneo@ct.gov or at Marilyn.Gould@ct.gov.

This species is protected by State laws, which prohibit killing, harming, taking, or keeping them in your possession. A CTDEEP's fact sheet of the wood turtle shall be posted in the Contractor's and Inspection field offices and can be downloaded at the link below.

CTDEEP's Fact Sheet for the Wood Turtle:
https://portal.ct.gov//media/DEEP/wildlife/pdf_files/outreach/fact_sheets/woodturtlepdf.pdf

ITEM #0100600A – CONSTRUCTION ACCESS

Description: The item "Construction Access" shall consist of the design, construction, maintenance and removal of temporary works that the Contractor elects to use to access the work under the bridge structure for the removal of existing sewer main and installation of proposed sewer main attached to the bridge girder, removal of existing bridge, and construction of the proposed bridge.

Construction Methods: The Contractor's means and methods for construction shall meet all requirements established for the Project. At least 30 days prior to construction of temporary works, access, platforms and scaffolding, the Contractor shall submit detailed construction access working drawings and computations in accordance with Article 1.05.02. The working drawings and calculations must be prepared, stamped and signed by a Professional Engineer licensed in the State of Connecticut.

The furnishing of such plans, methods and calculations shall not serve to relieve the Contractor of his responsibility for the safety of the work and the successful completion of the Project. The Contractor's proposal must meet the requirements of Section 1.10.

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

Basis of Payment: Construction Access will be paid for at the contract lump sum price for "Construction Access" which price shall include the design, construction, maintenance and removal of all temporary works, all construction access, and all materials, tools, equipment, labor and work incidental thereto.

Pay Item	Pay Unit
Construction Access	L.S.

ITEM #0202216A – EXCAVATION AND REUSE OF EXISTING CHANNEL BOTTOM MATERIAL

Description: This work shall consist of excavating existing channel bottom material, herein referred to as natural streambed material, in areas where the channel bottom is to be disturbed and regraded to create a work area for a bridge, culvert, articulated concrete block placement, cofferdam installation, as shown on the plans or as directed by the Engineer. This item shall also include the stockpiling and protecting of the excavated material on-Site, subsequent placement, top dressing, or backfilling of the excavated stockpiled material within the watercourse, as shown on the plans or as directed by the Engineer.

Materials: The material for this item shall consist of the existing naturally-formed rocks, cobbles, gravel, soils and clean natural sediments from within the channel.

Any material excavated from shale, ledge (bedrock) formations broken from larger boulders, or material with sharp acute edges will not be accepted. Broken concrete will not be accepted.

Geotextile: Geotextile shall be as specified in M.08.01-19 Geotextiles.

Construction Methods:

1. Stockpiling of Material. The Contractor shall submit for the Engineer's approval a proposed location for stockpiling material. The proposed location shall be upland where disruption to the stream channel or impact to wetland areas caused by moving the natural streambed material to and from the stockpile are minimized. The Contractor shall prepare the area approved by the Engineer, suitable in size and location for stockpiling the natural streambed material.

The stockpile shall be located where it can remain undisturbed for the duration of the stream channel reconstruction or as shown on the plans and shall be protected using sedimentation control measures. The stockpile area shall be free of debris and cleaned adequately to prevent mixing with underlying soil or other materials, including the use of a separation barrier such as: Geotextile – (Separation Class 1), polyethylene sheeting, or similar. The stockpile area shall be adequately covered to protect the excavated natural streambed material from erosion by rain, wind, or other forces.

2. Excavation of Natural Streambed Material. The Contractor shall notify the Engineer 10 days in advance of excavation and placement of natural streambed material activities. The Engineer will identify the limits of the exposed natural streambed material during excavation under this item. The Engineer will identify the bottom limit of excavation, an amount up to but not exceeding 24 inches in depth, unless approved by the Engineer or their authorized delegate, based upon visual inspection of the natural streambed material. After the limits of excavation have been determined, the Contractor shall excavate the natural streambed material, separate from any other roadway, structure, channel or unsuitable material excavation on Site. After the natural streambed material has been excavated, it shall be placed in the pre-approved stockpile area.

3. Backfilling and Placement with Natural Streambed Material. The stockpiled natural streambed material shall be placed as fill material as specified at the designated location(s) to the required thickness and elevation as shown on the plans or as directed by the Engineer or their authorized delegate. Placement methods likely to cause segregation of the various sizes of stone will not be permitted. Placement techniques shall prevent integration with non-natural streambed material and shall keep the natural streambed material relatively homogenous. The natural streambed material shall be placed in a manner that replicates the original condition of the channel prior to excavation and to the elevation as shown on the plans.

4. Top Dressing with Natural Streambed Material. The stockpiled natural streambed material shall be used as top dressing over riprap or other material as specified at the designated location(s) to the required thickness and elevation as shown on the plans or as directed by the Engineer or their authorized delegate. Placement techniques shall prevent integration with the non-natural streambed material and shall keep the natural streambed material relatively homogenous. The natural streambed material shall be placed in a manner that replicates the original condition of the channel prior to excavation and to the elevation as shown on the plans.

5. Site Maintenance. When backfilling, placing, or top dressing, the Contractor shall perform all containment, diversion, or other separation of the channel flow to minimize sediment transport downstream.

The disposal of any surplus and/or unsuitable material shall be in accordance with Article 1.09.04.

If the Engineer determines that there is an insufficient quantity of natural streambed material within the Project limits, the Contractor shall procure Supplemental Streambed Channel Material as specified under Item #0202217A.

If it is required for the Project to have washing-in of supplemental streambed material, the Contractor shall procure Washing-in Supplemental Streambed Material as specified under Item #0202218A.

The pre-approved stockpile areas shall be restored to the satisfaction of the Engineer. Work to restore/regrade stockpile areas will be paid for under the respective pay item(s).

Method of Measurement: This work will be measured for payment by the number of cubic yards of natural streambed material excavated, stockpiled, maintained, installed, and accepted.

The Engineer will delineate the horizontal pay limit prior to the start of excavation. The vertical pay limit will be measured from the top of the existing channel bottom to the bottom of excavation required specifically for the stockpiling of channel bottom material.

Any material excavated beyond the approved horizontal pay limits or deeper than the depth of natural streambed material identified and approved by the Engineer will not be measured for payment under this item. Should such additional excavation be required to complete the Contract work, it will be measured for payment separately under the applicable pay item(s).

Basis of Payment: Payment for this work will be made at the Contract unit price per cubic yard for "Excavation and Reuse of Existing Channel Bottom Material." The price shall include all materials, equipment, geotextile, tools, and labor incidental to the preparation of the stockpile area, excavation of natural streambed material, hauling of the material to the stockpile, and separation of any rock ledge or concrete debris, storing, and protecting (including sedimentation controls and covering) excavated material.

Payment for clearing and grubbing of the approved stockpile area will be included in the item "Clearing and Grubbing."

Payment for the removal and proper disposal of all surplus and/or unsuitable material will be in accordance with Article 1.09.04 – Extra and Cost-Plus Work.

Riprap or other specified material as shown on the plan will be paid for under the respective items.

Payment for supplemental streambed channel material will be included in the Item #0202217A "Supplemental Streambed Channel Material." If no item appears in the proposal, payment for the work will be in accordance with Article 1.09.04 – Extra and Cost-Plus Work.

Payment for washing in supplemental streambed channel material will be included in the Item #0202218A "Washing-in Supplemental Streambed Material." If no item appears in the proposal, payment for the work will be in accordance with Article 1.09.04 – Extra and Cost-Plus Work.

Payment for all containment, diversion or other separation of stream flow will be included in the item "Cofferdam and Dewatering" or special provision for "Handling Water."

Pay Item	Pay Unit
Excavation and Reuse of Existing Channel Bottom Material	c.y.

ITEM #0204001A – COFFERDAM AND DEWATERING

Cofferdam and Dewatering shall be constructed in accordance with Section 2.04 and supplemented as follows:

Article 2.04.01 - Description: Add the following:
The installed cofferdam may act as a temporary earth retaining system where needed so that existing or planned facilities are properly retained during the excavation or placement of fill.

Article 2.04.03 – Construction Methods: Add the following at the end of section 1:

If Cofferdam is being used as a temporary earth retaining system, the work shall also be performed per article 7.16.03.

During the removal of the cofferdams, care shall be taken not to damage the recently constructed structures. Vibratory removal of cofferdams shall be limited to avoid disruption to the surrounding ground.

Pay Item	Pay Unit
Cofferdam and Dewatering	l.f.

ITEM #0204151A - HANDLING WATER

Description: Work under this item shall consist of designing, furnishing, installing, maintaining, and removing of a temporary water handling system. This may include water-handling-cofferdams, bypass pipes, bypass pumps/hoses, temporary energy dissipation, sump pumps, drainage channels, water handling for ancillary drainage, and dewatering.

A temporary water handling system redirects water beyond, through, or around the limits of construction to allow work to be done in the dry.

Materials: The materials required for this work shall be as shown on the plans, on the accepted Contractor's Working Drawing submittal, or as ordered by the Engineer.

Construction Methods: The Contractor shall prepare and submit written procedures for handling water. Working Drawings, in accordance with Article 1.05.02, shall also be prepared and submitted.

The Contractor shall consider stream conditions, water elevations, expected weather, and risks associated with the Site to determine the type of temporary water handling system required to redirect water away from work being performed. The system shall be designed to comply with the Temporary Hydraulic Table in the Contract plans and be compatible with the stage of construction and Maintenance and Protection of Traffic scheme, as indicated in the Contract, and shall conform to Section 1.10.

The Contractor shall be responsible to maintain and repair the water handling system throughout the duration of the Contract. If the system becomes damaged, displaced, or not functioning properly due to construction activities, stream conditions or storm events, the Contractor shall be responsible to remediate the system back to working order per plan or as required at the direction of the Engineer.

Unless otherwise directed by the Engineer, all temporary water handling system components shall be removed in an acceptable manner when no longer required.

Bypass Pumping:

The bypass pump system shall be designed by the Contractor to comply with the Temporary Hydraulic Table in the Contract plans.

When incorporating a bypass pump/hose system, the Contractor shall provide a means to maintain continuous flow to the downstream channel to protect resources, unless otherwise noted in the Contract plans or as accepted by the Engineer. The Contractor shall provide for both maintaining continuous flow and accommodating temporary design flows using appropriate pump size for each case, valving, metering, or adjusting the flow during construction.

A pump screen shall be provided on the intake with maximum 0.5 inch diameter openings.

Method of Measurement: The work under this item, being paid on a lump sum basis, will not be measured for payment.

Basis of Payment: This work will be paid for at the Contract lump sum price for "Handling Water" completed and accepted, which price shall include designing (including submittals and

Working Drawings), furnishing, installing, maintaining, and removing of all temporary water handling system components as are necessary for completion of the work. This price shall include all materials, equipment, tools, labor and work incidental thereto.

A schedule of values for payment shall be submitted to the Engineer for review and comment.

Pay Item	Pay Unit
Handling Water	l.s.

ITEM #0219011A – SEDIMENT CONTROL SYSTEM AT CATCH BASIN

Description: Work under this item shall consist of furnishing, installing, maintaining, replacing, and removing sediment control system at catch basins, herein referred to as Silt Sack, at the locations as shown on plans or as directed by the Engineer. The work shall also include removal of accumulated sediment, and disposal of accumulated sediment,

Materials: The Silt Sack must be commercially produced and marketed for the specific application(s) on the Project. All Silt Sack must be manufactured from a specially designed woven polypropylene geotextile sewn material. The Silt Sack must be able to handle flows of at least 180 gallons per minute per square foot, fit any sized catch basin or drop inlet, and be UV resistant.

The Silt Sack product shall be one of the following or an approved equal:

1. Siltsack®
2. Dandy Sack®
3. FleXstorm Catch-It™
4. PIG®Sediment-Drain Filter
5. ACF Environmental Silt Sack

The Sediment Control System at Catch Basin must have the following features: two dump straps attached at the bottom to facilitate the emptying of the Silt Sack and lifting straps to be used to lift the Silt Sack from the catch basin or drop inlet. The Silt Sack shall have a restraint cord approximately halfway up to keep the sides away from the catch basin or drop inlet walls. When required, a curb deflector shall be installed as directed by the Engineer.

Product Data for the Silt Sack to be used by the Contractor must be submitted for review and acceptance by the Engineer or their authorized delegate prior to the installation on-Site.

Construction Methods: The Contractor shall install the Silk Sack per the manufacturer's instructions and recommendations at each catch basin or drop inlet as shown on the plans or as directed by the Engineer to provide inlet protection to prevent silt, sediment, or debris from entering the stormwater drainage system.

When the Silt Sack becomes 1/2 full of accumulated sediment, the Contractor shall empty, clean, and replace the Silt Sack back into the catch basin or drop inlet. Sediment emptied shall be considered unsuitable material and be disposed of at an off-Site approved upland facility per federal, State, and local environmental laws and regulations.

At the completion of the Project, the Contractor shall remove all Silt Sacks within the Project limits. Any spilled sediment material during removal operations shall be removed by the Contractor at no cost to the State.

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

Basis of Payment: The item "Sediment Control System at Catch Basin" will be paid at the Contract unit price for each completed system in place and accepted, which price shall include installing, maintaining, replacing, removal of material, off-Site disposal of accumulated material, materials, equipment, tools, and labor incidental thereto.

The cost of installing hay bales, geotextile, check dam, or fiber roll for inlet protection shall be paid for under their respective Contract item or special provision.

Pay Item	Pay Unit
Sediment Control System at Catch Basin	ea.

ITEM #0406194A – JOINT AND CRACK SEALING OF BITUMINOUS CONCRETE PAVEMENT (LF)

Description: This work consists of furnishing and applying hot-applied asphalt crack sealer to bituminous concrete pavement joints and cracks. It shall be constructed in close conformity with the lines, grades, thicknesses, and typical cross sections shown on the plans or established by the Engineer. Joint and Crack Sealing of Bituminous Concrete Pavement may be used in conjunction with other repair treatments including joint and crack filling or patching, in which case the sequence of treatments will be provided in the Plans or directed by the Engineer.

For the purposes of this document, the word "crack" includes all longitudinal (along the direction of travel) and transverse (perpendicular to the direction of travel) cracks and joints. All work specified for "crack(s)" herein shall apply to all types of cracks and joints unless otherwise specified.

Materials:

1. Crack Seal: The crack seal material shall be composed of a hot-applied asphalt meeting ASTM D6690 Type II requirements. The Contractor must submit to the Engineer all Material Safety Data Sheet documents from the material manufacturer prior to the commencement of work. During work progress, the Contractor must submit to the Engineer a Materials Certificate (MC) and a Certified Test Report (CTR) showing conformance to ASTM D6690 Type II requirements for each batch or lot of material utilized on the Contract in accordance with Section 1.06.07.

2. Optional Barrier Material – Backer Rod: The backer rod shall be a heat resistant material compatible with the crack sealant and acceptable to the manufacturer of the sealant. No bond or reaction shall occur between the sealant and the rod. It shall be of a non-water absorbent material and shall not melt or shrink when hot sealant is poured on it.

   The backer rod shall have a maximum of 5% absorption when immersed in water for 24 hours with the ends sealed. The backer rod shall be of such a size that compression is required for installation in the crack, so that it maintains its position during the sealing operation. Backer rod shall be dry.

3. Optional Barrier Material – Hot Mix Asphalt (HMA): Any HMA placed in the bottom of a crack between 1.5 and 2 inches wide shall be HMA S0.25 Traffic Level 2 and shall meet all requirements of Section 4.06 - Bituminous Concrete.

Construction Methods: The crack sealing operation shall proceed in accordance with the requirements of the "Maintenance and Protection of Traffic" and "Prosecution and Progress" specifications.

1. Equipment: The equipment used by the Contractor shall include, but not be limited to, the following:

    a. Melter Applicator: The unit shall consist of a boiler kettle equipped with pressure pump, hose, and applicator wand; the boiler kettle may be a combination melter and pressurized applicator of a double-boiler type with space between the inner and outer shells filled with heat transfer oil. Heat transfer oil shall have a flash point of not less than 600°F. The kettle shall include a temperature control indicator. The kettle shall be capable of maintaining the crack seal material at the manufacturer's specified application temperature range. The kettle shall include an insulated applicator hose and application wand. The hose shall be equipped with a shutoff control. The kettle shall include a mechanical full sweep agitator to provide continuous blending. The unit shall be equipped with thermometers to monitor the material temperature and the heating oil temperature. The unit shall be equipped with thermostatic controls that allow the operator to regulate material temperature up to at least 425°F.

    b. Application Wand and Squeegee Applicator: The material shall be applied with a wand followed by a squeegee applicator. The squeegee applicator shall be of commercial/industrial quality designed with a "U" shaped configuration. It shall be of a size adequate to strike off, flush with the surrounding pavement surface and without overflow around the sides, all crack seal material placed. This tool shall be either attached to the applicator wand or used separately as its own long handled tool.

    c. Hot Air Lance: The unit shall be designed for cleaning and drying the pavement surface cracks. Minimum compressed air capacity shall be 100 psi. The compressed air emitted from the tip of the lance shall be capable of achieving a temperature of at least 1500°F.

    d. Vertically Mounted Power Driven Wire Brush: This tool shall be used to remove any dirt, debris, or vegetation to the depths specified that cannot be removed by the hot air lance. It shall be of adequate size and power to remove all material from cracks as specified.

2. Weather Requirements: Work shall not be performed unless the pavement is dry. No frost, snow, ice, or standing water may be present on the roadway surface or within the cracks. The ambient temperature must be 40ºF and rising during the field application operations for work to proceed.

3. Material Mixing Procedure: The prepackaged material shall be added to the melter applicator in the presence of the Engineer. It shall then be mixed and heated to the recommended application temperature. The crack seal material shall never exceed 400°F.

4. Determination of Cracks to be Sealed: The width and depth requirements for cracks to be sealed are as follows:

All crack width determinations shall be made by measuring the crack width flush at the surface of the pavement prior to being sealed. A straightedge shall be used whenever necessary to establish the location or limits of the flush surface of the pavement.

All cracks from $^1/_8$ inch up to 1.5 inches wide shall be prepared and sealed as stated below. Cracks that are between $^1/_8$ inch and 1.5 inches wide, but eventually taper in width below the minimum $^1/_8$ inch, shall also be prepared and sealed as stated below. Only cracks that are less than $^1/_8$ inch wide throughout their entire length shall be excluded.

Transverse cracks, where a portion of the crack (50% or less) exceeds a width of 1.5 inches, up to 2 inches, shall also be prepared and sealed as stated below.

All joints to be sealed that are raveled (loss of the pavement surface material) shall be at least ½ inch in depth at the joint's deepest point. The minimum width of a raveled joint must be ½ inch. The maximum width of a raveled joint to be sealed is 3 inches.

Any cracks exceeding the width and depth requirements specified above shall be repaired using separate items.

5. Crack Preparation: Cracks to be sealed shall be treated with a hot air lance prior to application of the crack seal material. Two (2) passes minimum shall be made with the hot air lance. The hot air lance operation shall proceed at a rate no greater than 120 feet per minute. There shall be no more than 10 minutes between the second hot air lance treatment and the material application.

   The use of the hot air lance is not intended to heat the crack. It is to be used to blow all debris from the crack to the depths specified below and to remove any latent moisture from the crack until the inside of the crack is completely dry as determined by the Engineer. "Moisture" does not include standing water. The hot air lance is not to be used to boil off or blow standing water from the bottom of a crack. If standing water is present in the bottom of any crack, the sealing operation shall be postponed until such time that the standing water evaporates naturally. The Contractor may use compressed, oil-free air (not heated) to blow standing water from a crack to help accelerate the natural evaporation process. If standing water remains after using compressed air, the crack shall be allowed to dry naturally until remaining standing water evaporates. The hot air lance shall be used after visible water has evaporated. If a crack is already completely dry as determined by the Engineer, the hot air lance shall be operated at its lowest temperature possible.

   The hot air lance is to be used to blow all debris from cracks (not including raveled joints) to a depth of at least ¾ inch for cracks between $^1/_8$ inch and ¾ inch wide, and to a depth of 1.25 inches for cracks between ¾ inch and 2 inches wide. The hot air lance shall be used to blow all debris from raveled joints to a depth of 1 inch or the full depth of the joint, whichever is smaller.

In the event that cracks are packed tightly with debris, dirt, vegetation, or other material, except previously placed sealant or filler, the Contractor shall use a vertically mounted power driven wire brush to remove all material and burnish the sides of the crack to the depths specified above. Cracks treated with the power driven wire brush shall subsequently be treated with a hot air lance as described in this section. The use of both the power driven wire brush and the hot air lance shall result in the complete removal of all material in the crack (except previously placed sealant or filler) to the depths specified above such that the sides of the crack are completely free and clean of any debris and moisture.

In the event that cracks have depths greater than 2 inches below the pavement surface, the Contractor may place a barrier composed of backer rod as specified herein. The backer rod shall be placed in a manner leaving 1.25 inches below the elevation of the pavement surface for crack seal material. Use of backer rod will not be allowed for cracks wider than 1.5 inches or less than ½ inch wide. For cracks between 1.5 and 2 inches wide, HMA S0.25 Traffic Level 2 may be placed in the bottom of the prepared crack. HMA shall be placed and compacted with a steel T-bar approved by the Engineer in a manner leaving 1.25 inches below the elevation of the pavement surface for crack seal material.

6. Crack Sealing: As soon as cracks have been prepared, they shall be filled to refusal along their entire length with the crack sealant material. The treatment material shall be maintained at the manufacturer's specified/recommended application temperature range at all times. The sealing operation shall be suspended if the temperature of the crack seal material falls outside the specified temperature range and shall remain suspended until the crack seal material is brought within the specified temperature range. Sealed cracks are to be squeegeed immediately following application of the crack seal material, striking excess sealer flat to the adjacent pavement surface. There shall be no build-up of treatment material above or adjacent to the crack at any time. If the initial application of crack sealant material fails to fill the crack or shrinks upon cooling such that there is a depression formed of at least ¼ inch or greater, a second application of sealant shall be placed over the first application.

7. Protection of Sealed Cracks: Traffic shall not be permitted on the pavement until the crack seal material is set so that the material does not track and is not deformed or pulled out by tires. If the work under this item is being performed prior to placing a hot mix overlay or other surface treatment, a detackifier or blotting agent will not be allowed. If work under this item is not followed by placement of an overlay of any kind, a detackifier or blotting agent may be used. If a detackifier or blotting agent is used, it shall be one recommended by the supplier of the crack seal material and shall be used as recommended by the supplier, except that no paper, cotton, or other organic materials shall be allowed. Information on the type and usage of a detackifier or blotting agent shall be submitted to the Engineer prior to use.

8. Removal and Disposal of Material: All debris generated from the operations described above shall be removed from the roadway by the Contractor.

   Treatment material remaining in the Contractor's kettle at the close of the daily work session shall be discarded. At no time shall treatment material be re-heated for use in subsequent

crack sealing applications unless permitted by the Engineer following a review of specific circumstances.

All debris and surplus treatment material shall be properly disposed in accordance with Article 1.10.03 and State of Connecticut law.

9. Acceptance of Work: When work is complete, an inspection shall be scheduled with the Engineer. The Engineer will note all deficiencies including, but not limited to, areas exhibiting adhesion failure, cohesion failure, tracking of sealant material, and missed cracks. Work identified by the Engineer as not acceptable shall be repaired at the Contractor's expense. The Contractor shall notify the Engineer upon completion of any corrective work performed.

Method of Measurement: This work will be measured by the total number of linear feet of cracks sealed of bituminous concrete roadway surface, as indicated in the Contract plans and as measured, verified, and accepted by the Engineer.

Basis of Payment: This work will be paid for at the Contract unit price per linear foot for "Joint and Crack Sealing of Bituminous Concrete Pavement" complete and accepted in place. The price shall include all submittals, materials, equipment, tools, and labor incidental thereto. No payment will be made to the Contractor prior to submittal of required documents.

Pay Item	Pay Unit
Joint and Crack Sealing of Bituminous Concrete Pavement	l.f.

ITEM #0406312A – GUTTER LINE SEALING FOR BRIDGES

Description: This work shall consist of applying hot-applied asphalt crack sealant along the gutter line of bridges after paving to seal the joint between the bituminous concrete overlay and parapet, curb, or barrier at the locations and to the limits shown on the Plans.

Materials:

1. Crack Seal: The crack seal material shall be composed of a hot-applied asphalt meeting ASTM D6690 Type II requirements.

   Prior to the start of work, the Contractor shall submit a Materials Certification (MC) in accordance with Article 1.06.07 certifying the joint seal material meets these requirements. The Contractor must submit to the Engineer all Safety Data Sheets (SDS) from the material manufacturer prior to the commencement of work.

2. Blotting Agent – Detackifier: This material shall be a fine-graded granular material with 100% aggregate passing the 3/16-inch sieve and no more than 5% passing the #200 sieve when tested in accordance with AASHTO T 27 and T 11.

   The material shall be as recommended by the supplier of the crack sealant and shall be used as recommended by the supplier, except that no paper, cotton, or other organic materials will be allowed. Product Data shall be submitted to the Engineer for review in accordance with Article 1.05.02.

Construction Methods: The sealing operation shall proceed in accordance with the requirements of the "Maintenance and Protection of Traffic" and "Prosecution and Progress" specifications.

1. Equipment: The equipment used by the Contractor shall include the following:

   a. Melter Applicator: This shall consist of a boiler kettle equipped with pressure pump, hose, and applicator wand; the boiler kettle may be a combination melter and pressurized applicator of a double-boiler type with space between the inner and outer shells filled with heat transfer oil. Heat transfer oil shall have a flash point of not less than 600°F. The kettle shall include a temperature control indicator. The kettle shall be capable of maintaining the crack seal material at the manufacturer's specified application temperature range. The kettle shall include an insulated applicator hose and application wand. The hose shall be equipped with a shutoff control. The kettle shall include a mechanical full sweep agitator to provide continuous blending. Thermometers shall monitor the material temperature and the heating oil temperature. Thermostatic controls shall allow the operator to regulate material temperature up to at least 425°F.

   b. Application Wand and Squeegee Applicator: The material shall be applied with a wand followed by a squeegee applicator. The squeegee applicator shall be of

commercial/industrial quality and be designed with a configuration to properly strike off the sealant placed along the gutter line of the bridge, adjacent bituminous concrete overlay and parapet, curb, or barrier to the dimensions specified. It shall be of a size adequate to strike off, flush with the surrounding areas, all crack seal material placed. This tool shall be either attached to the applicator wand or be a separate long handled tool.

c. Hot Air Lance: This shall be designed for cleaning and drying the pavement edge along the curb parapet or barrier. Minimum compressed air capacity shall be 100 psi. The oil-free compressed air emitted from the tip of the lance shall be oil free and capable of achieving a temperature of at least 1500°F.

2. Weather Requirements: The pavement shall be dry without frost, snow, ice, or standing water on the roadway surface and within the areas to be sealed. The ambient temperature must be at least 40ºF and rising during application.

3. Material Mixing Procedure: The prepackaged material shall be added to the melter applicator in the presence of the Engineer. It shall then be mixed and heated to the recommended application temperature. The crack sealant shall never exceed 400°F. The treatment material shall be maintained at the manufacturer's specified/recommended application temperature range during application. The sealing operation shall be suspended if the temperature of the crack sealant falls outside the specified temperature range and shall remain suspended until the crack sealant is brought within the specified range.

4. Delineation of Areas to be Sealed: Prior to the sealing operation, the Contractor shall locate and mark out the start and end limits of the work. The sealing shall span the entire length of the structure and be done along each side of the bridge such that both gutter lines are completely sealed, as shown on the Plans. Sealing shall be performed after the surface lift of the bituminous concrete overlay is placed, at a time determined by the Engineer, not to exceed 4 weeks after final paving is completed. The sealing operation shall not damage or otherwise negatively impact the performance of any portion of the overlay, membrane waterproofing, bridge deck, joint, or other structural element.

Sealing Preparation: Areas to be sealed shall be treated with a hot air lance prior to application of the crack seal material. A minimum of two (2) passes shall be made. Within 10 minutes of the second hot air lance treatment the sealant shall be applied. The use of the hot air lance is not intended to heat the areas to be sealed. It is to be used to blow away all debris and remove any latent moisture from the areas to be sealed until the area is completely dry as determined by the Engineer. "Moisture" does not include standing water. The hot air lance is not to be used to boil off or blow standing water. If standing water is present, the sealing operation shall be postponed until such time that the standing water evaporates naturally. The Contractor may use compressed, oil-free air (not heated) to blow standing water to help accelerate the natural evaporation process. If standing water remains after using compressed air, the area shall be allowed to dry naturally until remaining standing water evaporates. The hot air lance shall be used after visible water has evaporated. If an area is already completely dry as determined by the Engineer, the hot air lance shall be operated at its lowest temperature possible.

The parapet, curb, or barrier face shall be masked off above the sealant line to ensure straight, clean, and neat lines are provided along the vertical surface and that crack seal material is placed within the dimensions specified below.

5. Sealing Operation: Once prepared, all specified areas shall be sealed along their entire length with the crack seal applicator. Crack seal shall be placed 2 inches up onto the parapet, curb, or barrier face and 4 to 6 inches onto the adjacent bituminous concrete overlay. There shall be no build-up of sealant material above or adjacent to the sealed areas beyond these limits. Sealed areas are to be flattened with the squeegee applicator immediately following application of the crack sealant, striking excess material flat and even with the adjacent surface(s). If the initial application of crack sealant fails to fill the area flush or shrinks upon cooling with a depression of 1/8 inch or greater, additional applications of sealant shall be placed where necessary. Care shall be taken during the sealing operation to ensure that overfilling and spilling of material is avoided.

6. Protection of Sealed Areas: Traffic shall not be permitted on the sealed area of pavement along the gutter line until the crack sealant is set, so that the material does not deform or track and be pulled out by tires. If work under this item is not followed by placement of an overlay of any kind, a detackifier or blotting agent shall be used. If the work under this item is being performed prior to placing a surface treatment (e.g., chip seal), a detackifier or blotting agent will not be allowed.

7. Removal and Disposal of Material: All debris generated from the operations described above shall be removed by the Contractor. Treatment material remaining in the Contractor's kettle at the end of the work shift shall be properly discarded. Treatment material shall not be re-heated for use in subsequent crack sealing applications unless permitted by the Engineer. All debris and surplus treatment material shall be properly disposed of in accordance with Article 1.10.03 and State of Connecticut regulations.

8. Acceptance of Work: When work is complete, an inspection shall be scheduled. The Engineer will note all deficiencies including areas exhibiting adhesion failure, cohesion failure, tracking of sealant material, locations of missing, incompletely or incorrectly constructed sealant, or other factors that show the work is not acceptable. Work identified by the Engineer as not acceptable shall be repaired at the Contractor's expense. The Contractor shall notify the Engineer upon completion of any corrective work performed.

Method of Measurement: This work will be measured by the total number of linear feet sealed, verified and accepted by the Engineer.

Basis of Payment: This work will be paid for at the Contract unit price per linear foot for "Gutter Line Sealing for Bridges" complete and accepted in place. The price shall include all submittals, materials, equipment, tools, and labor incidental thereto. No payment will be made to the Contractor prior to submittal of required documents.

Pay Item	Pay Unit
Gutter Line Sealing for Bridges	l.f.

ITEM #0520036A - ASPHALTIC PLUG EXPANSION JOINT SYSTEM

Description: Work under this item shall consist of furnishing and installing an asphaltic plug expansion joint system (APJ) in conformance with ASTM D6297, as shown on the plans, and as specified herein.

Work under this item shall also consist of the removal and disposal of bituminous concrete, membrane waterproofing, existing joint components and sealing elements, cleaning and sealing median barrier joints, parapet joints, and sidewalk joints as shown on the Plans.

Work under this item excludes the removal of Portland cement concrete headers and furnishing and installing preformed joint seals.

Materials: The APJ component materials shall conform to ASTM D6297 and the following:

Aggregate: The aggregate shall meet the following requirements:

a) Loss on abrasion: The material shall show a loss on abrasion of not more than 25% using AASHTO Method T96.
b) Soundness: The material shall not have a loss of more than 10% at the end of five cycles when tested with a magnesium sulfate solution for soundness using AASHTO Method T 104.
c) Gradation: The aggregate shall meet the requirements of Table A below:
d) Dust: Aggregate shall not exceed 0.5% of dust passing the #200 sieve when tested in accordance with AASHTO T-11.

Table A

Square Mesh Sieves	1" (25.0 mm)	¾" (19.0 mm)	½" (12.5 mm)	⅜" (9.5 mm)	No. 4 (4.75 mm)
% passing	100	90 - 100	20 - 55	0 - 15	0 - 5

A sample of the aggregate shall be submitted to the Department with a Certified Test Report in accordance with Article 1.06.07 for each 20 tons of loose material or its equivalent number of bags delivered to the job site. The Certified Test report must include a gradation analysis resulting from a physical test performed on the actual material that accompanies the report.

Anti-Tacking Material: This material shall be a fine graded granular material with 100% passing the $^{3}/_{16}$" sieve and no more than 5% passing the #200 when tested in accordance with AASHTO T-27.

Backer Rod: All backer rods shall satisfy the requirements of ASTM D5249, Type 1.

Bridging Plate: The bridging plates shall be steel conforming to the requirements of ASTM A36 and be a minimum ¼" thick and 8" wide. For joint openings in excess of 3" the minimum

plate dimensions shall be ⅜" thick by 12" wide. Individual sections of plate shall not exceed 4' in length. Steel locating pins for securing the plates where shown on the Plans shall be size 16d minimum, hot-dip galvanized, and spaced no more than 12" apart.

Concrete Leveling Material: Shall be one of the Neat products listed on the Qualified Products List (QPL) for the category Rapid Hardening Concrete Patching (RHCP) Materials. The product shall be suitable for use at the thickness it will be applied as specified by the Manufacturer.

Parapet Sealant: The sealant used in parapet joint openings shall be a single component non-sag silicone sealant that conforms to the requirements of ASTM D5893.

Sidewalk Sealant: The sealant used in sidewalk joint openings shall be a rapid cure, self-leveling, cold applied, two-component silicone sealant. The silicone sealant shall conform to the requirements listed in Table B:

Table B

Properties - As Supplied	**Test Method**	**Requirement**
Extrusion Rate	ASTM C1183	200-600 grams/min
Leveling	ASTM C639	Self-Leveling
Specific Gravity	ASTM D792	1.20 to 1.40
Properties - Mixed	**Test Method**	**Requirement**
Tack Free Time	ASTM C679	60 min. max.
Joint Elongation – Adhesion to concrete	ASTM D5329 [1,2,3]	600% min
Joint Modulus @ 100% elongation	ASTM D5329 [1,2,3]	15 psi max
Cure Evaluation	ASTM D5893	Pass @ 5 hours

1. Specimens cured at 77±3^{0}F and 50±5% relative humidity for 7 days
2. Specimens size: ½"wide by ½"thick by 2" long
3. Tensile Adhesion test only

The date of manufacture shall be provided with each lot. No sealant shall be used beyond its maximum shelf-life date.

The two–part silicone sealants shown in Table C are known to have met the specified requirements:

Table C

Product	Supplier
Dow Corning 902RCS	Dow Corning Corporation 2200 W Salzburg Road Auburn, Michigan 48611
Wabo SiliconeSeal	BASF/Watson Bowman Acme Corporation 95 Pineview Drive Amherst, New York 14228

Other two-component silicone joint sealants expressly manufactured for use with concrete that conform to the aforementioned ASTM requirements will be considered for use provided they are submitted in advance for approval to the Engineer. Other joint sealants will be considered for use only if a complete product description is submitted, as well as documentation describing at least five installations of the product. These documented installations must demonstrate that the product has performed successfully for at least three years on similar bridge expansion joint applications.

A Materials Certificate and Certified Test Report for the asphaltic binder shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07 certifying that the asphaltic binder satisfies the requirements of the most current version of ASTM D6297.

A Materials Certificate for all other components of the APJ, leveling material, backer rod and sealant used in sealing parapet and sidewalk joint openings, shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07

Construction Methods: The APJ shall be installed at the locations shown on the Plans and in stages in accordance with the traffic requirements in the special provisions "Maintenance and Protection of Traffic" and "Prosecution and Progress".

At least 30 days prior to start of the work, the Contractor shall submit to the Engineer for approval a detailed Quality Control Plan for the installation of the APJ. The submittal shall include:

a) A list of all manufactured materials and their properties to be incorporated in the joint system, including, but not limited to the asphaltic binder, anti-tack material, backer rod, sealant, leveling material, as well as the aggregate's source.
b) A detailed step by step installation procedure and a list of the specific equipment to be used for the installation. The Quality Control Plan must fully comply with the specifications and address all anticipated field conditions, including periods of inclement weather.
c) Documented measurements taken during an exploration of the deck as detailed on the plans. Documentation shall include:

i. Wearing surface thickness measurements
ii. Location of end of deck / Layout of joint

iii. Deck joint gap measurements and ambient temperature at the time the measurements are taken.

The APJ shall not be installed when bituminous concrete overlay or joint cutout is wet or weeping. The APJ shall only be installed when the bridge superstructure surface temperature is at or below the maximum temperature specified on the Contract Plans and when the ambient air temperature is within the range of 45^0F to 95^0F. The bridge superstructure surface temperature range is determined using the thermal movement range provided on the Plans for the proposed APJ deck installation location and the selected normal or expanded use APJ product.

The superstructure surface temperature shall be determined from the average of three or more surface temperature readings taken at different locations on the interior girder surfaces by the Contractor as directed by the Engineer. Temperature measurements of the superstructure shall be taken by the contractor with a calibrated handheld digital infrared laser-sighted thermometer on the surfaces of an interior steel girder, or interior concrete girder protected from direct sunlight. The infrared thermometer to be supplied by the Contractor for this purpose shall meet certification requirements of EN61326-1, EN61010-1, and EN60825-1 maintained by the European Committee for Electrotechnical Standardization (CENELEC). The thermometer shall have a minimum distance-to-spot ratio of 50:1 and shall have adjustable emissivity control. The thermometer shall have a minimum accuracy value of $\pm$1% of reading or $\pm 2^o$F, whichever is greater. The thermometer shall be used in strict accordance with the manufacturer's written directions. An additional infrared thermometer satisfying the same standards to be used in this application shall also be provided to the Engineer for quality assurance purposes

Prior to installing the APJ, the Contractor shall determine the exact location of the deck joint beneath the bituminous concrete overlay and be able to locate the joint relative to the curb, sidewalk or parapet once the finished bituminous overlay is placed.
The APJ shall be installed symmetrically about the deck joint opening (except where detailed otherwise on the Plans) to the dimensions shown on the Plans or as directed by the Engineer. The proposed saw cut lines shall be marked on the bituminous concrete overlay by the Contractor and approved by the Engineer, prior to saw-cutting. The saw-cuts delineating the edges of the APJ shall extend full depth of the bituminous concrete overlay.

The existing bituminous concrete overlay, waterproofing membrane and/or existing expansion joint material, within the saw cut limits shall be removed and disposed of by the Contractor to create the joint cutout.

Concrete surfaces that will support the bridging plates shall be smooth and form a plane along and across the deck joint. Rough or damaged concrete surfaces shall be repaired with a leveling compound meeting the requirements of this specification. Deteriorated concrete areas within the joint limits shall be repaired as directed by the Engineer. The Contractor will be compensated for such repairs under the applicable concrete deck repair items in the Contract. The existing and repaired concrete surfaces shall provide continuous uniform support for the bridging plate and prevent the plate from rocking and deflecting.

Prior to the installation of the bridge joint, all horizontal and vertical surfaces of the joint cutout shall be abrasive blast cleaned using an oil-free, compressed air supply. The entire cutout shall then be cleared of all loose blast media, dust, debris and moisture using an oil-free, hot air lance capable of producing an air stream at 3,000ºF with a velocity of 3,000 feet per second. The hot air lance shall not be used to boil off or dry water weeping from the bituminous concrete overlay within the joint cutout. If this situation occurs, the weeping water shall be allowed to drain and dry naturally.

When an open joint is present below the proposed asphaltic plug joint, a single backer rod, with a diameter at least 25% greater than the existing joint opening at the time of installation or a foam-supported preformed joint seal, as shown on the Plans shall be installed. The seal shall be placed at a depth of 3/4 inch below the bridging plate in the existing deck joint opening between the concrete edges. The preformed joint seal shall be made continuous as it extends into the curb, sidewalk or parapet.

Asphaltic binder shall be heated to a temperature within the manufacturer's recommended application temperature range which shall be provided in the Quality Control Plan. During application, the temperature of the binder shall be maintained within this range. In no case shall the temperature of the binder go below 350º F nor exceed the manufacturer's recommended maximum heating temperature.

Asphaltic binder shall then be poured into the joint opening until it completely fills the gap above the preformed joint seal or backer rod. A thin layer of binder shall next be applied to all horizontal and vertical surfaces of the joint cutout. When preformed joint seals are used the manufacture shall be consulted on how to treat/protect the preformed joint seals from the asphaltic binder if required.

Bridging plates shall be abrasive blast-cleaned on-site prior to installation and then placed over the deck joint opening in the joint cutout. The plates shall be aligned over the joint opening as shown on the Plans. The plates shall be placed end to end, without overlap, such that the gap between plates does not exceed ¼". The plates shall extend to the gutter line and be cut to match the joint's skew angle, where concrete support exists on both sides of the joint. Within APJ installation limits, where concrete support does not exist at both sides of the joint opening (such as where a bridge deck end abuts a bituminous concrete roadway shoulder), bridging plates shall not be installed. Installed bridging plates shall not rock or deflect in any way. After installation of bridging plates, a thin layer of asphaltic binder shall be applied to all exposed surfaces of the plates.

The remainder of the joint cutout shall then be filled with a mixture of hot asphaltic binder and aggregate prepared in accordance with the submitted Quality Control Plan and the following requirements:

- The aggregate shall be heated in a vented, rotating drum mixer by the use of a hot-compressed air lance to a temperature of between 370° F. to 380° F. This drum mixer shall be dedicated solely for the heating and, if necessary, supplemental cleaning of the aggregate. Venting of the gas and loose dust particles shall be accomplished through ¼" drilled holes spaced no more than 3" on center in any direction along the entire outside surface of the drum

- Once the aggregate has been heated, it shall then be transferred to a secondary drum mixer where it shall be fully coated with asphaltic binder. A minimum of two gallons of binder per 100lbs of stone is required.
- The temperature of the aggregate and binder shall be monitored by the contractor with a calibrated digital infrared thermometer.
- The coated aggregate shall be loosely placed in the joint cutout in lifts not to exceed 2 inches.
- Each lift shall be leveled, compacted and then flooded with hot asphaltic binder to the level of the aggregate to fill all voids in the coated aggregate layer. The surface of each lift shall be flooded until only the tips of the aggregate protrude out of the surface.
- The final lift shall be placed such that no stones shall project above the level of the adjacent overlay surface following compaction of the coated aggregate.
- Following installation of the final lift, sufficient time and material shall be provided to allow all voids in the mixture to fill. This step may be repeated as needed.
- The joint shall then be top-dressed by heating the entire area with a hot-compressed air lance and applying binder. The final joint surface must be smooth with no protruding stones and be absent of voids.
- Once top-dressed, the joint shall have an anti-tack material spread evenly over the entire surface to prevent tracking.

The Contractor shall be responsible for removing all binder material that leaks through the joint and is deposited on any bridge component, including underside of decks, headers, beams, diaphragms, bearings, abutments and piers.

Traffic shall not be permitted over the joint until it has cooled to 130º F when measured with a digital infrared thermometer. Use of water to cool the completed joint is permitted.

Sidewalk, parapet, and/or curb joint openings

Before placement of any sealing materials in parapets, curbs, or sidewalks, the joints shall be thoroughly cleaned of all scale, loose concrete, dirt, dust, or other foreign matter by abrasive blast cleaning. Residual dust and moisture shall then be removed by blasting with oil free compressed air using a hot air lance. Projections of concrete into the joint space shall also be removed. The backer rod or preformed joint seal shall be installed in the joint as shown on the Plans. The joint shall be clean and dry before the joint seal or silicone joint sealant is applied. Under no circumstances is the binder material to be used as a substitute for the joint sealant.

Whenever abrasive blast cleaning is performed under this specification, the Contractor shall take adequate measures to ensure that the abrasive blast cleaning will not cause damage to adjacent traffic or other facilities.

Where silicone joint sealant is shown on the plans, the sealant shall be prepared and placed in accordance with the manufacturer's instructions and with the equipment prescribed by the

manufacturer. Extreme care shall be taken to ensure that the sealant is placed in accordance with the manufacturer's recommended thickness requirements.

The joint sealant shall be tooled, if required, in accordance with the manufacturer's instructions.

Primer, if required, shall be supplied by the sealant manufacturer and applied in accordance with the manufacturer's instructions.

When the sealing operations are completed, the joints shall be effectively sealed against infiltration of water. Any sealant which does not effectively seal against water shall be removed and replaced at the Contractor's expense.

Any installed joint that exhibits evidence of failure, as determined by the Engineer, such as debonding, cracking, rutting, or shoving of the APJ mixture shall be removed and replaced full-width and full–depth to a length determined by the Engineer at no additional cost to the State.

Method of Measurement: This work will be measured for payment by the number of cubic feet of "Asphaltic Plug Expansion Joint System" installed and accepted within approved horizontal limits. No additional measurement will be made for furnishing and installing backer rod and joint sealant in the parapets, concrete medians, curbs and/or sidewalks. Where Plans show a preformed joint seal below the asphaltic plug joint and in the curb, sidewalk or parapet, the seal will be measured for payment under a separate item.

Basis of Payment: This work will be paid for at the contract unit price per cubic foot for "Asphaltic Plug Expansion Joint System," complete in place, which price shall include the saw-cutting, removal and disposal of bituminous concrete, membrane waterproofing, existing joint components and sealing elements, the furnishing and placement of the leveling compound, cleaning of the joint surfaces, furnishing and installing bridging plates, the furnishing and installing of the asphaltic plug joint mixture, the cost of furnishing and installing joint sealant in the parapets, concrete medians, curbs and sidewalks, and all other materials, equipment including, but not limited to, portable lighting, tools, and labor incidental thereto. No additional payment shall be made for the 12" wide bridging plates that are required for deck joint openings with widths in excess of 3".

If directed by the Engineer, additional deck repairs will be addressed and paid for under the applicable concrete deck repair items in the Contract.

ITEM #0520041A - PREFORMED JOINT SEAL

Description: Work under this item consists of furnishing and installing a preformed joint seal as shown on the plans. Work also includes a pre-installation survey to measure the pavement depth at all locations where the joint meets the curb.

Materials: One of the following Preformed Joint Seals specified on the plans shall be supplied:

V-Shaped Silicone Seals:

1. Silicoflex:
   RJ Watson, Inc.
   11035 Walden Ave
   Alden, New York 14004
   Tel: (716) 901-7020
   Website: http://www.rjwatson.com

2. V-Seal:
   D.S. Brown Company
   300 East Cherry Street
   North Baltimore, Ohio 45872
   Tel: (419) 257-3561
   Website: http://www.dsbrown.com

Foam-Supported Silicone Seals:

3. Bridge Expansion Joint System (B.E.J.S.):
   EMSEAL Joint Systems Ltd.
   25 Bridle Lane,
   Westborough, MA 01581
   Tel: (508) 836-0280
   Website: http://www.emseal.com

4. Wabo FS Bridge Seal
   Watson Bowman Acme Corp.
   95 Pineview Drive
   Amherst, NY 14228
   Tel: (716) 691-9239
   Website: https://wbacorp.com/products/bridge-highway/joint-seals/wabofsbridge/

When foam-supported silicone joint seals are the only type allowed on the plans (such as at bridge joints that extend through sidewalks), the City of Meriden will consider products from other foam-supported silicone joint manufacturers, if the products have been installed by another State Department of Transportation, are functioning successfully in a similar climate to Connecticut's for at least one year, and are deemed by

the City of Meriden to be suitable for use in the specific application for which the Contractor is requesting. To be considered, the Contractor shall submit documentation indicating the product name, manufacturer, the contact information for a Department of Transportation official who can confirm the successful installation and continued success of the product, the date of installation and the nature of the installation, including thermal movement range and skew of the installed joint.

A Materials Certificate for all components of the selected preformed joint seal shall be submitted by the Contractor in accordance with the requirements of Article 1.06.07

Construction Methods: All work at each joint location shall be accomplished in accordance with "Maintenance and Protection of Traffic" and "Prosecution and Progress."

Submittals:
Prior to ordering preformed joint seals, and prior to forming block-outs for the preformed joint seals in the headers, the Contractor shall submit the following to the Engineer:

- The Manufacturer and product information of the selected joint system;
- Material safety data sheets (MSDS) and technical product information;
- Name and credentials of a qualified technical representative supplied by the manufacturer and acceptable to the Engineer. This person shall be available to provide assistance at the beginning of the work and be available to provide training and guidance throughout the project.
- A detailed, step-by-step installation procedure, including surface preparation, splicing of the preformed joint seal, and a list of the specific equipment to be used for the installation.

Installation: The technical representative of the accepted joint system shall be notified of the scheduled installation a minimum of 2 weeks in advance and be present to provide direction and assistance for the first joint installation and succeeding joint installations until the Contractor becomes proficient in the work and to the satisfaction of the Engineer.

The minimum ambient temperature for installing any of the qualified, preformed joint seals is 40°F and rising. When the manufacturer's requirement for minimum installation temperature is greater than 40°F, the manufacturer's requirement will govern.

All concrete surfaces to which sealing glands will be bonded shall be prepared in accordance with International Concrete Repair Institute (ICRI) concrete surface profile standards. The minimum acceptable surface profile is CSP2 (grinding), but CSP3 (light abrasive blast) is preferred. Any discontinuities or sharp projections into the plane of the joint shall be ground smooth prior to blasting. Whenever abrasive blast cleaning is performed, the Contractor shall take adequate measures to ensure that the abrasive blast cleaning will not cause damage to adjacent traffic or other facilities. Traffic will not be allowed to pass over the joint after blasting has occurred.

Following blasting, the joint surfaces shall be wiped down or blown clean as recommended by the manufacturer.

The joint surfaces shall be completely dry before installing any of the components of the selected joint seal. The selected joint seal shall not be installed immediately after precipitation or if precipitation is forecast. Joint preparation and installation of the selected preformed joint seal must be done during the same day.

The selected joint sealing system shall be installed continuously with no field splices in the preformed seal in the roadway section, unless field splices are allowed by the manufacturer of the selected preformed joint seal. In no case shall field splices of the preformed joint seal be allowed in a wheel path or within the roadway shoulder. When splices cannot be avoided due to traffic constraints, the splice shall be at a painted lane line.

After the joint seal has been installed, water shall not be able to penetrate the joint. Any joint seal that does not effectively seal against water shall be removed and replaced at the Contractor's expense.

Method of Measurement: This work will be measured for payment by the number of linear feet of preformed joint sealing system installed and accepted. The measurement will be made along the centerline of the joint at the top surface of header, curb, sidewalk and parapet.

Basis of Payment: This work will be paid for at the Contract unit price per linear foot for "Preformed Joint Seal," complete in place, including all materials, equipment, tools, and labor incidental thereto.

The Contract unit price shall include the cost of assistance from a technical representative of the selected joint system.

Pay Item	Pay Unit
Preformed Joint Seal	l.f.

ITEM #0521021A - STEEL-LAMINATED ELASTOMERIC BEARINGS

Description: Work under this item shall consist of furnishing and installing steel-laminated elastomeric bearings as shown on the plan, as directed by the Engineer and in accordance with these specifications.

Materials:

1. Elastomer: The elastomer shall be Grade 3 Virgin Neoprene (polychloroprene) with Shore "A" Durometer hardness as shown on the plans and conforming to the requirements of the AASHTO LRFD Bridge Construction Specifications (4th Edition).

2. Steel Laminae: The internal steel laminae shall be mild rolled steel conforming to ASTM A1011, Grade 36 or higher, A36, or an approved equal. Laminae shall be sandblasted and cleaned of all surface coatings, rust and mill scale before bonding and shall be free of sharp edges and burrs. Steel laminae shall develop minimum peel strength of 473 lb/ft when tested in accordance with ASTM D429 Method B.

3. External Top Plates: The external top plates shall conform to AASHTO M270 and to the requirements shown on the plans. Bonding surface of the external top plates shall be abrasive blast cleaned prior to being hot bonded to the bearing during vulcanization. Adhesive bonding of the top plate surface to the elastomer is not allowed.

4. Anchor Rods: The swedged anchor rods shall conform to ASTM F1554 Grade 105.

5. Nuts, Bolts, Flat Washers, and Beveled Washers: High strength bolts shall be as designated on the Contract Plans. Nuts and washers shall meet the requirements of Section M.06.02.3 of the standard specifications.

6. Fabrication and Fabrication Tolerances: The fabrication and fabrication tolerances of elastomeric bearings shall conform to the requirements of the AASHTO LRFD Bridge Construction Specifications (4th Edition).

If guide pins or other devices are used to control the side cover over the steel laminae, any exposed portions of the steel laminae shall be sealed by vulcanized patching.

7. Testing: The materials for the elastomeric bearing and the finished bearings themselves shall be subjected to testing. The testing shall conform to the requirements of the AASHTO LRFD Bridge Construction Specifications (4th Edition).

Test bearings, in addition to the bearings shown on the plans, shall be furnished for each type (size and thickness) of bearing for destructive testing. The test bearings shall be furnished without external top plates.

8. Marking: Each steel-laminated elastomeric bearing shall have marked on it, with indelible ink, the following: the manufacturer's identification code or symbol, and the month and year of manufacture, the orientation, order number, lot number, bearing identification number, and elastomer type and grade (Neoprene, Grade 3). The markings should be placed on a side of the bearing that is visible after installation.

9. Certification: The Contractor shall furnish a Certified Test Report, confirming that the elastomeric bearings satisfy the requirements of these specifications, in conformance with the requirements set forth in Article 1.06.07.

10. Adhesive: The adhesive, for bonding the shims, shall be a long lasting, high strength, cold applied, air cured, water and heat resistant material specifically formulated for bonding neoprene and shall meet the following requirements:

Property	Requirement	ASTM Test Procedure
Adhesion	30 lbf/in	D429, Method B
Hardness	50 + 5 Shore A points	D2240
Tensile Strength, min	1800 psi	D412
Elongation before breaking, min.	750 %	D412

11. Paint: The steel top plates shall be metallized. The coating system shall conform to the requirements of "Metallizing Structural Steel (Site No. 1)" within these specifications, or as approved by the Engineer. The same coating material manufacturer shall furnish all materials for the complete coating system. Top plates must be metallized after vulcanization. The elastomer shall be shielded during blast cleaning, metallizing, and painting.

The final color of the top coat shall be as noted on the plans.

Construction Methods:

Shop Drawings: Before fabricating any materials, the Contractor shall submit shop drawings to the Engineer, for review and approval, in accordance with Subarticle 1.05.02-3. These drawings shall include but shall not be limited to the following information: manufacturer's name, complete details of the bearings, material designations, nominal hardness of the elastomer, the quantity of bearings required, including test bearings, and the location of the bearing identification.

In lieu of the low temperature crystallization test for each lot of bearings and shear modulus test for each batch of material, the manufacturer may provide certificates from tests performed on identical formulations within the preceding year.

Fabrication: The bearing shall be cast as a unit in a mold and shall be bonded and vulcanized under heat and pressure. The mold finish shall conform to standard shop practice.

Fabrication tolerances shall conform to AASHTO LRFD Bridge Construction Specifications (3rd Edition) with 2010 and 2011 Interim Revisions. Flash tolerance, finish and appearance shall meet the requirements of the latest edition of the Rubber Handbook, published by the Rubber Manufacturer's Association, Inc., RMA F3 and T.063.

Every bearing shall be visually inspected for compliance with dimensional tolerance and for overall quality of manufacture. Buffing, cutting, or other attempt to alter the size of the bearings, for the purpose of meeting the tolerances stated herein will not be permitted.

Adhesive bonding of the elastomeric bearings to steel and concrete surfaces is not permitted.

Each elastomeric bearing pad shall have embossed on it the following: the word "CONN", project number, manufacturer's identification code or symbol, and the month and year of manufacture. The bearing shall also have stenciled on it, with indelible ink, the lot number, bridge number, and the bearing number. The marking shall be placed on a side of the bearing that is visible after installation.

For structures requiring less than fifty pads, one test pad shall be furnished. For structures requiring more than fifty pads, one test pad shall be furnished for each additional fifty pads or part thereof. If there are two or more types of pads in one structure, and only one test pad is required, the pad will be furnished for the type of which there are the greater numbers. All test pads shall be furnished without charge.

The same firm shall manufacture all of the elastomeric bearing pads to be installed on a structure.

The manufacturer shall furnish facilities for the test and inspection for the completed bearing in its plant or at the independent test facility and the inspectors shall be allowed free access to the manufacturer's plant and test facility.

Short-Duration Compression Test: Each bearing shall be tested as follows for a Short-Duration Compression Test:
1. The Bearing shall be loaded in compression to 1.5 times the design load shown on the plans. The load shall be held constant for 5 minutes, removed and reapplied for another 5 minutes.
2. The bearing shall be carefully examined while under the second loading.
3. If the bulging pattern indicates lamina parallelism of layer thickness outside of specified tolerance, or poor lamina bond, the bearing shall be rejected. If there are three or more separate surface cracks greater than 1/16" wide and 1/16" deep, the bearing shall be rejected.

A Certified Test Report in accordance with Section 1.06.07 of the Standard Specifications shall be required for the specified test on the elastomer and for the specified short duration tests.

Installation: Bearing areas of the masonry upon which the elastomeric bearing pads are to be placed shall be cleaned of all debris. Bearing areas shall be carefully finished, by grinding if necessary, to a smooth, even, level surface of the required elevation, and shall show no variations from a true plane greater than 1/16 inch over the entire area upon which the elastomeric bearing pads are to rest.

There shall be full contact and uniform bearing between the elastomeric bearing pad and the concrete seat after application of full dead load. Also, after application of full dead load, there shall be uniform deflection of the elastomeric bearing pad.

The elastomeric bearings shall be installed as shown on the plans. The elastomeric bearings shall be installed when the ambient air temperature is between 50°F to 77°F and has been within this range for at least 2 hours.

Welding with the elastomeric bearings in place will not be permitted unless there is more than 1½ inches of steel between the weld and the elastomer. Welding shall conform to the requirements of Subarticle 6.03.03-4(e). In no case shall the temperature of the steel plate adjacent to the elastomer or the vulcanized bond be subjected or exposed to temperatures greater than 250°F.

Assembly with high strength bolts shall conform to the requirements of Article 6.03.03-4(f).

Method of Measurement: This work will be measured by the volume of elastomeric bearings in cubic inches fabricated, furnished, installed and accepted. No allowance shall be made for test bearings.

Basis of Payment: This work will be paid for at the contract unit price per cubic inch of "Steel-Laminated Elastomeric Bearings," complete in place, which price shall include all vulcanized external top plates, high strength bolts, connection plates, cap screws, anchor rods, metallizing, silicone sealant, test bearings and all materials, testing, equipment, tools and labor incidental thereto.

Pay Item	Pay Unit
Steel-Laminated Elastomeric Bearings	C.I.

ITEM #0601054A - ULTRA HIGH PERFORMANCE CONCRETE

Description: Work under this item shall consist of all materials, tools, equipment and labor necessary for the performance of all work to transport, mix, form, place, cure, grind and test Ultra-High Performance Concrete (UHPC) where required per plans.

Materials: The materials for this work shall be as follows:
Ultra High Performance Concrete (UHPC): **Use a self-leveling, self-consolidating cementitious UHPC. Ensure all components of the UHPC mixture are supplied by a single material manufacturer, with a minimum of 5 years' experience in manufacturing and the commercial supply of UHPC.** The UHPC shall be mixed on Site from pre-packaged components, pre-proportioned by the UHPC Supplier.

Components: The following materials shall be as recommended by the UHPC Supplier:
(a) Fine Aggregate
(b) Cementitious Material and any replacement materials, such as silica fume
(c) Steel Fibers (must be in accordance with Article 1.06.01 – Buy America)
(d) Liquid Admixtures (such as super plasticizers or accelerators)

Water: Water for mixing shall meet the requirements of M.03.01-4 and the temperature at mixing shall be per UHPC Supplier recommendations for use in the UHPC mix.

Mix Design: The Contractor shall submit a mix design that meets the following criteria:

Table 1: UHPC Material Properties (after 28 days or as noted)

Description	Test Method	Acceptance Criteria
Compressive Strength	ASTM C39 (as modified by ASTM C1856)	≥ 14 ksi at 4 days ≥ 20 ksi at 28 days
Direct Tension 1st Cracking Stress	AASHTO T 397	$f_{t,cr}$ > 750 psi
Localization Strain	AASHTO T 397	$\varepsilon_{t,loc}$ > 0.0025
Shrinkage	ASTM C157 (as modified by ASTM C1856, initial reading after set)	≤ 800 micro-strain
Chloride Ion Penetrability	ASTM C1202 (without steel fibers)	≤ 250 coulombs
Freeze-Thaw Resistance	ASTM C666 Procedure A (300 cycles)	Relative Dynamic Modulus of Elasticity, RDM > 95%
Flow	ASTM C1437 (as modified by ASTM C1856)	7 to 10 inches

Packaging: The fine aggregate and cementitious material must be premixed and proportioned in bags or supersacks, in accordance with the approved mix design, and shall be identified by batch or lot number.

Steel fibers shall be made of high-carbon steel with minimum tensile strength of 290,000 psi. The steel fibers shall have a minimum diameter of 0.008 inches and a length of 0.5 inches. Ensure that minimum steel fiber content is 2% by volume of premix. Ensure that the UHPC is gray in color to match the color of adjacent deck concrete.

Water shall be potable and free from foreign materials in amounts harmful to concrete and embedded steel.

Construction Methods:

1. **Contractor Submittals:**
   - **(a)** Mix Design, including proportions of each component, water-to-dry mix material ratio, mixing time, set time, compressive strength properties of the mix at ages of 2, 4, 7, 14, and 28 days, and Certified Test Reports addressing the material properties in Table 1, shall be submitted to the Engineer for approval at least 90 days in advance of the first UHPC placement.
   - **(b)** UHPC Supplier and Technical Representatives: The Contractor shall obtain the services of a Supplier experienced in designing, mixing, placing, curing and testing of UHPC. Technical representatives shall be certified or recognized by the UHPC Supplier in the mixing, and placing of UHPC in similar installations. The Supplier and Technical Representatives submittal shall be submitted to the Engineer for approval at least 90 days in advance of the first UHPC placement and shall include the following:
     - i. Name and location of Supplier.
     - ii. Name of UHPC product and a list of bridge projects it was utilized on. For each bridge listed, provide a location, description of how UHPC was used, date of completion of work, the project owner's name, and the name, title and current contact information of a project owner representative.
     - iii. Identification of the potential Technical Representatives (minimum two).
     - iv. UHPC Supplier documentation that the Technical Representatives are qualified to oversee the UHPC operations.
     - v. Work experience of the Technical Representatives: For each Technical Representative, submit a list of projects they attended that included UHPC mixing and placing operations. For each project, provide a location, description, date of completion of work, the project owner's name, and contact information of a project owner representative.
   - **(c)** Construction Work Plan: The Contractor shall submit a Construction Work Plan to the Engineer for review and comment at least 90 days in advance of the first UHPC placement, which shall include the following elements:
     - i. Formwork
       1. Proposed formwork materials
       2. Procedure for installing, sealing and maintaining watertight formwork

3. Procedure and schedule for installing top forms, chimneys and head pails
4. Planned bulkhead locations
5. Removal of formwork including tools and access to underside of deck

ii. Surface preparation
1. Procedure to confirm precast concrete surfaces to be in contact with the UHPC are roughened and have exposed aggregate finish with average amplitude of 1/4 inch (at the precast plant or upon delivery to the Site)
2. Procedures, including source of water, for ensuring saturated surface dry (SSD) connection interfaces prior to UHPC placement

iii. Mixing
1. Storage plan for UHPC components
2. Mixers and mixing setup including the type and number of mixers, mixing location, water source, and contingency plan if a mixer malfunctions
3. Description of equipment for weighing UHPC components
4. Procedure for controlling UHPC mix temperatures including methods of storing ice
5. Sample batch identification sheet to be used during UHPC production

iv. Placement
1. Placement sequence and schedule including all planned bulkheads
2. Equipment for transportation and placement of UHPC
3. Contingency plan if placement operations are interrupted by weather, equipment malfunctions or other issues

v. Protection and Curing
1. Procedure to protect joints from live loads during curing
2. Cold weather casting plan, if required

vi. Grinding
1. Proposed equipment
2. Method of collecting and disposing of debris

vii. Trial placement plan, outlining procedures to be followed and a dimensioned drawing showing the proposed UHPC placement of a representative joint

(d) Contractor Quality Control:

i. Quality Control Plan, including equipment list, testing setup, the specific load machine and equipment that will be used for cylinder preparation and testing, sampling methods, frequency and types of tests at least 90 days in advance of the first placement of UHPC.

ii. The proposed format for test reporting (or an example test report) shall be provided for the Engineer's review and comment at least 90 days in advance of the first placement of UHPC.

iii. The name and location of the Contractor's proposed AASHTO accredited testing laboratory shall be provided to the Engineer at least 90 days in advance of the first placement of UHPC. The laboratory must be accredited for ASTM C1856-C39 to test for UHPC compressive strength and must have equipment capable of preparing UHPC specimens for testing in accordance with ASTM C1856. UHPC cylinders require end grinding, not capping.

iv. Reports of test results shall be provided to the Engineer within 48 hours of each test.

2. **Pre-Placement Meeting:** The Contractor shall arrange a pre-placement meeting to be held on Site after the approval of all submittals in advance of the trial placement. The meeting shall be attended by the UHPC Supplier's Technical Representatives, the Contractor's staff, any subcontractors involved in the work operation, and representatives from the Department. The objective of the meeting will be to review the Project plans, Contractor's Construction Work Plan and to review the procedures for mixing, placing, curing and testing of the UHPC, as well as the specifics of the trial placement.

3. **Trial Placement:** The Contractor shall construct a cast-in-place joint trial placement at the Site (or a location approved by the Engineer), based on Pre-Placement meeting discussions, and as recommended by the UHPC Supplier.

   The joint trial placement shall be a representation of the proposed joint and shall replicate the form pressure created by the plastic UHPC. A watertightness test shall be performed at least one week prior to placement of the UHPC, to ensure proper sealing of the formwork. The test must be reviewed and approved by the Engineer prior to trial placement of UHPC. Representatives from the Department must be onsite for trial placement and shall be notified of the casting date a minimum of 2 weeks in advance.

   Following placement and minimum 14-day cure of the UHPC, the Contractor shall cut the hardened trial placement transversely at two locations to allow for visual inspection of the joint interface and material bond. The Contractor shall make the completed joint trial placement cut sections available for review and approval by the Engineer a minimum of 28 days prior to placement of the UHPC.

   The Contractor shall perform flow tests during joint trial placement casting to develop guidelines for the duration that the plastic UHPC will remain workable. The guidelines developed shall be used during production placement. The flow tests shall be in accordance with ASTM C1437 (using modifications described in ASTM C1856) and the mix temperature shall be maintained between 50°F and 85°F as determined using ASTM C1064.

   The Contractor shall perform the following workability procedure during the casting of joint trial placement:
   (a) Take initial samples prior to the start of the discharge of plastic UHPC and perform the flow tests. Record the time of sampling and initial flow value.
   (b) Measure the UHPC and ambient temperatures.
   (c) Continue sampling at 10-minute intervals and determine the flow of each sample, until flow measure is below 4 inches.
   (d) Plot the flow versus time for the duration of the test. From the plot of flow-time curve, determine the flow time at 8 inches, which is considered the mixture cutoff time.

The Contractor shall perform a Time of Setting test of UHPC during joint trial placement in accordance with ASTM C191 (as modified by ASTM C1856).

The Contractor shall cast five sets of three, 3 inch by 6 inch cylinders, in accordance with ASTM C1856, during joint trial placement for determination of compressive strength and test them in accordance with ASTM C39 (as modified by ASTM C1856) at 2, 4, 7, 14, and 28 days. Only tests by the identified and approved AASHTO accredited testing laboratory using the approved preparation methods and equipment shall be used for the Project.

4. **Safety:** The Contractor shall make UHPC material safety data sheets (MSDS) available and shall provide a safety briefing to all on-site personnel prior to UHPC placement. Proper personal protective equipment shall be used (including but not limited to goggles, dust masks, and respirators) as recommended by the UHPC supplier and as required by the MSDS based on proximity to specific operations.

5. **Storage:** The Contractor shall assure the proper storage of dry premixed components, steel fibers and admixtures as recommended by the Supplier and the following:
   - **(a)** All dry premixed components shall be stored on raised pallets, with vapor barrier between the pallets and the ground surface to prevent moisture ingress, and shall be covered thoroughly.
   - **(b)** Steel fibers shall be stored with the same protection as the dry premixed components and rusted fibers shall not be used in mixing.
   - **(c)** Liquid admixtures shall be stored in sealed containers above freezing temperatures and shall be protected from direct sunlight.

6. **Formwork:** Formwork shall be non-absorbing, watertight and of sufficient rigidity and strength to safely support all loads imposed. The Contractor shall form the UHPC locations to be overfilled according to the Plans.

   Top forms, chimneys, and head pails shall be used, according to UHPC Supplier recommendations, to achieve the desired profile and confirm that the joint is completely full. Formwork removal shall not begin until the compressive strength has reached 12 ksi.

7. **Surface Preparation:** The Contractor shall confirm that precast concrete surfaces to be in contact with the UHPC are roughened and have exposed aggregate with an average amplitude of 1/4 inch. The Contractor shall pre-wet the precast concrete surfaces for at least 4 hours prior to placement of UHPC to confirm that a saturated surface dry (SSD) condition has been reached. During the pre-wetting operation, the Contractor shall check the formwork for leaks and shall seal any formwork that is not watertight. Just prior to placement of the UHPC, the Contractor shall air blast the joints to remove dirt, debris and standing water.

8. **Technical Representatives:** The Contractor shall arrange for two Supplier's Technical Representatives, as approved by the Engineer, to be on Site for the duration of the UHPC mixing and placement operations. One representative shall remain with the mixing operations and the other representative shall remain with the placement operations. Mixing or placement

shall not begin until the Supplier's representative(s) are on-Site and have checked in with the Engineer.

9. **Mixing:** In accordance with the approved Mix Design, the UHPC components shall be pre-weighed using a calibrated scale prior to the commencement of mixing. The Contractor shall provide a sufficient number of portable mixing units to maintain the necessary output for mixing and placement of the UHPC. At least one spare mixer shall be provided in case of mechanical failure. Mixing equipment that is not provided by the Supplier must be reviewed by the Supplier for adequacy. The Contractor shall maintain the temperature of the UHPC below 85°F during mixing. Ice may be used in lieu of an equal weight of water in the mix as recommended by the Supplier's representative. Should the ambient temperature fall below 50°F, the batching water shall be heated to maintain the mix temperature between 50 and 85°F.

10. **Placement:** In accordance with the approved placement sequence, start at the low end of the joint to allow fluid mix to fill in up-hill. Confirm that the joint is overfilled according to the plans. Add top forms as flow progresses. If the formwork exhibits evidence of leakage at any location, the Contractor shall take remedial measures necessary to stop further leakage. The UHPC shall not be internally vibrated but where 2 successive batches meet, agitate the point of intersection with a rod. Cold weather placement procedures are required when the ambient temperature falls below 50°F.

11. **Curing:** Curing and cold weather protection shall be per Supplier recommendations and the following: Cover the UHPC and keep formwork in place until the Contractor's testing confirms that it has achieved a minimum compressive strength of 12 ksi. Prevent construction or traffic live loads from traveling over the UHPC until the Contractor's testing confirms that it has achieved a minimum compressive strength of 14 ksi.

12. **Grinding:** Immediately after removal of formwork, the UHPC overfill shall be removed using grinding equipment to level the joint material with the precast concrete surface. The grinding equipment shall be equipped with an on-board wet vacuum attachment capable of removing the debris and residue from the grinding process. The Contractor shall be responsible for proper disposal of the debris.

13. **Contractor QC requirements:**
    - **(a)** Batch identification: For each batch of UHPC, record the date, start time and end time, amounts of water and ice, and admixtures used.
    - **(b)** Flow tests: The Contractor shall conduct one flow test per batch of UHPC in accordance with ASTM C1437 (as modified by ASTM C1856) to verify workability and time of setting. The flow shall be 7 to 10 inches.
    - **(c)** Mix temperature checks: The Contractor shall conduct one temperature check per batch of UHPC in accordance with ASTM C1064. The temperature of the mix at discharge shall be between 50 and 85°F.
    - **(d)** Compressive strength cylinder specimens: A minimum of 15 cylinders, 3 inches x 6 inches shall be cast for each day's production. One set (3 cylinders) shall be cast at the beginning and one set at the end of the day's production. Three intermediate sets of

cylinders shall be cast from the middle portion of the day's production.
All sets shall be cured initially in the field and shipped to the Contractor's AASHTO accredited testing lab for final curing, preparation of test specimens (note that cylinder ends must be ground parallel and flush prior to testing in accordance with ASTM C1856), and testing.

All cylinders shall be cured using the same method of curing used in the field. The temperature during curing shall be controlled to represent field conditions. The compressive strength of three cylinders shall be tested at 2, 4, 7, 14, and 28 days after casting. The compressive strength shall be measured using ASTM C39 (as modified by ASTM C1856). The minimum compressive strength shall be 14 ksi at 4 days and 20 ksi at 28 days. Failure to meet the minimum at any point requires immediate notification to the Engineer and a written corrective action plan to be submitted to the Engineer for approval.

(e) Pull out tests: The Contractor shall cast 6 cylinders 12 inches diameter and 7 1/2 inches deep. Each cylinder shall have one 32-inch-long reinforcing bar cast in the center of the circular face. The axis of the bar shall be perpendicular to the formed surface. Three (3) of the castings shall have #6 bars embedded 6 inches deep, and three (3) of the castings shall have #4 bars embedded 4 inches deep. One set of samples is required for the entire Project. These cylinders shall be kept wet for four (4) days then delivered to the Contractor's AASHTO accredited testing lab for testing using a continuous rate of loading until failure in accordance with the tensile test requirements of ASTM E488. The test shall be performed as soon as practical after the corresponding compressive strength samples reach 14 ksi. The samples pass if the bars yield without the UHPC failing and without the bars pulling out of the UHPC. Failure to meet these requirements requires immediate notification to the Engineer and a written corrective action plan to be submitted to the Engineer for approval.

(f) As-built records: The Contractor shall track and show the placement locations of UHPC production by day. A PDF copy of the records shall be submitted to the Engineer on a weekly basis.

Results of all the laboratory tests, conducted by the Contractor's AASHTO accredited testing lab, shall be submitted to the Engineer for review. Testing frequency shall be as needed to maintain control of the operation.

Method of Measurement: The volume of UHPC will be calculated in cubic yards based on the nominal dimensions shown on the plans except the UHPC material used to overfill above top of deck elevation will not be measured for payment. No volume adjustments will be made for precast tolerances, or for embedded components such as reinforcing steel or shear studs.

Basis of Payment: This work will be paid for at the Contract unit price per cubic yard for "Ultra High Performance Concrete," complete and accepted in place, which price shall include all materials, equipment, tools and labor incidental thereto.

Preparation of the mix design, trial mixes and Work Plan; transporting and mixing UHPC; formwork, testing, placing, curing and grinding, as well as the services of the Supplier's Technical Representatives shall be included in the Contract unit price.

Pay Item	Pay Unit
Ultra High Performance Concrete	c.y.

ITEM #0601088A – CONCRETE FORM LINERS

Description: Work under this item shall consist of furnishing, installing and removing concrete form liners that will be used to produce a simulated stone facing on the exposed faces of the cast-in-place concrete, wingwalls, and end blocks as shown on the plans, as directed by the Engineer and in accordance with these specifications. All form lined concrete surfaces shall be stained.

Materials: The concrete form liner shall conform to:

Pattern No. 1352 North East Dry Stack from Concrete Rock Surfaces, LLC, Bethel, Connecticut or Pattern No. 1203 "New England Dry Stack" from Custom Rock International, Inc., St. Paul, Minnesota, as distributed by Connecticut Bomanite Systems, inc., Newtown, Connecticut or approved equal.

Color Stain – Concrete Stain shall be recommended by the Engineer, but final selection of the stain will be by the Town of North Haven.

Color Stain shall be a special penetrating stain mix as provided by the manufacturer, shall achieve color variations present in then natural stone being simulated by the pattern selected for the project. The stain shall create a surface finish that is breathable (allowing water vapor transmission), and that resists deterioration from water, alkali, fungi, sunlight or weathering. The stain shall be a water borne, low V.O.C. material less than 180 grams/liter, and shall meet requirements for weathering resistance – 2000 hours accelerated exposure in accordance with the 3-bulb test of ASTM G23, scrub test – 100 revolutions, abrasion resistance (Tabor CF-10) – 500 cycles, adhesion – 1.00 mm cross cuts on glass pass 3 or higher on a scale of 1 to 5 in accordance with ASTM D3359. chemical resistance – ASTM D1308.

Form Liners – The form liners shall be reusable, made of high-strength urethane and not compress more than 3/16" when concrete is poured at a rate of 10 vertical feet per hour. All form liners for the project shall be from a single supplier.

Release Agent – The release agent shall be compatible with the form liners as recommended by the manufacturer.

Form Ties – The form ties shall be designed to separate at least 1 inch back from the finished surface, leaving only a neat hole that can be plugged with patching material. Patching material shall be Portland Cement Mortar.

Construction Methods: The Contractor shall submit the following for approval by the Engineer prior to beginning the forming operations:

Photographs - Color photographs of at least three (3) similar projects recently performed by the contractor (or his subcontractor) and at least three (3) similar projects recently produced by the manufacturer.

Form Tie Sample - A sample, description, and demonstration of the form tie the Contractor proposes to use.

Pattern Layout Drawings (3 copies) - Layout drawings shall be the plan, elevation, and details showing the overall pattern, joint locations, form tie locations, weep-hole locations, and any other special considerations. These drawings shall maximize re-use of form liners and minimize cutting of form liners and shall be approved prior to installation of the form liners.

Concrete Facing Test Panel - At least 30 days prior to placing structural concrete requiring form liners, a concrete test panel shall be built on-site, using the same materials and methods of work force that will be used for the project. Location of the test panel shall be approved by the Engineer and the concrete test panel shall conform to the following:

1. The size of the test panel shall be 50 square feet, or larger if needed to adequately illustrate the pattern selected.

2. The test pattern shall contain an area demonstrating stone masonry butt joint and the continuation of the pattern through an expansion joint.

3. The test panel shall include staining as may be required for the selected pattern.

4. Upon completion of the Test Panel, the Engineer along with a representative of the Town of North Haven shall review the constructed test panel for the form liner pattern, stain used and the overall aesthetics and provide approval of the pattern and the stain to the Contractor before the form liner is used for the construction of the wingwalls and the end blocks.

5. The test panel shall be removed when it is no longer needed, to the satisfaction of the Engineer.

General: The manufacturer of the simulated stone form liners and custom coloring systems shall demonstrate at least three (3) years of experience making custom simulated stone form liners and color stains to create formed concrete surfaces to match natural stone shapes, surface textures and colors. Evidence and color pictures of projects actually constructed over the last three years shall be submitted prior to approval.

The contractor or subcontractor who is to install the form liners and perform the work shall demonstrate at least three (3) years of experience placing vertically formed architectural concrete, including training in the manufacturer's special techniques as may be required in achieving realistic surfaces.

An authorized representative from both the form liner manufacturer and the color stain manufacturer (if floor stain is used) shall be present at the site for installation of the facing test panel and during placing of all structural concrete utilizing form liners.

Prior to initiating any work, a meeting shall be scheduled by the contractor to assure full understanding of the work by all parties involved to coordinate the work. Included for attendance shall be the manufacturer's authorized representatives, the Contractor, the subcontractor (installer), and the Engineer.

All work associated with the process of form lining, texturing and color staining of the hardened concrete shall be performed in strict accordance with the manufacturer's recommendations and as approved by the Engineer.

The contractor shall:

- provide, cut and install the form liners in accordance with the approved pattern drawings for each structural component
- provide and apply manufacturer's release agent
- hand carve top exposed texture surfaces (as applicable)
- remove form liner after concrete is sufficiently set to avoid damage
- patch, grind or brush hammer form liner seams as required
- power wash hardened concrete just prior to staining
- power wash and patch form liners as may be required before re-use

Form Liners: Design and pattern of the form lined concrete surfaces shall follow the manufacturer's standard drawing and the approved pattern layout drawings. The completed color and formed concrete surfaces shall match the pattern, color and texture of the approved test panel and shall accurately simulate the appearance of real stone, demonstrating the colors that may be apparent due to aging, rusting, and staining from oxidation, soil and/or vegetation.

All form liners shall be placed such that there is less than ¼" separation between form liners. Form liners shall be securely attached to the forms with wood or sheet metal screws, securely bolted through the forms with bolts secured into threaded inserts in the back of the form liners, or securely bolted through the form liner and forming system with flat head bolts inserted in a pattern joint, all according to manufacturer's recommendations for the pattern and form liner used. Construction adhesives maybe used but not on re-usable form liners.

Release of Form Liners: Only manufacturer recommended form release agents shall be utilized and shall be applied to the form liners before the concrete is placed. Release agents shall be applied in strict accordance with release agent manufacturer recommendations. Hand-charged sprayers will only be allowed if a thin uniform coating of release agent is obtained on the form liner.

Form liners shall be removed from the wall within 24 hours of placing the concrete. The form liners may be detached from the forms and then removed from the concrete or they may remain attached to the forms and the entire forming system removed from the concrete. Remove the form liners from the top, down. Curing of concrete may be accomplished with form liners and forms placed back against the wall after the initial detachment. **Curing compounds shall not be used,** as they are incompatible with the color staining material.

Care & Cleaning of Form Liners: Form liners shall be cleaned the same day they are removed from the wall with a power wash and mild detergent. Synthetic brushed with stiff bristles may be used on stubborn areas. Mild acid washes may also be used. **Solvents shall not be used.** If necessary, patching of holes shall be performed with 100% clear silicone caulk. Form liners shall be stored inside or under a protective, non-transparent cover in a vertical position.

Wall Patching and Preparation: After form liners are removed from the hardened concrete, the textured uncolored surface shall be prepared for color staining. All holes greater than 3/8" in greatest principal dimension shall be filled with concrete patching material such as Tamms Speed- crete (or equal) mixed with latex or acrylic bonder, as approved by the manufacturer and Engineer. All honeycombed areas shall be filled and textured to match surrounding areas. Seam lines and other unnatural protrusions shall be ground down to match adjacent areas with a hand-heldpower grinder

using discs made for concrete. Grinding of seams shall be performed immediately after removal of the form liners. Perform final bush hammering to blend defects and ground areas into the final rock texture. In particular, the process of wall patching and preparation shall be subject to approval of the manufacturer and Engineer.

Color Staining: All color staining shall be performed by the manufacturer, or his authorized representative, and the hardened concrete shall be a minimum of 30 days old before color staining is applied. The Contractor shall power wash the wall to free it from laitance, dirt, oil and other objectionable materials. After the wall had dried, the color staining process is applied using colors approved by the Engineer. Color staining shall be applied in such a way that the stones shall have individual colorations form one to the other. Water-based stains shall be used in air temperatures ranging from 50 degrees F to 100 degrees F. Solvent-based stains shall be used in air temperatures of 50 degrees F and below, but in no case when the temperature of the hardened concrete is 40 degrees and falling.

All staining work shall be scheduled after adjacent earth work is completed to avoid contamination or damaging the surface. Top soil, riprap, backfill, etc. shall be placed after staining is complete and approved.

06.01.04 – Method of Measurement: The portion of the work covered under this special provision and associated with construction of textured and colored formed concrete surfaces using simulated stone form liners and a color stain system, shall be measured for payment by the actual number of square feet of concrete patterned on cast-in-place concrete surfaces.

Method of Measurement: This work will be measured for payment by the number of square feet of surface area formed to produce a simulated stone facing within the limits as shown on the plans.

Basis of Payment: This work will be paid for at the contract unit price per square foot for "Concrete Form Liners" which price shall include all materials, equipment, tools and labor incidental to the form liner work.

Pay Item	Pay Unit
Concrete Form Liners	s.f.

ITEM #0602865A - #5 MECHANICAL COUPLERS

ITEM #0602867A - #6 MECHANICAL COUPLERS

ITEM #0602869A - #8 MECHANICAL COUPLERS

ITEM #0602872A - #11 MECHANICAL COUPLERS

Work under this item shall comply with Section 6.02 of the Standard Specifications, modified as follows:

Article 6.02.03 – Construction Methods: Add the following to section 5 – Splicing of Bars:

Reinforcing steel shall be spliced using galvanized mechanical couplers, where noted on the Contract plans. Mechanical couplers shall be internally threaded butt splice type and shall be installed in accordance with the manufacturer's recommendations. The outside diameter of mechanical couplers shall be limited to 2.5 times the diameter of the largest bar being joined by the coupler. Set screws, if any, shall be installed with the screw's alignment away from the face of concrete in areas where required concrete cover would otherwise be reduced.

Article 6.02.04 – Method of Measurement: Add the following:
This work will be measured for payment by the number of mechanical couplers, of the type specified, installed and accepted at the required locations.

Article 6.02.05 - Basis of Payment: Add the following:

Work under this item shall be paid for at the contract unit price each for "#5 Mechanical Couplers", "#6 Mechanical Couplers", "#8 Mechanical Couplers", "#11 Mechanical Couplers", which price shall include furnishing and installing mechanical couplers and all materials, equipment, tools and labor incidental thereto. All mechanical couplers shall be galvanized.

Pay Item	Pay Unit
#5 Mechanical Couplers	ea.
#6 Mechanical Couplers	ea.
#8 Mechanical Couplers	ea.
#11 Mechanical Couplers	ea.

ITEM #0603474A - METALLIZING STRUCTURAL STEEL (SITE NO. 1)

Description: Work under this item shall consist of the surface preparation, shop application of a thermal spray (metallizing) coating, shop application of a sealer and topcoat, and field painting and touch-up painting operations of new structural steel, as shown on the plans, or as directed by the Engineer.

Materials: Only one metallizing supplier and one sealer and topcoat manufacturer may be used for the Project including material supplied for field painting and touch-up painting operations.

Abrasives:
Abrasives shall conform to the following:

1. SSPC AB 1 for mineral slag abrasives
2. SSPC AB 2 for recycled ferrous metal abrasives
3. SSPC AB 3 for new steel abrasives

Thermal Spray Coating (TSC) Materials: The thermal spray coating (TSC) wire feedstock material used for metallizing must be 85%/15% (Zn/Al alloy) and meet the Chemical Composition requirements stated in Table 2 of AWS C2.25, classification W-ZnAl-2. The Contractor shall provide a Certified Test Report (CTR) in accordance with 1.06.07 for the feedstock from the feedstock supplier.

Sealer and Topcoat: The Contractor shall select one of the following semi-gloss topcoats of the color shown on the plans from the list below:

AkzoNobel: International *Interthane 870UHS*
Carboline: Carbothane *133 LV*
Sherwin Williams: Hi-*Solids Polyurethane 250*
or approved equal

The Contractor shall select a sealer compatible with the topcoat chosen. The sealer shall be capable of penetrating into the body of the TSC to seal the interconnected surface porosity as defined in AWS C2.18-93R.

The sealer and topcoats shall be packaged and sealed, in the original container with labeling bearing the manufacturer's name, type of material, brand name, shelf life, batch number, and instructions for mixing and thinning. The topcoat shall meet the color and gloss retention performance criteria of SSPC Paint 36, Level 3, for accelerated weathering. The Contractor shall provide Materials Certificates in accordance with 1.06.07.

Caulking Materials: Caulking shall be as recommended by the coating manufacturer.

Construction Methods: The Contractor shall implement procedures that comply with this specification. If a state or local regulation is more restrictive than the requirements of this specification, the more restrictive requirements shall prevail. The Contractor must comply with all local OSHA and EPA standards and regulations, even if the regulation or standard is not specifically referenced herein.

The complete coating system shall be shop-applied except for surfaces that are otherwise listed on the plans or otherwise noted in this specification. Such surfaces shall be coated only after all members are erected, bolts are fully tensioned, and temporary deck formwork is removed. The tops of bridge girder top flanges shall be primer coated only and shall not be metallized or sealed.

Metallizing Contractor Worker Qualifications: The Metallizing Contractor shall be certified by the SSPC Painting Contractor Certification Program QP-6, entitled "Thermal Spray (Metallizing) Contractor Certification Program" in the *enclosed shop* category or be certified in the American Institute of Steel Construction (AISC) Sophisticated Paint Endorsement (SPE) category – *enclosed shop* P1 or *covered shop* P2. A list of approved contractors can be found on the AISC website at www.AISC.org.

The Metallizing Contractor shall be fully certified, including endorsements, for the duration of the time they are doing the surface preparation and coating application. The certification(s) must be kept current for the duration of the Project work. If a Contractor's, subcontractor's or any craft-worker's certification expires, the firm will not be allowed to do any work on this item until the certification is reissued. Requests for extension of time for any delay to the completion of the Project due to an inactive certification will not be considered, and liquidated damages will apply.

Each person applying a metallized coating shall be qualified according to ANSI/AWS C2.18-93R.

The Metallizing Contractor shall have a certified NACE Coatings Inspector Program (CIP) Level 3 inspector, or approved equal, on staff for the duration of the project and actively engaged in the metallizing activities before during and after the coating application.

The Metallizing Contractor and subcontractors are required to have at least one (1) **Coating Application Specialist (CAS) (SSPC ACS/NACE No. 13)** – certified (Level II-Interim Status Minimal) craft-worker. CAS-certified (Level II-Interim Status-Minimal) craft-worker(s) are required for all crews/craft-workers up to four (4) crew members. For each crew larger than four (4), an additional CAS-certified (Level II-Interim Status-Minimal) craft-worker shall be present on each painting/blasting crew during blast cleaning and spray application (Atmospheric and Immersion Service) operations. A crew-member is a person who is on the job performing hand-held nozzle blast cleaning and/or spray application of protective coatings on a steel structure. The certification(s) must be kept current for the duration of the Project work. If a Contractor's, subcontractor's or any craft-worker's certification expires, the firm will not be allowed to do any work on this item until the certification is reissued.

Submittals: The Contractor shall submit the following to the Division of Materials Testing, the Designer of Record and the Project Engineer, for review a minimum of thirty (30) days prior to metallizing.

Metallizing Quality Control (QC) Plan, including:

A. Written procedures for the preparation of surfaces and the application of the metallizing, the sealer, and topcoat in the shop; and procedures for the repair and touch up of any damage that occurs to the newly applied metallizing or coatings. Shop and field repair procedures must be clearly identified.
B. Hold points for surface preparation, metallizing application, adhesion testing of metallizing application and top coating thickness measurements.
C. Identification of the metallizing and coating materials to be applied, including manufacturer's name, product names, and product numbers.
D. Product Data Sheets, VOC levels for liquid coatings, MSD sheets, and written application instructions including mixing requirements, proposed thinners, and manufacturer's recommended thinner amounts for liquid coatings.
E. Identification of the type and brand name of the abrasive proposed for use.
F. Metallizing Manufacturer's Slip Critical Class B Certificate of Compliance.
G. Copies of qualification records along with continuity logs for all thermal spray operators.
H. Copies of NACE CIP Level 3 certifications, or approved equal, for all staff required to possess the same. Copies of CAS (SSPC ACS/NACE No. 13) certifications, for all staff required to possess the same.
I. Identification of the thermal spray equipment.
J. A work schedule that includes timelines for surface preparation, metallizing, sealing and topcoating.

Notification: Contact the Division of Materials Testing at DOT.Steel@ct.gov a minimum of two (2) weeks prior to the start of work.

Surface Preparation:

A. Weld Spatter, Sharp Edges, and Holes: All slag, flux deposits, and weld spatter and steel irregularities such as fins, tears and slivers shall be removed from the surfaces to be metallized. Any resulting burrs from such removal shall be ground smooth, including burrs around holes. All corners and edges shall be rounded to a 0.0625-inch radius or chamfered to a 0.0625-inch chamfer.
B. Cleaning of Steel: All visible contaminants shall be removed from surfaces in accordance with SSPC-SP 1 using only solvents or detergents.
C. Compressed Air Cleanliness: The cleanliness of the compressed air shall be confirmed in accordance with ASTM D4285 at least once per shift for each compressor system.
D. Surface Requirements: The required surface preparation shall meet SSPC SP 5. Surface preparation shall not be performed under damp environmental conditions or when the surface temperature of the steel is less than 5°F above the dewpoint temperature as determined by a surface thermometer and an electric or sling psychrometer.
E. Abrasives/Profile:
    1. The Contractor shall use abrasives that are free of oil, soluble salts and other similar substances that could contaminate the surface.
    2. A uniform sharp angular profile with a profile of 3.0 to 6.0 mils shall be provided in accordance with ASTM D4417, Method B or C.
F. Acceptance Prior to Metallizing: The cleaned surface shall be accepted by the Engineer

before application of metallizing. Failure of the Contractor to prepare and clean the surfaces to be metallized in accordance with these specifications shall be cause for rejection by the Engineer. All surfaces that are rejected shall be re-cleaned to the satisfaction of the Engineer at no additional cost to the State.

G. Pre-Production Test Section and Bend Tests:
   1. The Contractor shall blast clean and metallize at least 9 square feet of steel surface prior to initiating the full-scale metallizing operation using the same metallizing equipment, set up, materials, and calibration and operating procedures in the test section(s) that shall be used for the production operations.
   2. Spray parameters shall be validated by passing a bend test as follows:
      a. Five (5) steel coupons 2 × 8 × 0.05 inches shall be fabricated of the same steel grade proposed as the member being coated.
      b. The coupons shall receive the same surface preparation, and metallizing as the actual member.
      c. The coupons may be fastened to larger pieces of stock during the blast cleaning and metallizing operations.
      d. Bend coupons 180 degrees around a 0.5-inch diameter mandrel.
      e. The bend test passes if there is no cracking or only minor cracking visually observed on the bend radius.
      f. The bend test fails if the coating cracks and lifts from the substrate.
   3. Additional coupons and testing may be required by the Engineer to establish the suitability of the surface preparation and the thermal spray coating. Full-scale metallizing shall not commence until the Engineer has inspected and approved the Test Section and coupons.

Metallizing Application:

A. Quality of Surface Preparation: The Contractor shall verify that the surface meets the specified SSPC-SP 5 surface requirements immediately prior to application of the metallized coating.
B. Surface Cleanliness: Subsequent coats shall not be applied until overspray, spent abrasive, dirt, dust, and other contaminants have been removed in accordance with SSPC-SP 1.
C. Ambient Conditions: Metallizing shall be applied when the relative humidity is less than 80%. Metallizing shall not be applied under damp environmental conditions or when the surface temperature of the steel is less than 5°F above the dewpoint temperature as determined by a surface thermometer and an electric or sling psychrometer.
D. Metallizing: The coating shall be applied by thermal spray employing multiple passes to achieve a uniform thickness of 0.008 to 0.012 inches (8-12 mils) unless otherwise specified. No single pass shall deposit more than 0.004 inches.
E. Metallizing Adhesion: Adhesion strength of the metallizing shall be 700 psi minimum as measured with approved equipment per ASTM D4541, Annex A4. Measurements shall be taken on companion coupons 4 × 6 × 0.25 inches of the same steel grade as the member being coated and processed concurrently. If adhesion is less than 700 psi but greater than 560 psi, four (4) additional adhesion tests shall be made. If any of the additional adhesion tests are less than 700 psi, the coating shall be removed and re-applied. Any single adhesion test result less than 560 psi, will be justification for the Engineer to have the Contractor

remove the entire coating. All corrective action will be at the Contractor's expense.

F. Quality Control of Metallizing Operation:
   1. The Metallizing Contractor shall verify proper spray equipment set up, calibration, and operating procedures by performing a bend test at the beginning of each work shift that metallizing is to be applied in accordance with requirements described in the Pre-Production Test Section.
   2. In addition to the bend test, a cut test shall be performed on the companion coupons, one during the production day and one at the end of each shift, to confirm that metallizing is being properly applied. The cut test consists of a single cut 1.5 inches long through the thermal spray coating to the substrate without severely cutting the substrate. A cut shall be made with a hammer and sharp chisel. The chisel cut shall be made at a shallow angle. The bond of the metallizing is considered unsatisfactory if any part of the metallizing lifts from the substrate along the cut.
   3. The Engineer shall be notified immediately of any unsatisfactory tests.

G. Bolted Connections and Other Areas:
   1. The Contractor shall state in writing to the Engineer a list of areas they believe are inaccessible prior to the start of work. The Engineer will have the final determination as to the accessibility of those areas.
   2. Bolted connections shall be processed in a manner that achieves the required Slip Critical Classification detailed on the approved steel shop drawings.
   3. Thickness in bolted, Class B, connection areas shall not exceed those listed on the Metallizing Manufacturer's Class B Slip Critical Certificate of Compliance. Under no circumstance shall any thickness reading exceed 16 mils.
   4. All connection points shall be appropriately masked off either before or after metalizing and prior to the application of seal coat.
   5. After members have been erected in the field, all previously masked areas that remain exposed shall be thoroughly cleaned and lightly sanded by hand to receive a brush-applied coat of the same sealer and topcoat used in the shop.
   6. Areas such as bolt holes, backs of snipes and other similar areas where the standard application of a metallized coating cannot be performed shall be cleaned and free of dirt and any loose overspray, and shall receive a brush applied coating of the approved coating system.
   7. The top of the top flange shall NOT be metallized but shall be coated with an inorganic zinc-rich primer from the NEPCOAT Qualified Products List. No sealer shall be applied over the zinc-rich primer.
   8. Metallized coating applied to surfaces not required to be coated may remain if found to be tightly adhered, as determined by the Engineer.

Sealer and Topcoat Application:

A. The sealer shall be applied in a single mist coat followed by a full topcoat.
   1. The Metallizing Contractor shall apply the sealer in accordance with the manufacturer's recommendations, unless otherwise specified.
   2. The sealer shall be applied no more than 8 hours after application of the metallizing, and in no case shall the sealer be applied over dust, rust that may have bled through (if there was not enough thickness), loose oxides or other visible contaminants that would

interfere with the sealer.

3. When conventional spray equipment is used, the Contractor shall verify that the compressed air supply is clean and dry as determined by the blotter test (ASTM D4285).
4. The topcoat shall be applied to achieve a 4 to 6 mils dry film thickness and shall be applied after the seal coat has been allowed to dry as required by the recoat time in the manufacturer's written instructions, but in no case shall a coat remain exposed for longer than ten (10) calendar days prior to overcoating.

B. Coverage and Continuity: All surfaces shall be completely coated and free of voids, runs, sags or other defects. Special attention shall be given to hard-to-reach or inaccessible areas and irregular surfaces. Some configurations may require spraying from multiple directions to assure complete coverage.

C. Sealer and Topcoat Adhesion to Metallized Surfaces:
1. The Metallizing Contractor shall apply the sealer and topcoat in such a manner to assure adherence to the underlying surface. Any lifting of an underlying coat, or poor adhesion between coats or to the substrate, will require removal of the coating in the affected area to adjacent intact, adherent, coating, and reapplication of the material.
2. Topcoat adhesion shall be verified using adhesion tests in accordance with ASTM D4541 as directed by the Engineer.

D. Coating Thickness
1. Wet Film Thickness: The Contractor shall verify and document the thickness of each liquid coat at the time of application using wet film thickness gages in accordance with ASTM D4414.
2. Dry Film Thickness: The dry film thicknesses of the completed coating shall be:

Metallizing	8 to 12 mils
Topcoat	4 to 6 mils
TOTAL SYSTEM	12 to 18 mils

The Contractor shall measure the thickness of each coat using nondestructive magnetic dry film thickness gages. The procedure shall comply with SSPC-PA2 for the calibration and use of the gages, and the frequency of thickness measurements. Spot readings both 20% above and 20% below the thicknesses shown above are permitted, provided the average thicknesses are within the specified tolerances.

Field Required Coating Operations: Any areas requiring sealer or topcoat after erection shall be done in accordance with the previously submitted and approved field coating procedures and shall be in accordance with the manufacturer's recommendations.

Repair of Film Discontinuities and Damage to Coating System after Erection: A repair procedure shall be submitted for concurrence by the Engineer prior to the start of repair work.

Shipping and Storage: All materials shall be shipped and stored in a manner to prevent damage from all physical and environmental factors.

Date of Completion: The words "METALLIZED AND TOPCOATED" followed by the month and year the coating of the structure is completed along with the CTDOT Project Number and the manufacturer's abbreviations, shall be stenciled on the inside of a fascia girder at mid-depth of the girder in three (3) inch high block letters located near the abutment, so as to be clearly visible from

the ground below. Paint for stenciling information shall be of a contrasting color and be compatible with the topcoat and shall be approved by the Engineer prior to application of the stenciled information.

Method of Measurement: The work under this item, being paid on a lump sum basis, will not be measured for payment.

Basis of Payment: The coating of structural steel, incorporated in the completed and accepted structure, will be paid for at the Contract lump sum price for "Metallizing Structural Steel (Site No. 1)". The lump sum price shall include all materials, equipment, tools, transportation, repairs, corrective actions, inspection access, and labor incidental thereto.

A schedule of values shall be submitted to the Engineer for review and comment prior to application of the metallizing coating.

Pay Item	Pay Unit
Metallizing Structural Steel (Site No. 1)	l.s.

ITEM #0686002.24A 24” R.C. PIPE (CLASS V) 0’ TO 10’ DEEP

6.86.02-Materials: *Add the following:*

Materials for this work shall conform to the current AASHTO specification M170, Class V, Wall C with the tongue-groove expansion joint sealed with continuous rubber gasket. Material requirements of Article M.08.01.7 of the standard specification, form 819 will apply.

ITEM #0707009A - MEMBRANE WATERPROOFING (COLD LIQUID ELASTOMERIC)

Description: Work under this item consists of furnishing and installing a seamless elastomeric waterproofing membrane system applied to a concrete or steel surface as shown on the plans, and as directed by the Engineer. Work shall also include conditioning of the surface to be coated, and all submittals and quality-control testing noted herein.

The completed membrane system shall be comprised of a primer coat, reinforcing material as specified or directed, membrane coating (minimum total thickness of 80 mil and maximum total thickness not to exceed 120 mil), an additional 40 mil membrane layer with aggregate broadcast into the material while still wet, and an application of tack coat.

Materials: The Contractor shall select a waterproofing membrane system from the Department's Qualified Products List (QPL) for Spray-Applied Membrane Waterproofing System. All materials incorporated in the work shall meet the Manufacturer's specification for the chosen system. A Manufacturer is the original source of supply as defined in Article 1.06.01 of CTDOT's Standard Specifications. The Engineer will reject any system that is not on the QPL.

Reinforcing material (to bridge gaps, joints and cracks) shall be as recommended by the manufacturer.

Aggregate: The aggregate shall be a nonfriable, durable #8 aggregate stone with no more than one-half percent (0.5%) passing the #200 sieve by weight.

Concrete Deck Repair Material: Depressions greater than ½ inch that are required to be filled before application of the membrane shall be repaired with a neat repair mortar as approved by the Engineer. If the repair includes engagement of reinforcing steel, the repair shall be performed under separate, appropriate Contract items.

Construction Methods:

1. Submittals:
   Prior to submission, the Contractor shall ensure that the Manufacturer and Supplier are fully informed regarding any site constraints or specific structural materials on which the membrane system is to be installed on.
   At least 30 days prior to installation of the membrane system, the Contractor shall submit to the Engineer the following:
   (a) A Site-specific Installation Plan that includes, but is not limited to, the manufacturer's recommended equipment, materials and procedure for:
      1) Authorization by Manufacturer of applicator
      2) Safety precautions, SDS documents
      3) On site storage of material
      4) preparation of the deck surface and recommended surface moisture content at time of priming, including the manufacturer's recommendation for primer based on substrate material or environmental conditions

5) Pre-treatment or preparation procedure at cracks and gaps, treatment at curbs, vertical surfaces or discontinuities
6) Overspray protections (masking and shielding)
7) Method and equipment for taking/calculating onsite temperatures and dewpoint temperatures as well as listing of acceptable temperature and dewpoint ranges for application of primer and/or membrane
8) Method and equipment for application of the primer and membrane
9) Treatment of already primed areas when delays occur; include allowable time frame for covering already placed primer or treatment if the primed surface is compromised
10) Treatment at overlap areas
11) Method for placement of the aggregated coat
12) All Quality Control (QC Plan) tests and procedures to be performed prior to and during the membrane system's installation
13) Recommended repair methods for system non-compliant issues identified during application

(b) Materials Certificate for the primer, membrane and aggregate in accordance with the requirements of Article 1.06.07.
(c) Concrete Mix Design: At least two weeks before installation, the Contractor shall submit the concrete mix design to the Engineer for acceptance. For RSCP material, NTPEP lab test data shall be submitted that demonstrates that the concrete mix matches the mix that was tested by NTPEP and meets the pre-qualification criteria in the QPL. This test data shall be submitted with a Materials Certificate and a Certified Test Report in accordance with Article 1.06.07.

Automated mechanical applicators will be considered for approval for use, provided there is a trial installation area to demonstrate that the required thickness can be consistently achieved. The Installation Plan shall identify and differentiate between areas using automated applicators and areas where hand application will be used, such as on vertical surfaces and at areas prior to installation of reinforcing material.

2. A technical representative, in the employ of the manufacturer, shall be present on-Site immediately prior to and during application of the membrane. The technical representative shall not be an employee of the installation contractor but is on Site solely to perform QC. The technical representative shall review environmental conditions for proper application, inspect and approve the surface prior to priming, provide guidance on the handling, mixing and addition of components, observe application of the primer and membrane. The technical representative is required to notify the Engineer immediately when conditions are not within acceptable parameters and any further installation will be analyzed by the Engineer under Article 1.06.04. The technical representative shall be qualified and shall perform all required QC testing and remain on the Project site until the membrane has fully cured.

   All QC testing, including verbal direction or observations at the time of installation, shall be recorded and submitted to the Engineer for inclusion in the Project records. The QC testing

data shall be received by the Department's Project personnel prior to any paving over the finished membrane, or within 24 hours following completion of any staged portion of the work.

3. Applicator Approval: The Contractor's membrane Applicator shall be fully trained and authorized by the membrane manufacturer and shall have successfully completed at least six spray membrane projects in the past two years. The Contractor shall furnish references from those projects, including names of contact persons and the names, addresses and phone numbers of persons who supervised the projects. This information shall be submitted to the Engineer prior to the submittal of the Installation Plan. The Engineer shall have sole authority to determine the adequacy and compliance of the submitted information. Inadequate proof of ability to perform the work will be grounds to reject proposed applicators.

4. Job Conditions:
   (a) Environmental Requirements: Air and substrate temperatures shall be between 40°F and 104°F and the substrate shall be above the dew point. Outside of this range, the Manufacturer shall be consulted.

   The Applicator shall be provided with adequate disposal facilities for nonhazardous waste generated during installation of the membrane system. The applicator shall follow safety instructions regarding respirators and safety equipment.

   Extra care shall be taken to prevent the introduction of moisture onto the area to be membraned including, but not limited to, locating water rest break areas/devices away from the works, prevent vehicles from accessing the prepared areas that may have AC units that drip water. If there is any potential for moisture to impact application, operations shall cease until conditions warrant proper adherence to specification requirements.

   (b) Safety Requirements: All open flames and spark producing equipment shall be removed from the work area prior to commencement of application.

   Personnel not involved in membrane application or inspection duties shall be kept out of the work area.

5. Delivery, Storage and Handling:
   (a) Packaging and Shipping: All components of the membrane system shall be delivered to the Site in the Manufacturer's packaging, clearly identified with the product type, lot and batch number, manufactured date and expiry or "Best-used-by Date."

   (b) Storage and Protection: The Applicator shall be provided with a storage area for all components. The area shall be cool, dry and out of direct sunlight and shall be in accordance with the Manufacturer's recommendations and relevant health and safety regulations.

   Copies of Safety Data Sheets (SDS) for all components shall be kept on Site for review by the Engineer or other personnel.

(c) Shelf Life - Membrane Components: Packaging of all membrane components shall include a shelf-life date sealed by the Manufacturer. No membrane components whose original shelf life has expired shall be used.

6. Pre-application Meeting: A minimum one week prior to beginning any membrane waterproofing work, an on-site Pre-application meeting shall be scheduled to review all requirements of the approved Installation Plan. This meeting shall include representatives from the membrane system's Manufacturer and from the Installer as well as the Prime Contractor.

7. Surface Preparation:
   (a) Protection: The Contractor shall be responsible for the protection of equipment, adjacent areas, and affected pedestrians/traffic from over spray or other contamination. Permanent highway features adjacent to the work such as, but not limited to, curbs, parapets, sidewalks and bridge joints shall be masked prior to application of the materials.

   (b) Surface Preparation: Surfaces shall be free of oil, grease, curing compounds, loose particles, moss, algae, growth, laitance, friable matter, dirt, bituminous products, previous waterproofing materials or any material that will affect the proper bonding/adhesion of the membrane to the surface receiving the membrane application. If required, degreasing shall be done by detergent washing in accordance with ASTM D4258.

   Sharp peaks and discontinuities within the areas to be coated shall be ground smooth. Any peak greater than ¼ inch above the surface profile of the prepared substrate shall be ground to the surrounding elevation and voids and holes greater than ½" in the surface patched with appropriate material. The surface shall be abrasively cleaned, in accordance with ASTM D4259, to provide a sound substrate free from laitance and shall achieve a Concrete Surface Profile (CSP) as defined by the International Concrete Repair Institute (ICRI) of between 4 and 6. The QC representative shall have on their person and available for use by Department Engineers, a full CSP Chip Set to confirm concrete surface meets above profile requirement. Areas not falling within the noted range shall be re-addressed as needed.

   Steel components to receive membrane waterproofing shall be blast cleaned in accordance with the Society of Steel Protective Coatings' SSPC-SP6, Commercial Blast Cleaning, and shall be coated with the membrane waterproofing system within the same work shift.

8. Inspection and Testing: Prior to priming of the surface, the Engineer, the Applicator and Manufacturer's technical representative shall inspect and approve the prepared substrate.

   (a) Random tests for deck moisture content shall be conducted on the substrate by the Contractor at the Site using a "Sovereign Portable Electronic Moisture Master Meter," "Tramex CMEXpertII Concrete Moisture Meter" or approved equal. The minimum frequency shall be one test per 1000 s.f. but not less than three tests per shift for each

contiguous section worked on during that shift. Additional tests may be required if atmospheric conditions change and retesting of the substrate moisture content is warranted.

The membrane system shall not be installed on substrate with a moisture content greater than 6%, or at a moisture content above the amount recommended by the written submittal installation documentation from the system's Manufacturer.

(b) The ambient air temperature and dew point temperature readings shall be taken immediately prior to starting any primer or membrane application and continuously throughout the installation process. No primer or membrane application shall be allowed if the difference between the two is 5° deg or less, or is not within the recommended air and dew point temperature ranges noted in the submitted Installation Plan from the system's Manufacturer.

(c) Random tests for adequate tensile bond strength shall be conducted by the Contractor on the substrate using an adhesion tester in accordance with the requirements of ASTM D7234 for concrete substrate or ASTM D4541 for steel substrate. The minimum frequency shall be one test per 5,000 s.f. but not less than three adhesion tests per shift for each contiguous section worked on during that shift. The locations of the pull tests shall be at least a distance from each other equal to or greater than 1/3 of the width or length (whichever is greater) of the area being worked in that section. The location of the pull tests shall be located in accordance with ASTM D3665 or a statistically based procedure of stratified random sampling approved by the Engineer.

Adequate surface preparation will be indicated by tensile bond strengths of the substrate greater than or equal to 150 psi or failure in a concrete surface and greater than or equal to 300 psi for steel surfaces.

If the tensile bond strength is lower than the minimum specified, the Engineer may request additional substrate preparation.

(d) Grouted joints, materials that the membrane cannot bond to, and cracks or discontinuities that cannot be bridged over by the membrane material shall be covered by a reinforcing material recommended by the membrane system's Manufacturer prior to application of membrane layers as approved or directed by the Engineer.

9. Application:
   (a) The System shall be applied in the following distinct steps as follows:
      1) Substrate preparation,
      2) Priming,
      3) Reinforcing material application over grouted joints, cracks, etc., embedded in wet membrane bonding layer,
      4) Membrane application,
      5) Membrane with aggregate.

(b) Immediately prior to the application of any components of the System, the surface shall be adequately dry (see Section 8(a) of this specification) and any remaining dust or loose particles shall be removed using clean, dry, oil-free compressed air or industrial vacuum.

(c) Where the area to be treated is bound by a vertical surface (e.g. curb or wall), the membrane system shall be continued up the vertical, if shown on the plans or directed by the Engineer.

(d) The handling, mixing and addition of components shall be performed in a safe manner to achieve the desired results, in accordance with the Manufacturer's recommendations or as approved or directed by the Engineer. All components shall be used from its original packaging (barrels) or be discarded – no mixing of like materials from different batches shall be allowed.

(e) A neat finish with well-defined boundaries and straight edges shall be provided by the Applicator.

(f) Primer: The primer shall consist of one coat with an overall coverage rate of 125 to 175 s.f./gal unless otherwise recommended in the Manufacturer's written instructions.

All components shall be measured and mixed in accordance with the Manufacturer's recommendations.

The primer shall be spray applied using a single component spray system approved for use by the Manufacturer. If required by Site conditions and allowed by the manufacturer brush, squeegee or roller application will be allowed.

The primer shall be allowed to cure tack-free for a minimum of 30 minutes or as required by the Manufacturer's instructions, whichever time is greater, prior to application of the first lift of waterproofing membrane.

Porous concrete (brick) may require a second coat of primer should the first coat be absorbed.

Bond Strength: Random tests for adequate adhesion capacity shall be conducted on the primed substrate in accordance with the requirements of ASTM D7234 for concrete or ASTM D4541 for steel substrate. The minimum frequency shall be one test per 5,000 s.f. but not less than three adhesion tests per shift for each contiguous section worked on during that shift. The locations of the pull tests shall be at least a distance from each other equal to or greater than 1/3 of the width or length (whichever is greater) of the area being worked in that section. The location of the pull tests shall be located in accordance with ASTM D3665 or a statistically based procedure of stratified random sampling approved by the Engineer.

Adequate adhesion will be indicated by tensile bond strengths of primer to the substrate greater than or equal to 150 psi or failure in a concrete surface and greater than or equal to 300 psi for steel surfaces.

Any primer not adequately applied shall be removed and new primer applied at the Contractor's expense, as directed by Engineer.

Delays to the membrane installation following installation of the primer may necessitate remedial measures. Re-application of the primer or any work required due to, but not limited to, precipitation, ambient or dew point temperatures falling out of allowable zone, materials dropped on the surface, shall be accomplished as outlined in the Installation Plan.

(g) Membrane and Reinforcing Material: Application of the membrane on the primed surface shall not commence until the primer is cured and adequate adhesion capacity achieved as described in Section 9(f) of this specification.

The waterproofing membrane shall consist of two equal 40 mil coats for a total dry film thickness of a minimum 80 mils but not to exceed 120 mils. successive coats shall be of a contrasting color to aid in Quality Assurance and inspection.

Hand sprayer application of a single layer at 80 mils may be allowed after demonstration on a test section of not less than 100 sq. feet, of the applicator's ability to meet specified tolerances has been reviewed and found acceptable to the Engineer.

Use of an automated mechanical applicator to achieve the required thicknesses in either one or two equal layers, may be allowed after demonstration on a test section of not less than 100 sq. feet, of the applicator's ability to meet specified tolerances has been reviewed and found acceptable to the Engineer.

Reinforcing material, if required, shall be applied as described in the Installation Plan.

The substrate shall be coated in a methodical manner.

Thickness checks: For each layer, checks for wet film thickness using a gauge pin or standard comb-type thickness gauge shall be carried out once every 100 s.f. Where rapid set time of the membrane does not allow for wet film thickness checks, ultrasonic testing (steel surfaces only), calibrated point-penetrating (destructive) testing, in-situ sampling (cutout of small sections for measuring thicknesses), or other methods approved by the Engineer shall be employed for determination of dry film thickness. The measured thickness of each and every individual test of the membrane shall be greater than or equal to the required thickness.

Bond Strength: Random tests for adequate adhesion shall be conducted on the membrane in accordance with the requirements of ASTM D7234 for concrete substrate or ASTM

D4541 for steel substrate. The minimum test frequency shall be one test per 5,000 s.f. but no less than three adhesion tests per bridge. Adequate adhesion will be indicated by tensile bond strengths of the membrane to the substrate of greater than or equal to 150 psi or failure in a concrete surface, and greater than or equal to 300 psi for steel surfaces.

Repair the membrane system following destructive testing and correct any deficiencies in the membrane system or substrate noted during QC testing in accordance with the Manufacturer's recommendations to the satisfaction of the Engineer at no additional cost to the State.

(h) Repairs: For areas left untreated or where the membrane hasn't bonded or becomes damaged, a patch repair shall be carried out to restore the integrity of the system. The damaged areas shall be cut back to sound materials, abraded and wiped with solvent (e.g. acetone or other manufacturer-recommended material) up to a width of at least six inches on the periphery, removing any contaminants unless otherwise recommended by the Manufacturer. The substrate shall be primed as necessary and tested for adhesion before the membrane layer(s) are applied. A continuous layer shall be obtained over the substrate with a six-inch overlap onto any adjacent existing membrane. The repaired area shall be tested for adhesion, with a minimum of one test per repair area.

(i) Overlapped areas: Where the membrane is to be joined to existing cured material, the overlapped area shall be cut back to sound material if necessary, abraded and wiped with solvent (e.g. acetone or other manufacturer-recommended material) or cleaned in accordance with the Installation Plan, up to a width of at least six inches prior to application of the overlapping membrane material. A continuous layer shall be obtained over the substrate with a six-inch overlap onto existing membrane. The overlapped section shall be tested for adhesion, with a minimum of one test per 200 lineal feet.

(j) Aggregated Finish:
1) Apply an additional 40 mil thick layer of the membrane material immediately followed by an aggregate coating, before the membrane cures, at a rate to fully cover the coated area to a point where no membrane material is visible. The membrane and aggregate shall be fully integrated after the aggregate has been applied and the membrane cured.
2) Using motorized mechanical sweepers followed by a vacuum or motorized blower apparatus, remove all loose and excess aggregate and fines from the surface, to the satisfaction of the Engineer, and dispose of properly prior to application of tack coat and overlay.
3) Traffic shall not be allowed to travel on the completed membrane system without prior approval of Engineer upon consultation with Manufacturers technical representative.
4) Localized areas not fully coated following removal of loose aggregate, defined as being at least 90% covered with well-adhered aggregate within any one square foot area, shall be touched-up with additional membrane and aggregate as needed. These areas shall then be swept and/or vacuumed or blown again prior to application of tack coat and overlay.

5) Tack coat: a Tack Coat Emulsion shall be applied to the aggregated finish prior to covering with a bituminous concrete mat. Material shall be applied in two coats of 0.06 - 0.08 gal/s.y. allowing it to break in between coats. This work shall be done as part of the paving operation and paid under separate, applicable Contract items.

10. Final Review: The Engineer and the Applicator shall jointly review the area(s) over which the completed system has been installed. Any irregularities or other criteria that do not meet the requirements of the Engineer shall be addressed at this time.

Method of Measurement: This item will be measured by the number of square yards of waterproofed surface completed and accepted.

Basis of Payment: This item will be paid for at the Contract unit price per square yard of "Membrane Waterproofing (Cold Liquid Elastomeric)," complete and accepted in place, which price shall include submittals, Pre-Work Meeting, all surface preparation, furnishing, storing and applying the system, technical representative and Quality Control testing, and any necessary repairs and remediation work as well as all materials, equipment, tools, labor incidental to this work.

The asphalt emulsion (tack coat) will be paid separately.

Pay Item	Pay Unit
Membrane Waterproofing (Cold Liquid Elastomeric)	s.y.

Date 2/17/2026

ITEM #0714999 – MONITORING STRUCTURES

Description: The work under this item shall consist of monitoring the existing bridge abutments, and pier for Bridge No. 04184 and the existing abutments for the pedestrian bridge along the north side of Bridge No. 04184 daily during installation of cofferdams and drilled shafts, and weekly for 6 weeks thereafter.

The work covered under this item includes furnishing, installing, surveying, protecting, reporting, and maintaining instrumentation and Deformation Monitoring Points (DMPs) as part of a Structure Monitoring Program required for evaluation of existing foundation movements during cofferdam and drilled shaft installation.

The purpose of this program is to provide data, which when used with other observations and measurements, will ensure overall stability of the existing bridge abutments and center pier.

Work in connection with the Structure Monitoring Program shall include the following:

A. Providing and installing DMPs.

B. Providing a Land Surveyor, licensed in the State of Connecticut, for layout and subsequent verification of all instrument locations and elevations. Establishment of temporary monuments and benchmarks, as necessary.

C. Providing access and lighting for the Engineer to inspect the instrument and to obtain confirmation readings.

D. Monitoring and reporting of instrumentation data including baseline measurements, daily measurements during installation of cofferdams and drilled shafts and weekly thereafter.

E. Protection and security for all DMPs until the end of the monitoring period.

F. Establishing an automated e-mail alert system to notify designated representatives from the Department and Engineer if a threshold or limiting value is exceeded.

G. Meeting with the Engineer to review current field conditions and further steps to be taken, as necessary, if recorded movement exceeds the threshold response values as detected by DMPs.

H. Taking immediate remedial action if recorded movement exceeds limiting response values as detected by DMPs.

Materials: Materials and products shall be in accordance with the following:

A. Materials for Instrumentation – All instrumentation hardware, equipment, and materials necessary to conduct the monitoring program shall be purchased by the Contractor. Prior to installation, all materials and equipment shall be available for inspection by the Engineer to ensure compliance with the intent of these specifications.

B. Deformation Monitoring Points
   a. Deformation monitoring points (DMPs) will be used to monitor vertical and horizontal deformation of facilities at selected locations shown on the plans.
   b. DMPs shall consist of a 3/8 in. dia. x 2 in. long (or longer) expandable anchor for concrete structures. These anchors shall typically be installed into vertical surfaces of

bridge foundations.

c. Where removal and patching are not required after construction, the bolts may be installed with epoxy or polyester adhesive in lieu of tamp-in screw anchors. Where the DMP is installed in steel column members the Contractor may install by drilling and tapping.

Construction Methods:

A. DMP Layout
   a. Locations of DMPs to be installed on Bridge 04184 shall be as shown on the Plans, described within this specification, or as approved by the Engineer. Locations of DMPs to be installed on the pedestrian bridge shall be submitted by the Contractor or as approved by the Engineer. The Engineer reserves the right to modify the instrument layout as is deemed necessary to monitor the impact of the Contractor's proposed method of construction. The instrumentation shall be arranged so that monitoring can continue until completion without interruption. Adequate access for maintenance and reading of the instrumentation shall be provided.
   b. At least 2 DMPs shall be installed at the remaining portion (Phase 1) of each abutment and pier for Bridge No. 04184. At least 2 DMPs shall be installed at each abutment/wingwall of the pedestrian bridge cloest to the new work. Minimum total number of DMPs is 10. The DMPs shall be evenly distributed on each substructure to the extent practical.

B. Submittals
   a. Working Drawings:
      a. Submit Working Drawings of instrumentation location layout and details at least 30 calendar days before installation. The location of all individual DMPs must be shown and labeled. Indicate methods of installation and maintenance for instrumentation systems.
   b. Documentation:
      a. Submit the name and license number of the Registered Land Surveyor that shall monitor the DMP's.
      b. Submit, within 24 hours of completion of equipment installation, installation notes, initial readings, and monitoring data taken immediately after installation to the Engineer.
   c. Monitoring Documentation:
      a. Unless otherwise provided by the Engineer, submit the proposed form to be used for recording observations, monitoring, and reporting data.
      b. Note daily high and low temperature at the time of each reading.
      c. Submit the approved data summary form within 12 hours after monitoring the DMPs in accordance with Para G – Data Reduction, Plotting and Reporting.
      d. Maintain records relating to problems encountered, delays, unusual aspects of the installation, and details of events that could affect instrument behavior.

C. Installation Requirements – General
   a. Installation procedures acceptable to the Engineer shall be developed for the DMPs.
   b. DMPs shall be securely fixed such that they can resist movement, vandalism, and adverse climatic conditions at surface locations.

c. Employ a Land Surveyor, licensed in Connecticut, to assist in the installation and measure the horizontal and vertical location of all DMPs.
d. Establish the initial horizontal and vertical position of DMPs to 0.001 feet. Achieve level circuit closure with an error of closure of 0.1 feet or less.
e. To enable the Engineer to perform supplemental monitoring of instrumentation activities, the Contractor shall:
    a. Make instrument locations available to Engineer as required.
    b. Coordinate activities to minimize interference.
    c. Remove obstruction from line of sight when requested by the Engineer.
    d. Regulate traffic during instrument surveying operations.
    e. Temporarily cease activities which create hazards to instrument monitoring or surveying personnel.
    f. Provide site benchmark and reference point information.
    g. The performance of and the extent of supplemental monitoring is at the discretion of the Engineer. Supplemental monitoring performed by the Engineer does not relieve the Contractor of the responsibility for the instrumentation and monitoring activities described in these Special Provisions.

D. Responsibilities of the Contractor
    a. The Contractor shall furnish DMPs to be installed during construction. The Contractor shall protect and maintain installed instruments, repair the damaged, and replace the inoperative instruments.
    b. Collect, reduce, process, plot, and report data to the Engineer.
    c. Provide access to the Engineer for data collection upon request. Coordinate with the Engineer to verify the consistency of collected data. Implement remedial measures based on interpretations of monitoring program data.
    d. Disclosure of Instrumentation Data:
        1. Do not disclose instrumentation monitoring data to third parties and do not publish instrument monitoring data without the prior approval of the Engineer.
    e. Determine exact location of the instruments to be installed in the field with approval of the Engineer.
    f. Access to Instruments: Provide access to each DMP for the Engineer. Access includes ladders, working platforms and other necessary facilities, and the removal thereof.

E. Monitoring Requirements
    a. All equipment required to monitor DMPs and recording of measurements shall be by the Contractor and shall be available at least 4 weeks in advance of installation and shall be securely stored where they will not suffer physical damage or damage arising from excessive moisture, extremes of temperature, or other adverse conditions.
    b. Contractor shall provide and maintain adequate lighting and provide a safe means of access to all instruments to allow installation, repair, and reading of instruments at times selected by the Engineer.
    c. Monitoring Schedule
        a. Initial readings shall be taken within 24 hours after installation to establish datum readings from a minimum of two independent reading operations

giving consistent results. Installed locations and elevations for DMPs shall be provided within 1 week of installation.

b. Monitor DMPs daily during construction of cofferdams through the installation and testing of drilled shafts. Following drilled shaft installation, monitor the DMPs weekly for at least 4 weeks.
c. If deformations exceed values in Table 1, or if in the opinion of Engineer, there appears to be excessive movement, the frequency of monitoring may be increased.

F. Installation of DMPs

a. Install the DMPs according to the manufacturers' recommendations. Adequate precautions shall be taken to protect the instruments from harmful effects of weather. Equipment found to be malfunctioning shall be replaced as soon as possible but within no more than 72 hours at no additional cost to the Department.
b. Install a permanent label on a fixed metallic tag visible at all times.
c. Install as indicated in these Specifications at locations indicated on the Plans or as approved by the Engineer.
d. Within 24 hours after installation, determine the horizontal position and elevation of each DMP to an accuracy of 0.001 ft.
e. Monitor horizontal position and elevation to an accuracy of +0.01 ft during construction.
f. Readings shall, wherever possible, be taken by the same personnel. DMP readings shall be taken at the same general time of day.

G. Data Reduction, Plotting and Reporting

a. The Contractor's instrumentation personnel and surveyors shall collect, reduce, process, plot, and report data for the Contractor's monitoring program.
    i. Each day the Contractor shall provide an electronic copy of the data form containing a cumulative history of all readings, including temperature and weather conditions at the time of each reading.
    ii. The daily report shall also include a plot of measured value versus time, which also includes a time history of relevant construction activity likely to influence such readings (e.g., excavation, dewatering, etc.).

H. Response Values and Response Plan

The Contractor shall implement remedial actions if instrumentation readings approach the Limiting Values shown in Table 1 and shall take steps to avoid exceeding Limiting Values. The Contractor may be required to suspend activities in the affected areas where Threshold Values are exceeded to avoid exceeding the Limiting Value and review potential corrective measures that could be implemented if the Limiting Value is exceeded. If the Limiting Value is reached, the Contractor shall immediately discontinue work within 25 feet of the monitoring point and meet with the Engineer to discuss response actions and implement a reviewed Plan of Action.

TABLE 1 –INSTRUMENTATION RESPONSE VALUES		
INSTRUMENT	**THRESHOLD**	**LIMITING**
DMP on Existing Bridge No. 04184 Abutment and Pier Substructures	0.25 inch	0.50 inch
DMP on Existing Pedestrian Bridge Abutment Substructures	0.25 inch	0.50 inch

Note: Threshold and Limiting Values are for deformation in both the vertical and horizontal direction

A predetermined list of project personnel to be notified and required actions by the Contractor if Threshold or Limiting Values are exceeded is presented in attached Table 2. Contractor shall request contact information from the Engineer prior to the start of monitoring.

The criteria above are intended to establish guidelines, and in no way relieve the Contractor of their responsibility for preventing detrimental movements or damage causing structural distress to the existing bridges or other adjacent utilities. The Contractor shall provide all measures necessary to control movements to within the established performance criteria. The Engineer may require the Contractor to take steps to control movements to levels which are lower, at no additional cost to the Owner, if in the Engineer's opinion the measured or observed movements are detrimental or damaging.

The Work shall be executed in such a manner as to prevent damage to the existing bridges and utilities and other public or private property. Damage to existing facilities shall be repaired by the Contractor at their own expense.

The Contractor shall monitor and interpret data from additional instrumentation they deem necessary to ensure the safety of their work. The Engineer is not responsible for safety of the work based on the instrumentation data.

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

Basis of Payment: Payment for this item will be made at the contract unit price per lump sum for "Monitoring Structures" measured as described above, which price shall include all costs of design, materials, equipment, labor, work, installation, repair, and maintenance of DMP's, survey, protecting, reporting, and consultant fees used during monitoring structures.

Pay Item	Pay Unit
Monitoring Structures	Lump Sum

Table 2 – Instrumentation Alert Notifications and Actions
Replacement of Bridge No. 04184 – Oregon Road over Quinnipiac River

Threshold Value	Required Actions
Engineer TBD TBD **City** TBD	• Document the occurrence on the Exceedance Summary Table. • All listed project staff to be alerted of validated exceedance via email within **24 Hours**. • Verify that construction activities are progressing per plan and obtain information on the extent of construction activities that could have generated alert. • Evaluate the nature of the movements and/or vibration. If exceedances are valid: • Identify preferred corrective measure to address increasing trends. • Schedule a meeting with City at a mutually agreeable time to discuss the need for response action(s) and, if applicable, develop a specific plan of action. • Set a revised (if warranted) Threshold Value and determine if additional monitoring points are needed. • Discuss threshold exceedance in the weekly monitoring data reports.

Limiting Value	Required Actions
Engineer TBD TBD **City** TBD	• Document the occurrence on the Exceedance Summary Table. • Confirm validity of data within **24 hours.** If exceedances are deemed invalid: • Discuss limiting exceedances in Exceedance Summary Tables. If exceedances are deemed valid: • Contact instrumentation personnel via email within **2 hours.** • Contact City personnel in via email within **4 hours.** • Terminate construction activities that are causing exceedances within **1 hour** of notification confirmation. • Meet with City as soon as possible to discuss need for an alternative response action. • Submit a specific plan of action that presents the preferred corrective measures. • Assess potential future movements and adjust the Limiting Value accordingly. • Confirm the preferred alternative corrective measures that will be implemented.

Date: 2/16/2026

ITEM #0728032A - NO. 6 CRUSHED STONE

Description: This item shall consist of crushed stone placed to a uniform depth to the limits and for the depth shown on the plans, or as directed by the Engineer.

Materials: The material for this work shall conform to the requirements of Article M.01.01 for No. 6 Crushed Stone.

Construction Methods: The Contractor shall place crushed stone to the limits and depths, and to the grade, shown on the Plans, or as directed by the Engineer.

Method of Measurement: This work will be measured for payment by the actual number of cubic yard of No. 6 Crushed Stone completed, accepted and measured in place after compaction.

Basis of Payment: This work will be paid for at the contract unit price per cubic yard for "No. 6 Crushed Stone," complete in place, which price shall include all materials, tools, equipment and work incidental thereto.

Pay Item	Pay Unit
No. 6 Crushed Stone	c.y.

ITEM #0819002A - PENETRATING SEALER PROTECTIVE COMPOUND

Description: Work under this item shall consist of cleaning concrete surfaces of dirt, dust, and debris, and furnishing and applying a clear, penetrating sealer to concrete surfaces where shown on the plans, to provide a barrier against the intrusion of moisture and chlorides. This work also includes furnishing, installing, and removing platforms, scaffolding, ladders, and other means of access as well as shields, as required, to protect adjacent areas and traffic from overspray.

Materials: The penetrating sealer shall conform to Article M.03.09. A Materials Certificate shall be submitted for the penetrating sealer in accordance with Article 1.06.07. A product not listed on the Qualified Products List (QPL) may be considered for approval. A Certified Test Report shall be submitted in accordance with Article 1.06.07 indicating that the product being considered conforms to the Test Requirements listed on the QPL.

Construction Methods:

Submittals: The Contractor shall submit to the Engineer Safety Data Sheets (SDS), Technical Data Sheets and product literature for the approved sealer. The literature shall include written instructions how to apply the sealer to vertical and horizontal surfaces, and where required, overhead surfaces. Application rate and number of applications of sealer shall be addressed.

The Contractor shall submit to the Engineer, in accordance with Article 1.05.02, written procedures for cleaning the concrete surfaces prior to sealer application The submittal shall include proposed equipment and materials and shall address how adjacent traffic and other areas shall be protected from dust, debris and overspray during the cleaning and application processes. Where the sealer is to be applied to parapets before pavement is placed, the submittal shall address protection of the deck and curb to which membrane waterproofing will be applied. Should the membrane already be present, the submittal shall address shielding of the membrane. It shall also indicate how vegetation and regulated areas shall be protected from overspray. The submittal shall address the conditions under which work may proceed, including wind speed, temperature and precipitation. It shall also include procedures to be followed to protect the work should unfavorable weather conditions occur before the product has been absorbed.

The Contractor shall inspect the surfaces to be sealed to identify surface cleaning needs before submitting the procedures. The Contractor shall identify concrete surfaces that:

- Need repair
- Require special attention or cleaning procedures
- Have been previously treated with coatings or curing compounds that would hinder penetration of the sealer into the concrete
- Will be new or newly repaired

Written procedures shall include observations listed above. Application of penetrating sealer to new concrete shall be addressed in the application procedures. Forms for surfaces of new concrete to receive penetrating sealer shall not be treated using form release oil, which can inhibit or prevent penetration of the sealer into the concrete.

Surface Preparation: Concrete surfaces to which penetrating sealer will be applied shall be clean and free of grease, oil, and other surface contaminants, including biological growth. Dry surfaces may be cleaned by sweeping with brushes or brooms, and blowing clean with oil-free, compressed air. The Contractor shall take care not to damage the concrete surface finish during cleaning operations. Care shall be taken so that cleaning methods do not damage joint sealant or other components of the structure that are to remain.

Application: Application of the sealer may begin only after the Engineer evaluates the concrete surfaces and determines that conditions for installation comply with the accepted written application procedures.

The sealer shall be applied in accordance with the accepted application procedures at the rate specified by the manufacturer. The Contractor shall monitor and record the number of square feet of concrete surface sealed and the number of gallons of sealer applied over that surface area to verify that the required application rate is being met. A minimum of three applications of sealer shall be assumed to be needed. After the first application of the sealer, curing time shall be recorded and submitted to the Engineer. Additional applications of sealer shall be applied as specified in the application instructions, provided adequate time between applications and appropriate curing of the sealer have occurred. For each application, the Contractor shall record the area and number of gallons of sealer applied as well as the curing time for that application. The Contractor may be directed to apply sealer in up to three separate applications if concrete surfaces readily absorb the previous application.

If the Contractor is directed to apply more than three applications of sealer, the additional applications will be compensated as extra work. Should salts, oil or other visually undesirable materials be evacuated from the concrete by the penetrating sealer and remain on the surface after sufficient rain events have occurred, the Engineer may order surface cleaning of the concrete as extra work.

The Engineer shall be provided access to inspect the concrete surface during application and after the sealer has had adequate time to cure.

Method of Measurement: This work will be measured for payment by the actual number of square yards of concrete, sealed and accepted, within the designated limits. The area will be measured once, regardless of the number of applications required.

Basis of Payment: This work will be paid for at the Contract unit price per square yard for "Penetrating Sealer Protective Compound," complete, which price shall include all equipment tools, labor and materials, incidental thereto, including the preparation of the concrete surfaces and proper disposal of debris.

The following are not included in the cost of this item and will be considered Extra Work:

- Special cleaning procedures ordered by the Engineer to properly prepare the concrete surface for application of the penetrating sealer (such as removal of tightly adherent biological growth, graffiti, or other difficult-to-remove surface contaminants)

- Additional applications of sealer as noted in the Construction Methods
- Cleaning of evacuated material from sealed surfaces as ordered by the Engineer.

Pay Item	Pay Unit
Penetrating Sealer Protective Compound	s.y.

ITEM #0904051A – 3-TUBE CURB MOUNTED BRIDGE RAIL

Description: Work under this item shall consist of fabricating, galvanizing, transporting and erecting a curb mounted bridge rail comprised of anchorages, concrete inserts, plates, posts, rails, fasteners and epoxy grout in accordance with the plans.

Materials: Structural steel shapes and plates shall meet the requirements of ASTM A572, Grade 50. Hollow structural sections shall meet the requirements ASTM A500, Grade C or ASTM A501, Grade B. Certified Test Reports and Materials Certificates shall be submitted in accordance with Article 1.06.07. The Certified Test Reports shall address that the steel meets the requirements of Article 1.06.01, Buy America.

All exposed steel shapes, plates and hollow structural sections shall have a controlled content of silicon within the range 0.0% to 0.4% or 0.15% to 0.25%. Before galvanizing, mill test certificates verifying silicon content shall be submitted to the Engineer and the galvanizer.

All steel shapes, plates and hollow structural sections shall be hot-dip galvanized in accordance with ASTM A123.

All high strength bolts shall meet the requirements of ASTM F3125, Grade A325, Type 1. Nuts shall conform to ASTM A563, Grade DH. Circular, flat, hardened steel washers shall meet the requirements of ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM F2329 or ASTM B695, Class 55.

The anchor rods shall be fully threaded rods in accordance with ASTM F1554, Grade 105. The nuts shall meet the requirements of ASTM A563, Grade DH. The washers shall meet the requirements of ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM F2329 or ASTM B695, Class 55.

Dome head bolts with wrench slots shall meet the requirements of ASTM F3125, Grade A325, Type 1 or ASTM A449, Grade 1. The nuts shall meet the requirements of ASTM A563, Grade DH. The washers shall meet the requirements of ASTM F436. The bolts, nuts and washers shall be galvanized in accordance with ASTM F2329 or ASTM B695, Class 55.

Concrete inserts shall meet the requirements shown on the plans. The concrete inserts shall be hot dip galvanized in accordance with ASTM A153. The bolts shall meet the requirements of ASTM A307 and the washers shall meet the requirements of ASTM F436. The bolts and washers shall be galvanized in accordance with ASTM F2329.

Epoxy grout shall capable of being installed in the void below the baseplate and meet the following requirements:

Compressive strength, ASTM C579, @ 73 degrees F, 10,000 psi
Tensile strength, ASTM C307 @ 7 days or ASTM D638 @ 7 days, 2,000 psi
Bond strength to concrete, ASTM C882, concrete failure

Bond strength to steel, ASTM C882, 2,500 psi
Volatile organic compounds (VOC), 0.0
Color, gray or concrete gray

Damaged areas of the hot-dip galvanized coatings shall be repaired in accordance with ASTM A780 amended as follows:

Paints containing zinc dust 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.

Construction Methods:

A. Submittals: Prior to fabrication, the Contractor shall submit shop drawings for the bridge rail at each location in accordance with Article 1.05.02 and welding procedures in accordance with Article 1.05.17.

Prior to placing the epoxy grout, the Contractor shall submit the following to the Engineer for review in accordance with Article 1.05.02 Product Data requirements:

1. A copy of the epoxy grout manufacture's data sheet documenting the grout meets the specification requirements.
2. A copy of the epoxy grout manufacturer's printed installation instructions (MPII)
3. A copy of the epoxy grout manufacturer's printed safety instructions

B. Fabrication Requirements: The steel fabricator shall meet the requirements of the AISC Certification Program for Manufacturers of Bridge and Highway Components (CPT).

Shop fabrication of the bridge rail shall meet the requirements of Article 6.03.03-3. Structural steel elements of the bridge rail shall be prepared for galvanizing in accordance with Article M.06.02.

After galvanizing, surfaces with inadequate zinc thickness shall be repaired in the shop according to ASTM A780 and ASTM A123, with the exception that only brush applied flat, light gray zinc rich coating shall be permitted. Aerosol spray or galvanizing repair stick products shall not be used. Surfaces of galvanized steel that are damaged after the galvanizing operation shall be repaired in accordance with ASTM A780 whenever damage exceeds 0.1875 inch in width or 4 inches in length. Damage that occurs in the shop shall be repaired in the shop.

C. Installation Requirements: The anchor rods shall be securely bolted to anchor plates to create anchorage assemblies. The anchorage assemblies shall be accurately positioned and restrained to prevent movement during field placement of the concrete. The concrete inserts shall be accurately positioned and restrained against movement during the placement of concrete.

Field installation of the rail components shall be as shown on the plans.

The connection of the post baseplate to the anchor rods shall be a double nut connection. The post baseplate shall be installed on washers supported by leveling nuts. The baseplate shall be secured in place with a washer topped with a nuts at each anchor rod.

High-strength bolts, including nuts and washers, shall be installed and tensioned in accordance with Subarticle 6.03.03-5(f).

Dome headed bolts shall be installed with a washer, a lock washer and nut.

Epoxy grout shall be placed between the concrete curb and the baseplate at all post locations. The concrete and steel surfaces that will be in contact with the grout shall be dry, clean and free of all loose concrete and contaminants. The galvanized surface of the baseplate shall not be abrasively cleaned. Solvent cleaning is acceptable if allowed by the epoxy grout manufacturer. The grout shall be placed within an area formed around each baseplate. The forms shall be liquid tight and treated with a form release agent. The forms shall have chamfer strips placed along all vertical and horizontal finished grout edges. The vertical faces of the grout shall extend beyond the vertical edges of the baseplate.

Prior to placing the epoxy grout, the curb concrete shall have obtained the compressive strength shown on the plans.

The grout shall be mixed and placed in accordance with the manufacturer's printed installation and safety instructions. Conditions, including the temperature of the mixed grout, air and substrate, at the time of the installation shall meet the manufacturer's recommendations. The grout shall be placed from one side allowing it to flow beneath the baseplate to the formed surfaces and avoid air entrapment. After removal of the forms, rough surfaces and edges shall be trimmed or ground down to provide smooth surfaces and defined edges.

Damage that occurs to the hot-dip galvanized surfaces during transport or during installation 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 or galvanizing repair stick is not 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.

During installation of the rail and any component parts, the Contractor shall take necessary precautions to prevent any injury or property damage from any falling materials.

All work shall proceed in accordance with the special provisions "Maintenance and Protection of Traffic" and "Prosecution and Progress."

Method of Measurement: This work will be measured for payment by the number of linear feet of bridge rail installed, complete and accepted, measured within the pay limits shown on the plans.

Basis of Payment: This work will be paid for at the Contract unit price per linear foot for "3-Tube Curb Mounted Bridge Rail," complete and accepted in place, which price shall include all materials, equipment, tools, and labor incidental thereto.

Pay Item	Pay Unit
3-Tube Curb Mounted Bridge Rail	l.f.

Date: 09/05/2025

ITEM #0950019A – TURF ESTABLISHMENT - LAWN

Description: This item shall consist of providing well developed stands of turf grasses to match existing, 'lawns', as well as to enhance the new sidewalk system. This item shall include all materials, equipment & labor to meet the requirements of final acceptance and be coordinated with Special Soil Preparation and Furnishing & Placing Compost.

Submittals: Use the Landscape Seeding Submittal Template as per the COMPASS Contractor's User Manual.

Materials: The materials for this work shall conform to the requirements of Section M.13 of Standard Specification Form 818, as amended below.

Temporary Lawn Seed: (To be used for erosion control & out of season seeding)100 Perennial Ryegrass Lolium perenne 80% Min.Improved varieties

Final Lawn Seed Mix : In order to preserve and enhance the diversity, the source for seed mixtures shall be locally obtained within the Northeast USA including New England, New York, Pennsylvania, New Jersey, Delaware, or Maryland.

Percent	Common Name	Scientific name	Germination
25	Kentucky Bluegrass Improved varieties	Poa pratensis	80% Min.
45	Red Fescue Improved varieties	Festuca rubra	85% Min.
30	Perennial Ryegrass Improved varieties	Lolium perenne	80% Min.

4 Lbs. per 1000 S.Y., to be approved depending on slope, month of seeding, and exposure.

Mulching: Flex-terra or equal.

Herbacide: Glyphosate or other broadleaf herbicide, accompanied by certification.

Construction Methods: Rates of application shall be field determined in Pure Live Seed (PLS) based on the minimum purity and minimum germination of the seed obtained. The seed shall be mulched in accordance with Article 9.50.03. Prior to seeding the Contractor shall remove any existing weeds or other vegetation which is not turf grass using a broad leaf herbicide. No seeding shall occur until the seedbeds have been reviewed by Landscape Design and the recommended amendments have been accepted by the Engineer.

Existing lawn areas where minimal disturbance has occurred, but overseeding is required, shall be raked by hand, making sure all stones & debris are removed and the top 2" is loosened. The Engineer will review all areas to ensure the soil is friable and ready for seeding. The Engineer shall review areas and the Contractor shall address concerns prior to initial acceptance.

Maintenance: Newly seeded areas shall be watered and mowed as required. Additional work may include augmenting compost to finished grades of sidewalk, re-applying seed which was dis-lodged or not thriving, the spraying of herbicide where unwanted species are hindering the establishment of specified grasses, or as otherwise directed by the Engineer.

Establishment Period: Turf Establishment – Lawn areas shall be subject to a One-Year Warranty for all work and material, including watering & mowing. Any area compacted or otherwise impacted by construction shall be repaired and re-seeded at no expense to the State.

Method of Measurement: This work will be measured for payment by the number of square yards of surface area of accepted established grasses as specified. No areas shall be accepted until the new surfaces meet finished grades, and are covered with vibrant, dark green vegetation, consisting of the specified turf species.

Basis of Payment: This work will be paid for at the contract unit price per square yard for "Turf Establishment - Lawn" which price shall include all materials, labor, equipment, tools, and work incidental thereto. Partial payment of up to 50% may be made for work completed, but not accepted. Establishment period to run concurrently with the Special Provision 9.49 Permit Bond.

Pay Item	Pay Unit
Turf Establishment - Lawn	s.y

ITEM #0950043A - WETLAND GRASS ESTABLISHMENT

Description: The work included in this item shall consist of providing an accepted stand of established wetland grasses by furnishing and placing seed as shown on the plans, permits, or as directed by the Engineer within the Wetland Mitigation Area(s) or other areas when required.

Materials: All wetland grass mixture sources shall be locally obtained within the Northeast USA including New England, New York, Pennsylvania, New Jersey, Delaware, or Maryland in order to preserve and enhance the diversity of native wetland grass species.

The placement of fertilizer, mulch or bio-degradable erosion control matting will not be allowed within any wetland area.

All wetland seed mixture sources shall be approved by the Engineer prior to purchase.

Three (3) qualified wetland seed mixtures are as follows:

1. **New England Wet Mix (Wetland Seed Mix)**, New England Wetland Plants, Inc. 820 West Street Amherst, MA 01002, or equal. Rate shall be 1 pound PLS per 2,500 sq. ft.

2. **OBL Wetland Mix,** Ernst Conservation Seeds, Inc. 8884 Mercer Pike, Meadville, PA 16335, or equal. Rate shall be 1 pound PLS per 2,000 sq. ft.

3. **Vermont Wetland Shrub**, Vermont Wetland Plant Supply, LLC, P.O. Box 153, Orwell, VT 05760, or equal. Rate shall be 1 pound PLS per 2,420 sq. ft.

All seed mixtures must be reviewed and approved by the Engineer prior to application. All seed Materials Certificates must have seed mixtures that shall not include any invasive species pursuant to Connecticut General Statute Sec. 22a-381d, or any State Threatened or State Endangered species known pursuant to Connecticut General Statute Sec. 26-303 which would be a violation of the Connecticut Endangered Species Act. The seed tags from the bags are to be removed by the Engineer upon delivery and attached to the Materials Certificate. No seeding shall occur if the requirements are not met.

All approved seed mixtures shall be obtained in sufficient quantities to meet the pure live seed (PLS) application rates as determined by the seed analysis of the mixture.

Construction Methods: Construction methods shall be those established as agronomically acceptable and feasible and approved by the Engineer.

Wetland grass establishment seeding for Wetland Mitigation Site(s): Seeding shall occur during the fall season immediately following construction of the wetland site(s). Fall seeding must occur from August 15th to October 31th.

Wetland grass establishment seeding for areas other than the Wetland Mitigation Site(s), when required: Seeding dates shall adhere to Section 9.50 – Turf Establishment.

Seeding shall be applied to wetland areas that will not be routinely inundated. If seed is purchased in bulk rather than by PLS, the rate of application must be adjusted to meet the required PLS seeding rate. This seeding rate shall be increased by the appropriate percentage based on the information provided on the seed tags at delivery, as determined by the following formula:

(Germination Percentage X Purity Percentage)/100 = Percentage PLS

The Engineer shall verify that the seed is applied at a rate that will allow for 100% PLS.

Method of Measurement: This work will be measured for payment by the number of square feet of surface area of established wetland seed mixture, planted, and accepted as specified or by the number of square feet of surface area of seeding actually covered as specified.

Basis of Payment: This work shall be paid at the Contract unit price per square foot for "Wetland Grass Establishment," which price shall include all materials maintenance, equipment, tools, labor, transportation, operations and all work incidental thereto. Partial payment of up to 50% may be made for work completed, but not accepted. Full payment shall not be made until the area has been accepted by the Engineer.

Pay Item	Pay Unit
Wetland Grass Establishment	s.f.

ITEM #0952051A - CONTROL AND REMOVAL OF INVASIVE VEGETATION

Description: This work shall include the development and implementation of an Invasive Vegetation Removal Plan (IVRP) to outline the identification and treatment methods for the control of invasive vegetation, including trees if present, as directed by the Engineer or their authorized delegate. This work will also include the removal and off-Site disposal of invasive vegetation from within the Project limits in accordance with the accepted IVRP.

The list of invasive vegetation to be controlled, removed, and disposed off-Site under this item can be found on the following websites:

- Connecticut Invasive Plant Working Group (CIPWG) Invasive Plants Council (http://cipwg.uconn.edu/invasive_plant_list/)
- US Army Corps of Engineers (ACOE) New England District Compensatory Mitigation Guidance Appendix K (http://www.nae.usace.army.mil/portals/74/docs/regulatory/Mitigation/2016_New_England_Compensatory_Mitigation_Guidance.pdf)

Materials: The herbicide shall be formulated as applicable for target-species foliar treatment or a flush cut/stump treatment. All herbicide applications shall be in accordance with Product label rates and in conjunction with Sections 22a-46 to 22a-66z of the Connecticut General Statutes (CGS).

Flagging tape, if used, shall be fluorescent, 'All-Weather' type, resistant to UV and water damage.

Stakes shall be survey-grade, as specified under Article 9.80.02.

Construction Methods: The Contractor shall be responsible to identify invasive vegetation at all times of the year and to prepare a plan for its control, removal, and off-Site disposal without assistance.

1. IVRP: Prior to any ground disturbance within the Project limits, the Contractor shall submit a proposed IVRP to the Engineer or their authorized delegate for review and comment. The Contractor shall address any comments to the satisfaction of the Engineer and resubmit their revised IVRP for review and acceptance.

The IVRP shall include the following information:

1) Proposed dates for the initial walk through of the invasive vegetated areas to be controlled and removed for off-Site disposal.
2) Schedule identifying specific dates when herbicide treatment or mechanical excavation or removal of invasive species is to occur for the life of the Contract, including the 1-year warranty period that begins at Substantial Completion. The treatment schedule shall coincide with the Contractor's schedule.
3) Plan sheets identifying the species of invasive vegetation and trees within the Project limits showing the total square yards proposed to be controlled and removed for off-Site disposal. For each species of invasive vegetation present on-Site, the following shall be described:
   a. Types and concentrations of any herbicides to be used to control the identified species

for the life of the Contract, including any adjuvants, SDS sheets, types of tools, equipment, or machinery to be used.

b. Mechanical excavation and removal methods including the type of machinery to be used.

4) Provide proof of DEEP Pesticide Application Business registration pursuant to CGS Section 22a-66b, and certifications for each supervisor and operational commercial applicator on-Site or as required under CGS Sections 22a-54 to 22a-58. All Contractors physically applying pesticides on Department construction Projects to treat invasive vegetation in the State highway right-of-way must ensure that the "6 Rights-of-Way Pest Control" certification is held by at least one Commercial Supervisory Pesticide Applicator employed at the Pesticide Application Business. If the applicator does not have a commercial supervisory certificate, then the applicator must have a junior operator certificate in "6 Rights-of-Way Pest Control" and operate under the written or in-person directions of the supervisor who is certified in "6 Rights-of-Way Pest Control." More information on DEEP certifications and permits for applying pesticides is available at the Pesticide Management Program page website. The Department reserves the right to require additional DEEP certifications based on Project Site specific requirements.
5) A description of safety equipment required.
6) Procedures for handling chemical spills.
7) Proposed disposal methods:
   a. Procedures for off-Site removal of invasive vegetation including trees.
   b. Provide address of disposal location, current permits / letters from the town authorizing such activity and a Site map (showing regulated areas).
   c. Invasive vegetation shall not be buried on-Site.

If changes are required to the accepted IVRP during the life of the Contract (including registration/certification changes for the personnel applying pesticides or new invasive species not previously identified in the original IVRP submission) or additional invasive vegetation control and/or removal are ordered by the Engineer, these changes shall be documented by the Contractor and resubmitted to the Engineer or their authorized delegate for review and acceptance. Only those changes recommended by the appropriately licensed supervisor/ applicator will be considered. At no time shall the Contractor direct or advise workforces on the pesticide treatment. All direction must be generated from the licensed Pesticide Application Business and approved by the Engineer.

The IVRP or any amended version must be accepted by the Engineer or their authorized delegate prior to beginning of any mechanical excavation or herbicide treatment in the areas which require invasive species control, removal and off-Site disposal as identified Contractor's marked up plan sheets. The accepted methods must be capable of total control and removal of all identified invasive species in the identified areas throughout the life of the Contract and the 1-year warranty period.

2. Special Handling of Invasive Species Vegetation: The Contractor will be allowed to mechanically excavate invasive vegetation and underlying soils using the accepted methods in the IVRP. The accepted methods must be capable of the removal of all soil to a depth where invasive plant material and root system is no longer evident, to the satisfaction of the Engineer or their authorized delegate. Suitable material shall be provided and placed to final grade as shown on the plans or as directed by the Engineer.

All excavated invasive vegetation and underlying soils shall be considered an unsuitable material and must be removed separately from clearing and grubbing operations and disposed of off-Site at an approved location as described in the Contractor's IVRP.

Whether the Contractor's method of removal is by flush cutting/stump treatment or spraying of herbicides, invasive species, including trees identified as invasive in the above websites or IVRP, must be removed separately from clearing and grubbing operations and disposed of at an approved location as described in the Contractor's IVRP.

The Contractor will not be allowed to strip/cut topsoil from any location and reuse this material within the Project limits identified within the IVRP as an area requiring treatment. The stripped/cut material is considered unsuitable material and is to be taken off-Site to an approved disposal facility as described in the Contractor's IVRP.

Wood chips from invasive species are not allowed to be stockpiled or reused on-Site. Wood chipping on-Site may be allowed to remain on-Site if temporarily stored in a properly contained enclosure and removed off-Site at the end of the treatment cycle, to the satisfaction of the Engineer or their authorized delegate.

No equipment or vehicles other than those required to complete the work as described in the Contractor's IVRP will be permitted in the areas designated for invasive vegetation removal. Any equipment used to process invasive vegetation, such as chippers and transport vehicles, must be cleaned prior to further use.

3. Site Maintenance: Broadcast or uncontrolled spray application will not be permitted, and care must be taken to avoid contacting non-target native species. If any non-target native species to remain within the Project limits are inadvertently treated with herbicide and perish, they shall be replaced with in-kind species at the Contractor's expense.

Vines shall be cut from the ground to the tree canopy. Twining vines within a tree canopy shall be removed to the greatest extent possible without damaging the existing tree to remain. Should branches be damaged, the Contractor shall prune damaged limbs at their expense. All corrective pruning shall meet the requirements of the National Arborists Association Pruning Standards. Note: Use of aerial equipment is encouraged; use of a pole saw to cut vines leaving unsightly debris hanging from the trees will not be allowed.

Flush cutting/stump treatment of brush and trees shall not be more than 2 inches above the ground line.

Any invasive species control and removal work performed throughout the duration of the Contract that causes damage or soil disturbance shall be repaired at the Contractor's expense within 7 days. Disturbed areas shall be vegetatively stabilized with the appropriate seed mix and protected with hay mulch, cellulous fiber mulch, or erosion control matting.

Limits for control and removal of invasive vegetation shall be maintained for the life of the Contract. Should stakes or flagging be damaged during the course of construction, the Contractor shall re-establish limits. Use of reference staking is permissible.

4. Field Meetings: The Contractor's IVRP must receive acceptance from the Engineer, or their authorized delegate and have the Site surveyed, staked, and flagged prior to any field meeting.

The Contractor shall provide at least 10 working days' notice to the Engineer for any scheduled field meeting(s) as described in the IVRP. During the meeting, the Contractor's IVRP shall be reviewed to verify the identified invasive species and to review the square yardage on the marked-up plan sheet(s). At this time, the Engineer or their authorized delegate may identify additional invasive species or designate additional areas for removal that are not included within the Contractor's submitted IVRP.

Additional field meetings may be warranted at any time, as directed by the Engineer or their authorized delegate, to ensure the Contractor is compliant with the IVRP or amended versions.

5. Treatment: The treatment schedule as identified in the IVRP may be modified based on changes to the Contractor's construction schedule or based on existing field conditions. The Contractor shall provide at least 10 working days' notice to the Engineer or their authorized delegate prior to proceeding with each treatment.

Treatment of invasive species will not be permitted without notifying the Engineer or their authorized delegate prior to activity and such personnel shall be on-Site to observe the work, unless specifically authorized otherwise. Treatment shall not be permitted outside of normal working hours, unless specifically authorized.

Prior to any herbicide treatment on-Site, the Contractor shall provide proof of DEEP Pesticide registration/certification, as specified above in **1. IVRP**. The Contractor shall not perform, nor allow subcontractors to perform, any treatment work at any time unless proof of current registration/certification for the actual supervisor and operator conducting or overseeing the herbicide application is available to the Engineer, upon request.

At a minimum, the Contractor shall treat all areas within the optimal growing season between April 15 and October 15. Additional spot treatment measures may be warranted within the same optimal growing season in any year throughout the life of the Contract if full control and removal of the invasive species is not achieved within the Project limits as outlined in the IVRP or as identified by the Engineer or their authorized delegate. When herbicide is used, a minimum of 10 working days is required prior to clearing and grubbing, planting, and seeding operations, so the herbicide application can take effect.

Mechanical excavation and disposal may occur at any time of the year as specified above in **2. Special Handling of Invasive Species Vegetation**.

If rain or windy conditions are anticipated on the day of the scheduled treatment, the Contractor will not be allowed to proceed, unless authorized by the Engineer or their authorized delegate.

Method of Measurement: The work to remove invasive vegetation, as defined above, will be measured for payment by the number of square yards of invasive vegetation surveyed, treated, and removed as required, including any required re-treatment of any regrowth or new growth. This work shall also include the removal of invasive trees, if present. No additional payment will be made for subsequent treatments.

All areas for removal shall be surveyed, flagged, and measured prior to treatment. After a review of the surveyed limits during the field meeting(s), the Engineer may designate additional areas for removal not indicated on the plans which will be measured for payment by the number of square yards treated.

Basis of Payment: The work for the removal of invasive vegetation and trees will be paid for at the Contract unit price per square yard for "Control and Removal of Invasive Vegetation." Payment shall include all labor, surveys, materials, tools, and equipment necessary for limits of the invasive area(s); development and required revisions of the IVRP; maintenance of the limits throughout the Project; species identification; proof of DEEP pesticide registration/certification; and cutting, excavation and replacement of in-kind material, treating, re-treating, removal, and off-Site disposal of designated invasive plant and tree material. Off-Site disposal of residue shall include the loading, transport, dumping, and fees associated with legal off-Site disposal.

- Upon Engineer's acceptance of the required IVRP, the Contractor will receive payment equal to 10% of the estimated Contract Item value.
- Upon completed initial herbicide or mechanical removal treatment methods as described in the IVRP, the Contractor will receive payment equal to 20% of all areas receiving treatment.
- The Contractor will receive incremental payments for each additional treatment throughout the duration of the Project of all areas receiving treatment. The total of incremental payments will not exceed 40% of the Contract item value.
- Upon successful completion of the 1-year warranty period covering all treated areas on the Project, the Contractor will receive final payment.
- Any fines levied against the Department due to the Contractor's or Subcontractor's failure to comply with the specifications or applicable regulations will be deducted from the monies due the Contractor.

All other vegetation to be removed which is not designated as invasive vegetation or invasive tree shall be removed in accordance with the Item "Clearing and Grubbing" or other Contract items. Vegetative stabilization of disturbed areas will be paid for under the respective Contract items.

Pay Item	Pay Unit
Control and Removal of Invasive Vegetation	s.y.

ITEM #0969064A - CONSTRUCTION FIELD OFFICE, LARGE

Reference to "CTDOT" in this Item refers to "City of Meriden".

Description: Under the item included in the bid documents, adequate weatherproof office quarters with related furnishings, materials, equipment, and other services, shall be provided by the Contractor for the duration of the work, and if necessary, for a close-out period determined by the Engineer. The office, furnishings, materials, equipment, and services are for the exclusive use of CTDOT forces and others who may be engaged to augment CTDOT forces with relation to the Contract. The office quarters shall be located convenient to the work site and installed in accordance with Article 1.08.02. This office shall be separated from any office occupied by the Contractor. Ownership and liability of the office quarters shall remain with the Contractor.

Furnishings/Materials/Supplies/Equipment: All furnishings, materials, equipment, and supplies shall be in like new condition for the purpose intended and require approval of the Engineer.

Office Requirements: The Contractor shall furnish the office quarters and equipment as described below:

Description\ Office Size	Small	Med.	Large	Extra Large
Minimum Sq. Ft. of floor space with a minimum ceiling height of 7 ft.	400	720	1400	2800
Minimum number of exterior entrances.	2	2	2	2
Minimum number of parking spaces.	7	7	10	15

Office Layout: The office shall have minimum square footage as indicated in the table above and shall be partitioned as shown on the building floor plan as provided by the Engineer.

Unless otherwise approved by the Engineer, office space shall be partitioned into segregated work areas for each user as follows:

A. Each work area (or cubicle) shall be a minimum of 8 feet × 8 feet, with full height walls or tall cubicle partitions (minimum 6 feet high), placed to provide a minimum of 6 feet walking space around and between each user work area (for social distancing).
B. Only one user (workstation/desk) per work area.
C. Desks, tables, and other work surfaces shall be arranged so that adjacent users do not face each other.

Tie-downs and Skirting: Modular offices shall be tied-down and fully skirted to ground level.

Lavatory Facilities: For field offices sizes Small and Medium the Contractor shall furnish a toilet facility at a location convenient to the field office for use by CTDOT personnel and such assistants as they may engage; and for field offices sizes Large and Extra Large the Contractor shall furnish two (2) separate lavatories with toilet (men and women), in separately enclosed rooms that are properly ventilated and comply with applicable sanitary codes. Each lavatory shall have hot and cold running

water and flush-type toilets. For all facilities the Contractor shall supply lavatory and sanitary supplies as required.

Windows and Entrances: The windows shall be of a type that will open and close conveniently, shall be sufficient in number and size to provide adequate light and ventilation, and shall be fitted with locking devices, blinds, and screens. The entrances shall be secure, screened, and fitted with a lock for which four keys shall be furnished. All keys to the construction field office shall be furnished to the CTDOT and will be kept in their possession while State personnel are using the office. Any access to the entrance ways shall meet applicable building codes, with appropriate handrails. Stairways shall be ADA/ABA compliant and have non-skid tread surfaces. An ADA/ABA compliant ramp with non-skid surface shall be provided with the Extra-Large field office.

Lighting: The Contractor shall equip the office interior with electric lighting that provides a minimum illumination level of 100 foot-candles at desk level height, and electric outlets for each desk and drafting table. The Contractor shall also provide exterior lighting that provides a minimum illumination level of 2 foot-candles throughout the parking area and for a minimum distance of 10 ft. on each side of the field office.

Parking Facility: The Contractor shall provide a parking area, adjacent to the field office, of sufficient size to accommodate the number of vehicles indicated in the table above. If a paved parking area is not readily available, the Contractor shall construct a parking area and driveway consisting of a minimum of 6 inches of processed aggregate base graded to drain. The base material will be extended to the office entrance.

Field Office Security: Physical Barrier Devices - This shall consist of physical means to prevent entry, such as: 1) All windows shall be barred, or security screens installed; 2) All field office doors shall be equipped with dead bolt locks and regular day operated door locks; and 3) Other devices as directed by the Engineer to suit existing conditions.

Electric Service: The field office shall be equipped with an electric service panel, wiring, outlets, etc., to serve the electrical requirements of the field office, including lighting, general outlets, computer outlets, electronics, etc., and meet the following minimum specifications:

A. 120/240 volt, 1 phase, 3 wire
B. Ampacity necessary to serve all equipment. Service shall be a minimum 100 amp dedicated to the construction field office.
C. The electrical panel shall include a main circuit breaker and branch circuit breakers of the size and quantity required.
D. Additional 120-volt, single phase, 20-amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed at each desk and personal computer table (workstation) location.
E. Additional 120-volt, single phase, 20-amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed, for use by the Telephone Company.
F. Additional 120-volt circuits and duplex outlets as required meeting National Electric Code requirements.
G. One exterior (outside) wall mounted GFI receptacle, duplex, isolated ground, 120-volt, straight blade.

H. After work is complete and prior to energizing, the State's CTDOT electrical inspector, must be contacted at 860-594-2240. (Do Not Call Local Town Officials)
I. Prior to field office removal, the CTDOT Office of Information Systems (CTDOT OIS) must be notified to deactivate the communications equipment.

Heating, Ventilation and Air Conditioning (HVAC): The field office shall be equipped with sufficient and properly operating, heating, air conditioning, and ventilation equipment to maintain a temperature range of 68º-80º Fahrenheit within the field office. The Contractor shall increase ventilation rates and increase the percentage of outdoor air that circulates into the system where possible.

Telephone Service: The Contractor shall provide telephone service with unlimited nation-wide calling plan. For a Small, Medium, and Large field office this shall consist of the installation of one (1) telephone line for phone/voice service. For an Extra-Large field office this shall consist of three (3) telephone lines for phone/voice service. The Contractor shall pay all charges.

The Contractor shall provide the field office telephone number(s) to the CTDOT Project Engineer within 10 calendar days after the signing of the Contract as required by Article 1.08.02.

Data Communications Facility Wiring: As soon as the field office is in place, the Contractor shall propose a central wiring location, to designated CTDOT District personnel for the review and approval of CTDOT OIS. The central wiring location shall be large enough to house the Contractor supplied modem, Contractor supplied patch panel (if applicable), and CTDOT OIS supplied LAN switch and router. The Contractor shall supply the number of Category 6A 568B patch panels necessary to support the anticipated number of networked devices. The central wiring location shall also house the data circuit with appropriate power requirements and Category 6A cable run to the location of the installed data circuit. Power shall be provided at the central wiring location to power the hardware installed.

The Contractor shall install CAT 6A cables from the central wiring location to each workstation, Smart Board/TV location, Multifunction Laser Printer/Copier/Scanner and any other networked devices. The CAT 6A cables shall terminate in a (Category 6A 568B) wall or surface mount data jack at each networked device. Each run / jack shall be clearly labeled with an identifying Jack Number. The CAT 6A cables shall be terminated at the central wiring location with a service loop and RJ45 connectors. The Contractor shall also supply CAT6A cables of adequate length to reach from the wall or surface mount jack to the device being networked.

The number of networked devices anticipated shall be at least equal to the number of personal computer tables, Multi-Function Laser Printer/Copier/Scanner, Contractor supplied devices, and smartboards listed below.

Additional Equipment, Facilities and Services: The Contractor shall provide at the field office at least the following to the satisfaction of the Engineer:

Furnishing Description	Office Size			
	Small	Med.	Large	Extra Large
	Quantity			
Office desk (2.5 ft. x 5 ft.) with drawers, locks, and matching desk chair that have pneumatic seat height adjustment and dual wheel casters on the base.	1	3	5	8
Standard secretarial type desk and matching desk chair that has pneumatic seat height adjustment and dual wheel casters on the base.	-	-	-	1
Personal computer tables (4 ft. x 2.5 ft.).	2	3	5	8
Drafting type tables (3 ft. x 6 ft.) and supported by wall brackets and legs; and matching drafter's stool that have pneumatic seat height adjustment, seat back and dual wheel casters on the base.	1	1	1	2
Conference table, 3 ft. x 12 ft.	-	-	-	1
Table – 3 ft. x 6 ft.	-	-	-	1
Office Chairs.	2	4	8	20
Mail slot bin – legal size.	-	-	1	1
Non-fire-resistant cabinet.	-	-	2	4
Fire resistant cabinet (legal size/4 drawer), locking.	1	1	2	3
Storage racks to hold 3 ft. x 5 ft. display charts.	-	-	1	2
Vertical plan racks for 2 sets of 2 ft. x 3 ft. plans for each rack.	1	1	2	2
Double door supply cabinet with 4 shelves and a lock – 6 ft. x 4 ft.	-	-	1	2
Case of cardboard banker boxes (Min 10 boxes/case)	1	1	2	3
Open bookcase – 3 shelves – 3 ft. long.	-	-	2	2
White Dry-Erase Board, 36" x 48" min. with markers and eraser.	1	1	1	1
Interior partitions – 6 ft. x 6 ft., soundproof type, portable and freestanding.	-	-	6	6
Coat rack with 20 coat capacity.	-	-	-	1
Wastebaskets - 30 gal., including plastic waste bags.	1	1	1	2
Wastebaskets - 5 gal., including plastic waste bags.	1	3	6	10
Electric wall clock.	-	-	-	2
Electronic Level	1	1	1	2

Furnishing Description (continued)	Office Size			
	Small	Med.	Large	Extra Large
	Quantity			
Telephone.	1	2	3	-
Full size stapler 20 (sheet capacity, with staples)	1	2	5	8
Desktop tape dispensers (with Tape)	1	2	5	8
8 Outlet Power Strip with Surge Protection	3	4	6	9
Rain Gauge	1	1	1	1
Business telephone system for three lines with ten handsets, intercom capability, and one speaker phone for conference table.	-	-	-	1
Mini refrigerator - 3.2 c.f. min.	1	1	1	1
Hot and cold-water dispensing unit. Disposable cups and bottled water shall be supplied by the Contractor for the duration of the project.	1	1	1	1
Microwave, 1.2 c.f., 1000W min.	1	1	1	1
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.	*	*	*	*
Electric pencil sharpeners.	1	2	2	2
Multi-Function Laser Printer/Copier/Scanner combination unit, network capable, as specified below under Field Office Technology	1	1	1	1
Field Office Internet Service and Hardware as specified below under Field Office Technology	1	1	1	1
Digital Camera as specified below under Field Office Technology	1	1	3	3
Teleconferencing Equipment as specified below under Field Office Technology	-	-	-	-
Infrared Thermometer, including annual third-party certified calibration, case, and cleaning wipes.	1	1	1	2
Concrete Curing Box as specified below under Concrete Testing Equipment.	1	1	1	1
Concrete Air Meter and accessories as specified below under Concrete Testing Equipment as specified below. Contractor shall provide third party calibration on a quarterly basis.	1	1	1	1
Concrete Slump Cone and accessories as specified below under Concrete Testing Equipment.	1	1	1	1
First Aid Kit	1	1	1	1
T-handle concrete cylinder mold splitter as specified below under Concrete Testing Equipment	1	1	1	1
Smart Phones as specified under Computer Related Hardware and Software.	-	-	-	-

The furnishings and equipment required herein shall remain the property of the Contractor. Any supplies required to maintain or operate the above listed equipment or furnishings shall be provided by the Contractor for the duration of the project.

Field Office Technology:
The Contractor shall supply the internet service connection, Contractor supplied modem, associated hardware, Digital Camera(s), Smart Phones, Multifunction Laser Printer/Copier/Scanner, Conference Room Teleconferencing Equipment, associated hardware and software meeting the requirements of this specification, as well as the latest minimum specifications posted, as of the Project advertising date, at CTDOTs Construction Field Office Technology web site.

Within 10 calendar days after the signing of the Contract, but before ordering/purchasing the required Digital Camera(s), Smart Phones, Multifunction Laser Printer/Copier/Scanner, Teleconferencing Equipment, as well as associated hardware, the Contractor must submit a copy of their proposed order(s) with catalog cuts and specifications to the Administering CTDOT District for review and approval. The modem, digital cameras, smart phones, and Teleconferencing Equipment will be reviewed by CTDOT District personnel for approval. The Multifunction Laser Printer/Copier/Scanner will be reviewed by the CTDOT OIS. The Contractor shall not purchase the hardware, software, or services until the Administering CTDOT District informs them that the proposed equipment, software, and services are approved. The Contractor will be solely responsible for the costs of any hardware, software, or services purchased without approval.

The Contractor and/or their internet service provider shall be responsible for the installation, setup of the internet service connection and the configuration of the modem with a static IP address. Installation shall be coordinated with CTDOT District and Project personnel. Specifically, the Contractor shall supply the District with a Static IP Address, Subnet Mask Address and Gateway Address immediately upon establishment of internet service connection to assist with OIS equipment installation.

After the approval of the hardware and software, the Contractor shall contact the designated representatives of the CTDOT administering District, a minimum of 2 working days in advance of the proposed delivery or installation of the modem / Internet Service Connection, Digital Camera(s), Smart Phones, Multifunction Laser Printer/Copier/Scanner, Teleconferencing Equipment, as well as associated hardware, software, supplies, and support documentation. The hardware and cabling shall be installed in the field office to and at locations acceptable to the Engineer. Adequate electric service shall be supplied at all hardware and workstation locations to support the Department staff and hardware specified.

The Contractor shall provide all supplies, paper, maintenance, service, and repairs (including labor and parts) for the printer(s), copiers, field office Wi-Fi / internet service, and other equipment and facilities required by this specification for the duration of the Contract. All repairs of contractor supplied equipment and internet service must be performed with-in 48 hours. If the repairs require more than 48 hours, then an equal or better replacement must be provided.

Once the Contract has been completed, the Contractor supplied hardware and software will remain the property of the Contractor.

First Aid Kit: The Contractor shall supply a first aid kit adequate for the number of personnel expected based on the size of the field office specified and shall keep the first aid kit stocked for the duration that the field office is in service.

Rain Gauge: The Contractor shall supply, install and maintain a rain gauge for the duration of the Project, meeting these minimum requirements. The rain gauge shall be installed on the top of a post such that the opening of the rain gauge is above the top of the post an adequate distance to avoid splashing of rainwater from the top of the post into the rain gauge. The location of the rain gauge and post shall be approved by the Engineer. The rain gauge shall be made of a durable material and have graduations of 0.1 inches or less with a minimum total column height of 5 inches. If the rain gauge is damaged the Contractor shall replace it prior to the next forecasted storm event at no additional cost.

Electronic Level: The Contractor shall supply and maintain in working order, for the duration of the Contract, the number of electronic levels, identified in the Additional Equipment, Facilities and Services table of this specification. The electronic level(s) shall meet the following requirements:

A. 48-inch length, box beam type
B. IP65 water and dust proof
C. 0.1-degree accuracy
D. Backlit display
E. Carrying case included
F. New or like new condition

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 equipment.

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 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 T 119, Standard Test Method for Slump of Hydraulic-Cement Concrete.
D. T-handle concrete cylinder mold splitter.

All testing equipment will remain the property of the Contractor at the completion of the Project.

Insurance Policy: The Contractor shall provide a separate insurance policy, with no deductible, in the minimum amount of five thousand dollars ($5,000) 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 CTDOT shall be an additional named insured on the policy. Insured losses shall include, but not be limited to, theft, fire, and physical damage. The CTDOT will be responsible for all maintenance

costs of CTDOT owned computer hardware. In the event of loss, the Contractor shall provide replacement equipment in accordance with current CTDOT equipment specifications, within seven days of notice of the loss. If the Contractor is unable to provide the required replacement equipment within seven days, CTDOT 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, CTDOT will reimburse the Contractor for replacement costs exceeding the amount of the required coverage.

Maintenance: During field office occupancy by CTDOT, the Contractor shall maintain all facilities and furnishings provided under the above requirements, and shall maintain and keep the office quarters clean through the use of professional cleaning including vacuuming carpet, washing and waxing floors, cleaning restrooms, removal of trash, general cleaning, etc.

Exterior areas shall be mowed and clean of debris. A trash receptacle (dumpster) with weekly pickup (trash removal) shall be provided. Snow removal, sanding and salting of all parking, walkway, and entrance way areas shall be accomplished during a storm if on a workday during work hours, immediately after a storm and prior to the start of a workday. If snow removal, salting and sanding are not completed by the specified time, the State will provide the service and all costs incurred will be deducted from the next payment estimate.

Method of Measurement: The furnishing and maintenance of the Construction Field Office will be measured for payment by the number of calendar months that the office is in place and in operation, rounded up to the nearest month.

There will not be any price adjustment due to any change in the minimum computer related hardware and software requirements.

Basis of Payment: The furnishing and maintenance of the Construction Field Office will be paid for at the Contract unit price per month for "Construction Field Office, (Type)," which price shall include all material, equipment, labor, service contracts, licenses, software, repair or replacement of hardware and software, related supplies, utility services, parking area, external illumination, trash removal, snow and ice removal, and work incidental thereto, as well as any other costs to provide requirements specified herein.

Pay Item	Pay Unit
Construction Field Office, (Large)	Month

Date: 09/05/2025

ITEM NO. 0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

Article 9.71.01 – Description *is supplemented by the following:*

The Contractor shall maintain and protect traffic as shown on the contract plans and as described by the following and as limited in the special provision for Section 1.08 - Prosecution and Progress:

Route 70 and Oregon Road

The Contractor shall maintain and protect a minimum of 1 lane of traffic in each direction with each lane on a paved travel path not less than 11 feet in width during the periods outlined in section 01.08.04 of the contract special provisions.

During all other periods the following exceptions apply:

1. During the allowable periods and when the Contractor is actively working, the Contractor will be permitted to maintain and protect at least an alternating one-way traffic operation on a paved travel path not less than 11 feet in width and no more than 300 feet in length, unless specified elsewhere in the Contract. There shall be no more than one alternating one-way traffic operation within the Project limits without prior approval of the Engineer.

Commercial and Residential Driveways and Municipal Trails

The Contractor shall maintain access to and egress from all commercial and residential driveways and the Qunnipiac River Gorge Trail throughout the Project limits. The Contractor will be permitted to temporarily close affected driveways while actively working with coordination and permission from the owner or proprietor.

Blasting Operation

Blasting is not permitted.

Pedestrians:

The Contractor shall provide and maintain clear pedestrian travel paths (minimum 4 feet wide) on new or existing sidewalk or temporary walks on at least one side of the street at all times at the Project site.

If the Contractor proposes changes to the plans, or the Contract does not include plans, 30 days in advance of implementation, the Contractor shall submit plans and procedures to the Engineer for review. The submittal shall be in accordance with typical details of the Manual on Uniform Traffic Control Devices (MUTCD) for maintaining pedestrian sidewalk access during the reconstruction of the sidewalk. When a sidewalk or pedestrian route is closed, pedestrian traffic must be detoured or temporary sidewalk must be provided. Pedestrian detours and temporary sidewalks must meet ADA requirements. The appropriate signs for the pedestrian detour shall be installed in accordance with the MUTCD. All approaches to the closed sidewalks shall be blocked by Pedestrian Barricade with Sidewalk Closed signs. Temporary bituminous sidewalk and ramps, if required, will be paid under Contract Item "Temporary Pavement" and all pedestrian detour signage will be paid under Contract Item "Construction Signs."

When crosswalks or other pedestrian facilities are closed or relocated, temporary facilities shall

be detectable and shall include accessibility features consistent with the features present in the existing pedestrian facility. The Contractor shall furnish and maintain MUTCD compliant temporary RRFB (Rectangular Rapid Flashing Beacon) systems on both sides of temporary crosswalks through the duration of construction. RRFB units shall be push button actuated and display crosswalk signing and flashing beacons in both directions on both sides of the road, signing shall be as shown on the M&PT (Maintenance and Protection of Traffic) plans or as directed by the Engineer. Pedestrian traffic signal displays controlling closed crosswalks shall be covered or deactivated.

Pedestrians shall be detoured to existing crosswalks, or temporary crosswalks, which shall be located at intersections. If this is not possible, temporary midblock crosswalks may be installed, if directed by the Engineer. On-street parking shall be restricted for at least 50 feet in advance of any temporary crosswalk.

General

Unpaved travel paths will only be permitted for areas requiring full depth and full width reconstruction. The unpaved section shall be the full width of the road and shall be perpendicular to the travel lanes. The Contractor will be allowed to maintain traffic on processed aggregate for a duration not to exceed 10 calendar days and opposing traffic lane dividers shall be used as a centerline.

The Contractor is required to delineate any raised structures within the travel lanes, so that the structures are visible day and night, unless there are specific Contract plans and provisions to temporarily lower these structures prior to the completion of work.

The Contractor shall schedule operations so that pavement removal and roadway resurfacing shall be completed full width across a roadway or bridge section by the end of a work shift, or as directed by the Engineer.

When the installation of all intermediate courses of bituminous concrete pavement is completed for the entire roadway, the Contractor shall then install the final course of bituminous concrete pavement.

When the Contractor is excavating adjacent to the roadway, the Contractor shall provide a 3 foot shoulder between the work area and travel lanes, with traffic drums spaced every 50 feet. At the end of the work shift if the vertical drop-off exceeds 3 inches, the Contractor shall provide a temporary bituminous concrete traversable slope of 4:1 or flatter that is acceptable to the Engineer.

The Contractor, during the course of any active overhead construction work, shall close the lanes directly below the work area for the entire length of time overhead work is being undertaken.

At no time shall an overhead sign be left partially removed or installed.

When an existing sign is to be relocated or replaced, the work shall be completed during the same work shift.

The field installation of a signing pattern shall constitute interference with existing traffic operations and shall not be allowed, except during the allowable periods.

On limited-access highways, construction vehicles entering travel lanes shall not be allowed without a lane closure. The lane closure shall be of sufficient length to allow vehicles to enter or exit the work area at the posted speed limit, in order to merge with existing traffic.

Existing Signing

The Contractor shall maintain all existing overhead and side-mounted signs within the Project limits throughout the duration of the Project. The Contractor shall temporarily relocate signs and sign supports as many times as deemed necessary, and shall install temporary sign supports if necessary and as directed by the Engineer.

Requirements for Winter

The Contractor shall schedule a meeting with representatives of the Department, including the offices of Maintenance and Traffic, and the Town/City to determine any interim traffic control measures the Contractor shall accomplish prior to winter to provide safety to motorists and permit adequate snow removal procedures. This meeting shall be held prior to October 31 of each year and will include, but not be limited to, discussion of the status and schedule of the following items: lane and shoulder widths, pavement restoration, traffic signal work, pavement markings, and signing.

Signing Patterns

The Contractor shall erect and maintain all signing patterns in accordance with the traffic control plans contained herein. Proper distances between advance warning signs and proper taper lengths are mandatory.

Pavement Markings - Non-Limited Access Roadways

During construction, the Contractor shall maintain all pavement markings on paved surfaces on all roadways throughout the limits of the Project.

Temporary pavement markings shall be installed on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work shift.

Permanent Epoxy Resin Pavement Markings shall be installed on the final course of bituminous concrete pavement within 10 calendar days of the final pavement installation if no Pavement Marking Grooves are proposed.

Temporary Pavement Markings

Temporary pavement markings that will be in place for less than 72 continuous hours may consist of temporary plastic pavement marking tape at the Contractor's expense. Additionally;

1. These temporary pavement markings shall include centerlines, lane lines (solid and broken), and stop bars.
2. Centerlines shall consist of two 4 inch wide yellow markings, 2 feet in length, side by side, 4 inches apart, at 40 foot intervals.
3. Lane lines shall consist of 4 inch wide white markings, 2 feet in length, at 40 foot intervals.
4. No passing zones shall be posted with signs in those areas where the final centerlines have not been established on two-way roadways.
5. Stop bars may consist of two 6 inch wide white markings or three 4 inch wide white markings placed side by side.
6. The temporary plastic pavement marking tape shall be installed in accordance with Section 12.12.
7. The Contractor shall remove and dispose of the temporary plastic pavement marking tape prior to another course of bituminous concrete pavement being installed.

Temporary pavement markings that will be in place for 72 continuous hours or more should consist of temporary painted pavement markings and shall be installed in accordance with Section 12.09. The markings shall include centerlines, edge lines, lane lines (solid and broken), lane-use arrows, and stop bars on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work shift Edge lines and lane-use arrows are not required if the next course of bituminous concrete pavement will be placed within 10 calendar days.

All temporary pavement markings exposed throughout the winter shall be Epoxy Resin Pavement Markings, unless directed otherwise by the Engineer.

Temporary pavement markings, as described above, shall be maintained until the permanent pavement markings are installed.

Final Pavement Markings

Refer to Pavement Marking Groove special provisions for pavement marking requirements. Permanent epoxy resin pavement markings shall be installed in accordance with Section 12.10 and the applicable Traffic Engineering Standard Drawings.

If Temporary Plastic Pavement Marking Tape is installed, then the Contractor shall remove and dispose of these markings during the same work shift that the permanent epoxy resin pavement markings are to be installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

Traffic Control During Construction Operations

The following guidelines shall assist field personnel in determining when and what type of traffic control patterns to use for various situations. These guidelines shall provide for a safer and more efficient movement of traffic through work zones and enhance the safety of work forces in the work area.

Traffic Control Patterns

Traffic control patterns shall be used when a work operation requires that all or part of any vehicle or work area protrudes onto any part of a travel lane or shoulder or is within the clear zone. For each situation, the installation of traffic control devices shall be based on the following:

- Speed and volume of traffic.
- Duration of operation.
- Exposure to hazards.

Traffic control patterns shall be uniform, neat, and orderly in order to command respect from the motorist.

Lane reduction tapers should be placed so that the entire length of the taper is installed on a tangent section of roadway and the entire taper area can be seen by the motorist.

All existing conflicting signs shall be removed, covered with an opaque material, or turned so that they are not legible to oncoming traffic prior to implementing a traffic control pattern. The existing signs shall be uncovered or reinstalled once the pattern is removed.

A buffer area should be provided during installation of a traffic control pattern and maintained for the duration of the work. The buffer area shall be free of any equipment, workers, materials, and parked vehicles.

Construction Traffic Control Plans 19 through 25 should be used for moving operations such as line striping, rumble strips, pothole patching, mowing, or sweeping when it is necessary for equipment to occupy a travel lane.

Traffic control patterns are not required for vehicles on an emergency patrol type activity or for a short duration stop of up to one hour, as long as the equipment is contained within the shoulder. Flashing lights, arrow boards, truck-mounted or trailer-mounted impact attenuators, and appropriate Trafficperson(s) shall be used when required.

In a situation not adequately covered by the Construction Traffic Control Plans, the Contractor shall contact the Engineer for assistance prior to setting up a traffic control pattern.

Placement of Signs

Signs shall be placed in a position that allows motorists the opportunity to reduce their speed prior to the work area. Signs shall be installed on the same side of the roadway as the work area. On multi-lane divided highways, advance warning signs shall be installed on both sides of the highway. On directional roadways (on-ramps, off-ramps, one-way roads) where the sight distance to signs is restricted, these signs should be installed on both sides of the roadway.

Allowable Adjustment of Signs and Devices Shown on the Construction Traffic Control Plans

The Construction Traffic Control Plans contained herein show the location and spacing of signs and devices under ideal conditions. Signs and devices should be installed as shown on these plans.

The proper application of the Construction Traffic Control Plans and installation of traffic control devices is dependent upon actual field conditions.

In the case of a horizontal or vertical sight restriction in advance of the work area, the traffic control pattern shall be extended to provide adequate sight distance for approaching traffic.

Adjustments to the Construction Traffic Control Plans shall only be made at the direction of the Engineer.

Table 1 indicates the minimum taper lengths required for a lane closure based on the posted speed limit and lane width of the roadway. These taper lengths shall only be used when the recommended taper lengths shown on the Construction Traffic Control Plans cannot be achieved.

Table 1 – Minimum Taper Length

POSTED SPEED LIMIT (MPH)	MINIMUM TAPER LENGTH FOR A SINGLE LANE CLOSURE (FEET)	
	FREEWAYS	SECONDARY ROADS
30 OR LESS	180	165
35	245	225
40	320	295
45	540	495
50	600	550
55	660	605
65	780	715

1. Work Zone Safety Meetings

1.a) Prior to the commencement of work, a Work Zone Safety Meeting shall be conducted with representatives from DOT Construction, Connecticut State Police (Local Barracks), Municipal Police, the Contractor (Project Superintendent) and the Traffic Control Subcontractor (if different than the prime Contractor) to review the traffic operations, lines of responsibility, and operating guidelines which will be used on the Project. DOT Traffic Engineering shall be invited to the Work Zone Safety Meeting. Other Work Zone Safety Meetings during the course of the Project should be scheduled as needed.

1.b) A Work Zone Safety Meeting Agenda shall be developed and used at the Meeting to outline the anticipated traffic control issues during the construction of this Project. Any issues that can't be resolved at these Meetings will be brought to the attention of the District Engineer and the Office of Construction. The agenda shall include:

i. Review Project scope of work and time;
ii. Review Section 1.08, Prosecution and Progress;
iii. Review Section 9.70, Trafficpersons;
iv. Review Section 9.71, Maintenance and Protection of Traffic;
v. Review Contractor's schedule and method of operations;
vi. Review special concern areas: ramps, turning roadways, medians, lane drops, etc.;
vii. Open discussion of work zone questions and issues;
viii. Discussion of review and approval process for changes in Contract requirements as they relate to work zone areas.

2. General

2.a) Traffic control patterns shall only be installed if the required minimum number of signs, traffic cones, traffic drums, and other equipment (i.e. one Arrow Board for each lane closed, two Truck-Mounted or Trailer-Mounted Attenuators (TMAs), Changeable Message Sign, etc.) are on Site.

2.b) The Contractor shall have spare maintenance and protection of traffic equipment (TMAs, Arrow Board, Changeable Message Sign(s), construction signs, traffic cones, traffic drums, etc.) available at all times in case of mechanical failures, etc. Spare maintenance and protection of traffic equipment installed as a result of a sudden equipment breakdown shall be replaced by the Contractor within 24 hours.

2.c) Failure of the Contractor to have the required minimum number of signs, personnel, and equipment, which results in the pattern not being installed, shall not be a reason for a time extension or claim for lost time.

2.d) In cases of differences of opinion between the Contractor and the Inspection staff, the Contractor shall follow the directions of the Engineer. The matter shall be brought to the District Office for resolution immediately or, in the case of work after regular business hours, on the next business day.

3. Installing and Removing Traffic Control Patterns

3.a) Lane closures shall be installed beginning with the advance warning signs and proceeding forward toward the work area.

3.b) Lane closures shall be removed in the reverse order, beginning at the end of the work area, or traffic control pattern, and proceeding back toward the advance warning signs.

3.c) Stopping traffic may be allowed within the allowable hours stated in Section 1.08.04:

i. For those activities stated within the Contract.

ii. During paving, milling operations, or similar activities where, in the middle of the operation, it is necessary to flip the pattern to complete the operation on the other half of the roadway so traffic does not travel across the longitudinal joint or difference in roadway elevation.

iii. To move slow moving equipment across live traffic lanes into the work area.

3.d) The Contractor shall adhere to using the proper signs, placing the signs correctly, and ensuring the proper spacing of signs.

3.e) Additional devices are required on entrance ramps, exit ramps, and intersecting roads to warn and/or move traffic into the proper travel path prior to merging with or exiting from the mainline traffic. This shall be completed before installing the mainline pattern past the ramp or intersecting roadway.

3.f) Workers are prohibited from crossing the travel lanes on limited access roadways to install and remove signs or other devices on the opposite side of the roadway. Any signs or devices on the opposite side of the roadway shall be installed and removed separately.

4. Implementation of Rolling Road Block (RRB)

4.a) Temporary road closures using a RRB may be allowed on limited access highways for operations associated with the installation and removal of temporary lane closures. RRB may be allowed for the installation and removal of lead signs and lane tapers only and shall meet the following requirements:

i. Refer to the Limitation of Operations Chart provided in Section 1.08.04 for the hours allowed for implementing a RRB operation. The Contractor shall only implement a RRB operation within the hours shown in the Chart.

ii. In areas with good sight lines and full shoulders, signs on the side of the road opposite the traffic pattern should be installed in a separate operation.

iii. TMAs equipped with Arrow Boards shall be used to slow traffic to implement the RRB. State Police Officers in marked vehicles may be used to support the implementation of the RRB. The RRB shall start by having all vehicles, including TMAs and police vehicles, leave the shoulder or on-ramp and accelerate to normal roadway speeds in each lane. The vehicles will then position themselves side by side and decelerate to the RRB speed on the highway.

iv. A Pre-Warning Vehicle, as specified elsewhere in the Contract, shall be used to advise the motorists that sign pattern installation or removal is underway.

v. The RRB duration shall not exceed 15 minutes from the start of the traffic block until all lanes are opened as designated in the Limitation of Operations chart. If the RRB duration exceeds 15 minutes on 2 successive shifts, no further RRB will be allowed until the Contractor obtains approval for a revised installation procedure from the District.

vi. RRB shall not be used to expand a lane closure pattern to an additional lane during the shift. The workers and equipment required to implement the additional lane closure should be staged from within the closed lane. TMAs (and State Police if available) shall be used to protect the workers installing the taper in the additional lane.

vii. Exceptions to these work procedures may be submitted to the District Office for consideration. A minimum of 2 business days shall be allowed for review and comment by the District.

viii. The Engineer and the Contractor will review and discuss the RRB procedures (including any revisions) in advance of the work. The implementation of the agreed upon plan will be reviewed with the State Police during the Work Zone Safety Meeting held before each shift involving temporary lane closures. If the State Police determine that alternative procedures should be implemented for traffic control during the work shift, the Department and Contractor will attempt to resolve any discrepancies with the duty sergeant at the Troop. If the discrepancies are unable to be resolved prior to the start of the shift, then the work will proceed as recommended by the Department. Any unresolved issues shall be addressed the following day.

5. Use of Arrow Boards

5.a) On limited access roadways, one Arrow Board shall be used for each lane that is closed. The Arrow Board shall be installed concurrently with the installation of the traffic control pattern and its placement shall be as shown on the Construction Traffic Control Plans. Additional Arrow Boards shall be deployed if sight distances are limited.

5.b) On non-limited access roadways, the use of an Arrow Board for lane closures is optional. The roadway geometry, sight distance, and traffic volume shall be considered in the decision to use the Arrow Board.

5.c) A vehicle displaying an arrow board shall be equipped with high-intensity rotating, flashing, oscillating, or strobe lights.

5.d) The flashing arrow mode shall be used for lane closure (merge) tapers.

5.e) The flashing arrow mode shall not be used for temporary alternating one-way traffic operations or to laterally shift lanes of traffic.

5.f) The flashing double arrow mode shall only be used for closing a center lane on a multilane roadway where adjacent left and right lanes remain open.

5.g) For shoulder work or roadside work near the shoulder, the Arrow Board shall be positioned in the shoulder and the flashing alternating diamond mode should be used.

5.h) The flashing alternating diamond caution mode should also be used when supplemental Arrow Boards are positioned in an already closed lane.

6. Use of Truck-Mounted or Trailer-Mounted Impact Attenuators (TMAs)

6.a) On limited access roadways, lane closures shall use a minimum of two TMAs to install and remove traffic control patterns. If two TMAs are not available, then the pattern shall not be installed.

6.b) On non-limited access roadways, the use of TMAs to install and remove patterns closing a lane(s) is optional. The roadway geometry, sight line distance, and traffic volume shall be considered in the decision to utilize the TMAs.

6.c) On limited access roadways, one TMA shall be placed on the shoulder and the second TMA shall be approximately 1,000 feet ahead blocking the lane to establish the advance and transition signing. The Arrow Board mounted on the TMA shall be in the arrow mode when taking the lane. The sign truck and workers shall be at sufficient distance ahead of the second TMA. In no case shall the TMA be used as the sign truck or a work truck. Once the transition is in place, the TMAs shall travel in the closed lane until all Portable Changeable Message Signs, signs, Arrow Boards, and cones/drums are installed. The Arrow Board mounted on the TMA should be in the flashing alternating diamond caution mode when traveling in the closed lane.

6.d) A TMA shall be placed prior to the first work area in the pattern. If there are multiple work areas within the same pattern, then additional TMAs shall be positioned at each additional work area as needed. The Arrow Board mounted on the TMA should be in the flashing alternating diamond caution mode when in the closed lane.

6.e) TMAs shall be positioned a sufficient distance prior to the workers or equipment being protected to allow for appropriate vehicle roll-ahead in the event that the TMA is hit, but not so far that an errant vehicle could travel around the TMA and into the work area. For additional placement and use details, refer to Section 18.06. Some operations, such as paving and concrete repairs, do not allow for placement of the TMA(s) within the specified distances. In these situations, the TMA(s) shall be placed at the beginning of the work area and shall be advanced as the paving or concrete operations proceed.

6.f) TMAs will be paid for in accordance with how the unit is used. If it is used as a TMA and is in the proper location as specified, then it will be paid for at the specified hourly rate for Truck-Mounted or Trailer-Mounted Impact Attenuator. When the TMA is used as an

Arrow Board, it will be paid for at the daily rate for Arrow Board. If a TMA is used to install and remove a pattern and is also used as an Arrow Board in the same day, then the unit will be paid for as a Truck-Mounted or Trailer-Mounted Impact Attenuator for the hours used to install and remove the pattern, typically 2 hours (1 hour to install and 1 hour to remove). If the TMA is also used as an Arrow Board during the same day, then the unit will only be paid for at the daily rate as an Arrow Board.

7. Use of Traffic Drums and Traffic Cones

7.a) On limited-access highways, ramps, and turning roadways:

i. Traffic drums shall be used for taper channelization.
ii. Traffic drums shall be used to delineate raised catch basins and other hazards.
iii. Traffic cones with a minimum height of 42 inches may be used in place of drums in the tangent section of a closed lane or shoulder.
iv. Traffic cones less than 42 inches in height shall not be used.

7.b) On all roadways:

i. Traffic drums shall be used in place of traffic cones in traffic control patterns that are in effect for more than a 36-hour duration.
ii. Traffic cones shall not be left unattended.
iii. Traffic cones with a minimum height of 42 inches shall be used when the posted speed limit is 45 MPH or above.

7.c) Typical spacing of traffic drums and/or cones shown on the Construction Traffic Control Plans in the Contract are maximum spacings and may be reduced to meet actual field conditions as required.

8. Use of Barricade Warning Lights

8.a) Barricade Warning Lights may be installed on channelizing devices when used in a merge taper. The Barricade Warning Lights shall flash in a sequential pattern when used in a merge taper. The successive flashing shall occur from the upstream end (beginning) of the merge taper to the downstream end (end) of the merge taper.

8.b) Type C Barricade Warning Lights may be used at night to delineate the edge of the travel way.

c) Type B Barricade Warning Lights shall be used on post-mounted advanced warning signs.

9. Use of Portable Changeable Message Signs (PCMS)

9.a) On limited access roadways, one PCMS shall be used in advance of the traffic control pattern for all lane closures. Prior to installing the pattern, the PCMS shall be installed and in operation, displaying the appropriate lane closure information. The PCMS shall be positioned ½ to 1 mile ahead of the start of the lane closure taper. If the distance to the nearest exit ramp is greater than the specified ½ to 1 mile distance, then an additional PCMS shall be positioned a sufficient distance ahead of the

exit ramp (and before the previous on-ramp where practical) to alert motorists to the work and therefore offer them an opportunity to take the exit.

9.b) On non-limited access roadways, the use of PCMS for lane closures is optional. The roadway geometry, sight line distance, and traffic volume shall be considered in the decision to use the PCMS.

9.c) PCMS should be placed off the shoulder of the roadway and behind a traffic barrier, if practical. Where a traffic barrier is not available to shield the PCMS, it should be placed off the shoulder and outside of the clear zone. If a PCMS has to be placed on the shoulder of the roadway or within the clear zone, it should be placed on the paved shoulder with a minimum of five traffic drums placed in a taper in front of it to delineate its position. The taper shall meet minimum distance requirements for a shoulder closure. The PCMS shall be protected if it is used for a continuous duration of 36 hours or more.

9.d) The PCMS shall be removed from the clear zone and have the display screen cleared and turned 90 degrees away from the roadway when the PCMS is no longer required.

9.e) The PCMS should not be used within 1,000 feet of an existing PCMS or Variable Message Sign (VMS).

9.f) A PCMS message shall:

i. consist of no more than two phases;
ii. contain no more than three lines of text per phase;
iii. have no more than eight characters per line, including spaces.

9.g) The PCMS should be used for specific situations that need to command the motorist's attention which cannot be conveyed with standard construction signs. The PCMS should not be used for generic messages (ex.: Road Work Ahead, Bump Ahead, Gravel Road, etc.) or for messages that need to be displayed for long periods of time, such as during stage construction. These types of messages should be displayed with construction signs. Special signs shall be coordinated with the Office of Construction and the Division of Traffic Engineering for the proper layout/dimensions required.

9.h) Typical messages that are allowed on the PCMS are shown below. Approval must be received from the Office of Construction for any message(s) different than the typical messages shown in Figure 1.

9.i) All messages shall comply with the information provided in Tables 2 and 3.

Message No.	Phase 1	Phase 2	Message No.	Phase 1	Phase 2
1	LEFT LANE CLOSED	MERGE RIGHT	9	LANES CLOSED AHEAD	REDUCE SPEED
2	2 LEFT LANES CLOSED	MERGE RIGHT	10	LANES CLOSED AHEAD	USE CAUTION
3	LEFT LANE CLOSED	REDUCE SPEED	11	EXIT XX CLOSED	USE EXIT YY
4	2 LEFT LANES CLOSED	REDUCE SPEED	12	EXIT XX CLOSED USE YY	FOLLOW DETOUR
5	RIGHT LANE CLOSED	MERGE LEFT	13	2 LANES SHIFT AHEAD	USE CAUTION
6	2 RIGHT LANES CLOSED	MERGE LEFT	14	3 LANES SHIFT AHEAD	USE CAUTION
7	RIGHT LANE CLOSED	REDUCE SPEED			
8	2 RIGHT LANES CLOSED	REDUCE SPEED			

Figure 1: Typical PCMS Messages

Table 2: Acceptable Abbreviations

Word Message	Standard Abbreviation	Word Message	Standard Abbreviation
Access	ACCS	Minimum	MIN
Afternoon / Evening	PM	Minor	MNR
Ahead	AHD	Minute(s)	MIN
Alternate	ALT	Monday	MON
Avenue	AVE, AV	Morning / Late Night	AM
Bicycle	BIKE	Mount	MT
Blocked	BLKD	Mountain	MTN
Boulevard	BLVD	National	NATL
Bridge	BR	Normal	NORM
CB Radio	CB	North	N
Center	CTR	Northbound	NBND
Center	CNTR	Oversized	OVRSZ
Chemical	CHEM	Parking	PKING
Circle	CIR	Parkway	PKWY
Compressed Natural Gas	CNG	Pavement	PVMT
Condition	COND	Pedestrian	PED
Congested	CONG	Place	PL
Construction	CONST	Pounds	LBS
Court	CT	Prepare	PREP
Crossing	XING	Quality	QLTY
Crossing (other than highway-rail)	XING	Right	RT
Downtown	DWNTN	Road	RD
Drive	DR	Roadwork	RDWK
East	E	Route	RT, RTE
Eastbound	EBND	Saint	ST
Electric Vehicle	EV	Saturday	SAT
Emergency	EMER	Service	SERV
Entrance, Enter	ENT	Shoulder	SHLDR
Exit	EX	Slippery	SLIP
Express	EXP	South	S
Expressway	EXPWY	Southbound	SBND
Feet	FT	Speed	SPD
Freeway	FRWY, FWY	State, county, or other non-US or non-Interstate numbered route	[Route Abbreviation determined by highway agency]**
Friday	FRI	Street	ST
Frontage	FRNTG	Sunday	SUN
Hazardous	HAZ	Telephone	PHONE
Hazardous Material	HAZMAT	Temporary	TEMP
High Occupancy Vehicle	HOV	Terrace	TER

Highway	HWY	Thruway	THWY
Highway-Rail Grade Crossing	RR XING	Thursday	THURS
Hospital	HOSP	Tons of Weight	T
Hour(s)	HR, HRS	Traffic	TRAF
Information	INFO	Trail	TR
International	INTL	Travelers	TRVLRS
Interstate	I-	Tuesday	TUES
Junction / Intersection	JCT	Turnpike	TPK
Lane	LN	Two-Way Intersection	2-WAY
Left	LFT	Two-Wheeled Vehicles	CYCLES
Liquid Propane Gas	LP-GAS	Upper	UPR
Local	LOC	US Numbered Route	US
Lower	LWR	Vehicle(s)	VEH, VEHS
Maintenance	MAINT	Warning	WARN
Major	MAJ	Wednesday	WED
Maximum	MAX	West	W
Mile(s)	MI	Westbound	WBND
Miles Per Hour	MPH		

** A space and no dash shall be placed between the abbreviation and the number of the route.

Table 3: Unacceptable Abbreviations

Unacceptable Abbreviation	Intended Word	Common Misinterpretation
ACC	Accident	Access (Road)
CLRS	Clears	Colors
DLY	Delay	Daily
FDR	Feeder	Federal
L	Left	Lane (Merge)
LT	Light (Traffic)	Left
PARK	Parking	Park
POLL	Pollution (Index)	Poll
RED	Reduce	Red
STAD	Stadium	Standard
WRNG	Warning	Wrong

10. Use of State Police Officers

10.a) State Police may be used only on limited access highways and secondary roadways that are under their primary jurisdiction. A minimum of one Officer may be used per critical sign pattern; however, a State Police presence is not required. Shoulder closures and right lane closures can generally be implemented without the presence of a State Police Officer. Left lane closures may also be implemented without State Police presence in areas with only moderate traffic and wide, unobstructed medians. It may be desirable to have a State Police presence, when available, under specific situations, such as nighttime lane closures; left lane closures with minimal width for setting up advance signs and staging; lane and shoulder closures on turning roadways/ramps or mainline where sight distance is minimal; and closures where extensive turning movements or traffic congestion regularly occur; however, they are not required.

10.b) If a State Police presence is provided, once the pattern is in place, the State Police Officer should be positioned in a non- hazardous location in advance of the pattern to provide advance warning to the motorist. If traffic backs up beyond the beginning of the pattern, then the State Police Officer shall reposition so that they are located prior to the backup. The State Police Officer should not be located immediately behind or within the roll ahead area of any TMA or within the work zone buffer area. The State Police Officer shall not be positioned in such a way that the State Police Officer obstructs any construction warning signs or PCMS from view of the motorist.

10.c) Other functions of the State Police Officer(s) may include:

i. Assisting construction vehicles entering and exiting the work area.
ii. Enforcement of motor vehicle laws within the work area, if specifically requested by the Engineer.

10.d) State Police Officers assigned to a work site shall take direction from the Engineer.

11. Equipment Operation and Protection on Parkways

11.a) The following roads are designated as Parkways in the State of Connecticut:

i. Route 15 (Merritt Parkway) - New York State Line, Greenwich to west begin of Housatonic River Bridge, Stratford
ii. Route 15 (Wilbur Cross Parkway) - West begin of Housatonic River Bridge, Stratford to begin overpass Interstate Route 91, Meriden
iii. State Route 796 (Milford Parkway - Officer Daniel S. Wasson, Milford Police Department, Connector) - United States Route 1 (Boston Post Road) to Route 15 (Wilbur Cross Parkway), Milford

11.b) All trucks using any road designated as a Parkway must be equipped with a lighting/signal system that shall be in operation continuously while on the Traveled Way, as follows:

i. Two (2) amber strobe type flashers, visible from the rear only.
ii. Two (2) reflectorized "slow moving vehicle triangles" 14 inches H x 16 inches W mounted on the rear of the vehicle.
iii. The lights must show the full overall width of the vehicle.
iv. Each light shall be mounted on a hinged or telescoping post, so that the center of the light will not be less than 10 feet above the ground in the operating position.

11.c) In accordance with Section 14-298-237(b) of the State Traffic Administration Regulations, the Engineer has the authority to allow the Contractor's trucks and equipment to travel over portions of the Parkway from which they are normally excluded. Prior to authorization the following must occur:

i. The Contractor shall provide the Engineer with a list of all trucks and equipment that will need to access the Parkway. The list shall include those truck and equipment specifications requested by the Engineer. The Engineer will contact the Department's Oversize/Overweight Permit Section at DOT.OSOWPermits@ct.gov to request a review of the Contractor's trucks and equipment to ensure they can safely travel on the Parkway to and from the work site. This will include verifying that any structures the trucks and equipment will have to travel under or traverse will have sufficient vertical clearance or weight carrying capacity. The Engineer shall inform the Contractor of the results of the review.
ii. The Contractor shall obtain oversize/overweight permits for any trucks and equipment requiring them as determined by the Oversize/Overweight Permit Section.
iii. The Engineer has inspected each vehicle and has found them to meet the specifications included within this section.

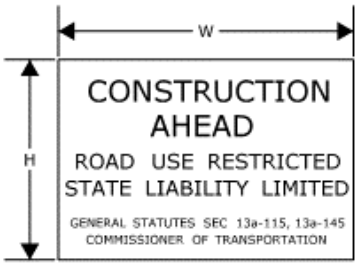
11.d) Each operator of such equipment shall be given instructions by the Contractor concerning the manner of operation while on the Parkway.

11.e) All vehicles shall be limited in travel between the nearest Parkway interchange and the work site.

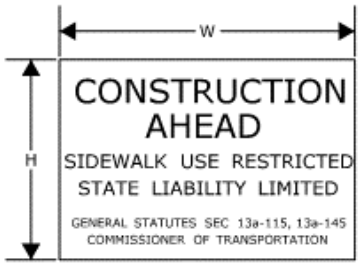
11.f) The Contractor will not be permitted to park equipment on the median strip and will not be permitted to cross the median strip without specific permission of the Engineer.

11.g) The Engineer reserves the right to revoke authorization if the Contractor fails to abide by the regulations herein prescribed.

SERIES 16 SIGNS



		W H
16-E	80-1605	84" x 60"
16-H	80-1608	60" x 42"
16-M	80-1613	30" x 24"



		W H
16-S	80-1619	48" x 30"

SIGN 16-S SHALL BE USED ON ALL PROJECTS THAT REQUIRE SIDEWALK RECONSTRUCTION OR RESTRICT PEDESTRIAN TRAVEL ON AN EXISTING SIDEWALK.

SERIES 16 SIGNS SHALL BE INSTALLED IN ADVANCE OF THE TRAFFIC CONTROL PATTERNS. SERIES 16 SIGNS SHOULD BE LOCATED TO ALLOW MOTORISTS THE OPPORTUNITY TO AVOID A WORK ZONE. SERIES 16 SIGNS SHOULD BE INSTALLED ON MAJOR INTERSECTING ROADWAYS THAT APPROACH THE WORK ZONE. ON LIMITED-ACCESS HIGHWAYS, THESE SIGNS SHOULD BE LOCATED IN ADVANCE OF THE NEAREST UPSTREAM EXIT RAMP AND ON ANY ENTRANCE RAMPS PRIOR TO OR WITHIN THE WORK ZONE LIMITS.

SIGNS 16-E AND 16-H SHALL BE POST-MOUNTED.

SIGN 16-E SHALL BE USED ON ALL FREEWAYS AND EXPRESSWAYS.

SIGN 16-H SHALL BE USED ON ALL RAMPS, OTHER STATE ROADWAYS AND MAJOR TOWN/CITY ROADWAYS.

SIGN 16-M SHALL BE USED ON OTHER TOWN ROADWAYS.

CONSTRUCTION TRAFFIC CONTROL PLAN
SERIES 16 SIGNS

SCALE: NONE

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Tracy L Fogarty Tracy L. Fogarty, P.E. 2013.10.09 16:30:32-04'00'
PRINCIPAL ENGINEER

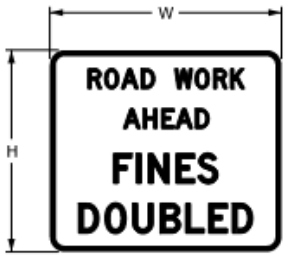
REGULATORY SIGN "ROAD WORK AHEAD FINES DOUBLED"

ROAD WORK AHEAD FINES DOUBLED SIGNS ARE REQUIRED AS DESCRIBED IN CONNECTICUT GENERAL STATUTE SECTION 14-212A.

THE REGULATORY SIGN "ROAD WORK AHEAD FINES DOUBLED" SHALL IN INSTALLED FOR ALL WORK ZONES THAT OCCUR ON ANY STATE HIGHWAY AND MUNICIPAL ROAD IN CONNECTICUT WHERE THERE ARE WORKERS PRESENT ON THE HIGHWAY.

THE "ROAD WORK AHEAD FINES DOUBLED" REGULATORY SIGN SHALL BE PLACED AFTER THE SERIES 16 SIGN AND IN ADVANCE OF THE "ROAD WORK AHEAD" SIGN.

	W	H
31-1906	48"	x 42"
31-1907	60"	x 54"

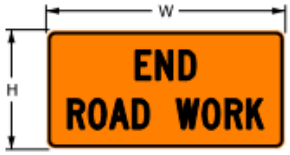


"END ROAD WORK" SIGN

END ROAD WORK SIGNS ARE REQUIRED AS DESCRIBED IN CONNECTICUT GENERAL STATUTE SECTION 14-212A.

THE LAST SIGN IN THE PATTERN SHALL BE THE "END ROAD WORK" SIGN.

	W	H
80-9611	36"	x 18"
80-9612	48"	x 24"



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

ROAD WORK AHEAD SIGNS

NOTES FOR TRAFFIC CONTROL PLANS

1. IF A TRAFFIC STOPPAGE OCCURS IN ADVANCE OF SIGN (A), THEN AN ADDITIONAL SIGN (A) SHALL BE INSTALLED IN ADVANCE OF THE STOPPAGE.

2. SIGNS (AA), (A), AND (D) SHOULD BE OMITTED WHEN THESE SIGNS HAVE ALREADY BEEN INSTALLED IN ADVANCE TO DESIGNATE A LARGER WORK ZONE THAN THE WORK ZONE THAT IS ENCOMPASSED ON THIS PLAN.

3. SEE TABLE 1 FOR ADJUSTMENT OF TAPERS IF NECESSARY.

4. TRAFFIC CONES AND PORTABLE CONSTRUCTION SIGNS SHALL NOT BE LEFT UNATTENDED.

5. ALL CONFLICTING SIGNS WITHIN THE LIMITS OF A ROADWAY / LANE CLOSURE AREA SHALL BE COVERED WITH AN OPAQUE MATERIAL WHILE THE CLOSURE IS IN EFFECT, AND UNCOVERED WHEN THE ROADWAY / LANE CLOSURE IS RE-OPENED TO ALL LANES OF TRAFFIC.

6. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 48 HOURS, THEN ANY EXISTING CONFLICTING PAVEMENT MARKINGS SHALL BE ERADICATED OR COVERED, AND TEMPORARY PAVEMENT MARKINGS THAT DELINEATE THE PROPER TRAVELPATHS SHALL BE INSTALLED.

7. DISTANCES BETWEEN SIGNS IN THE ADVANCE WARNING AREA MAY BE REDUCED TO 100' ON LOW-SPEED URBAN ROADS (SPEED LIMIT $\leqslant$ 40 MPH).

8. IF THIS PLAN IS TO REMAIN IN OPERATION FROM SUNSET TO SUNRISE, INSTALL BARRICADE WARNING LIGHTS - HIGH INTENSITY ON ALL POST-MOUNTED DIAMOND SIGNS IN THE ADVANCE WARNING AREA.

9. A PORTABLE CHANGEABLE MESSAGE SIGN SHALL BE INSTALLED ONE HALF MILE TO ONE MILE IN ADVANCE OF THE LANE CLOSURE TAPER.

10 SIGN (P) SHALL BE MOUNTED A MINIMUM OF 7 FEET FROM THE PAVEMENT SURFACE TO THE BOTTOM OF THE SIGN.

TABLE 1 - MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT (MILES PER HOUR)	MINIMUM TAPER LENGTH FOR A SINGLE LANE CLOSURE
30 OR LESS	180'
35	245'
40	320'
45	540'
50	600'
55	660'
65	780'

CONSTRUCTION TRAFFIC CONTROL PLAN

NOTES

SCALE: NONE

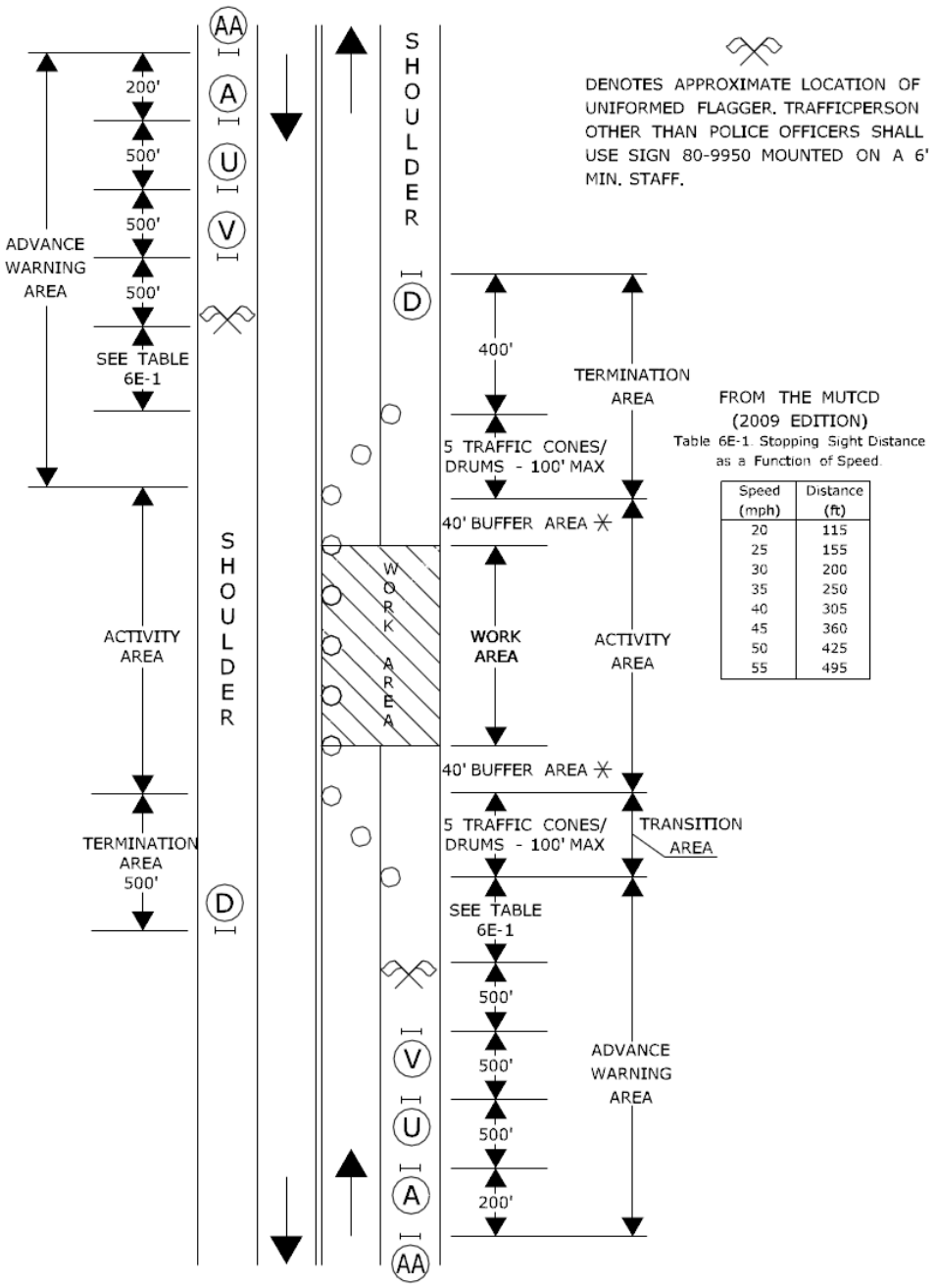
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Tracy L. Fogarty, P.E. 2019.09.13 08:47:47-04'00'

PRINCIPAL ENGINEER

Date: 09/05/2025

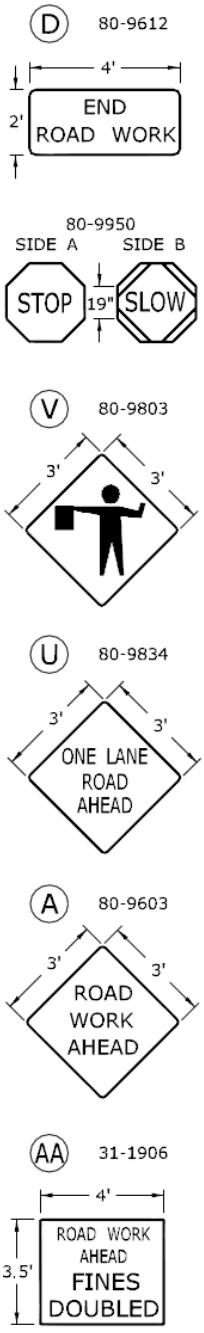
WORK IN TRAVEL LANE AND SHOULDER
TWO LANE HIGHWAY
ALTERNATING ONE-WAY TRAFFIC OPERATIONS



FROM THE MUTCD (2009 EDITION)
Table 6E-1 Stopping Sight Distance as a Function of Speed

Speed (mph)	Distance (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495

SIGN FACE
108 SQ. FT (MIN.)



TRAFFIC CONE **OR** TRAFFIC DRUM
OPTIONAL TRAFFIC DRUM PORTABLE SIGN SUPPORT
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 13 - SHEET 1 OF 2

SEE NOTES 1, 2, 4, 6, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.06.05 15:55:23-04'00'
PRINCIPAL ENGINEER

WORK IN TRAVEL LANE AND SHOULDER
TWO LANE HIGHWAY
ALTERNATING ONE-WAY TRAFFIC OPERATIONS

SIGN FACE
108 SQ. FT (MIN.)

HAND SIGNAL METHODS TO BE USED BY UNIFORMED FLAGGERS

THE FOLLOWING METHODS FROM SECTION 6E.07, FLAGGER PROCEDURES, IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES," SHALL BE USED BY UNIFORMED FLAGGERS WHEN DIRECTING TRAFFIC THROUGH A WORK AREA. THE STOP/SLOW SIGN PADDLE (SIGN NO. 80-9950) SHOWN ON THE TRAFFIC STANDARD SHEET TR-1220 01 ENTITLED, "SIGNS FOR CONSTRUCTION AND PERMIT OPERATIONS" SHALL BE USED.

A. TO STOP TRAFFIC

TO STOP ROAD USERS, THE FLAGGER SHALL FACE ROAD USERS AND AIM THE STOP PADDLE FACE TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. THE FREE ARM SHALL BE HELD WITH THE PALM OF THE HAND ABOVE SHOULDER LEVEL TOWARD APPROACHING TRAFFIC.



B. TO DIRECT TRAFFIC TO PROCEED

TO DIRECT STOPPED ROAD USERS TO PROCEED, THE FLAGGER SHALL FACE ROAD USERS WITH THE SLOW PADDLE FACE AIMED TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. THE FLAGGER SHALL MOTION WITH THE FREE HAND FOR ROAD USERS TO PROCEED.



C. TO ALERT OR SLOW TRAFFIC

TO ALERT OR SLOW TRAFFIC, THE FLAGGER SHALL FACE ROAD USERS WITH THE SLOW PADDLE FACE AIMED TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. TO FURTHER ALERT OR SLOW TRAFFIC, THE FLAGGER HOLDING THE SLOW PADDLE FACE TOWARD ROAD USERS MAY MOTION UP AND DOWN WITH THE FREE HAND, PALM DOWN.



◯ TRAFFIC CONE **OR** TRAFFIC DRUM
✳ OPTIONAL ⊗ TRAFFIC DRUM ⊢⊣ PORTABLE SIGN SUPPORT
⟵ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

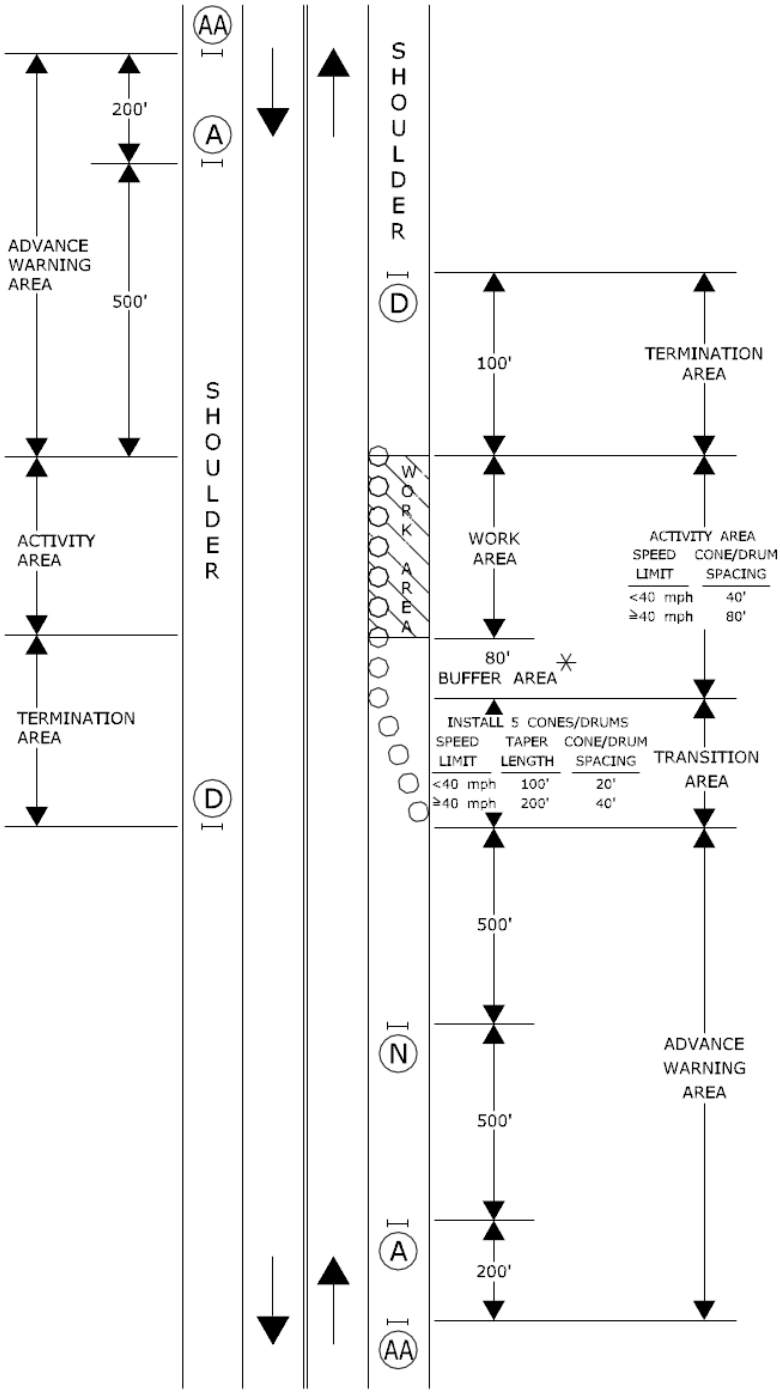
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 13 - SHEET 2 OF 2
SEE NOTES 1, 2, 4, 6, 7, 8

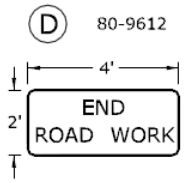
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

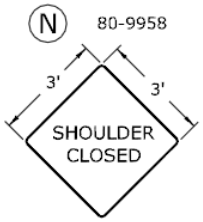
APPROVED Charles S. Harlow 2012.06.05 15:55:45-04'00'
PRINCIPAL ENGINEER

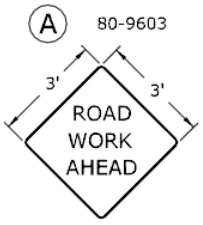
WORK IN SHOULDER - TWO LANE HIGHWAY

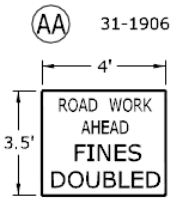
SIGN FACE
71 SQ. FT (MIN.)











◯ TRAFFIC CONE **OR** TRAFFIC DRUM
✳ OPTIONAL ⊗ TRAFFIC DRUM ⊢ PORTABLE SIGN SUPPORT
⟵ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 14

SEE NOTES 1, 2, 4, 7, 8

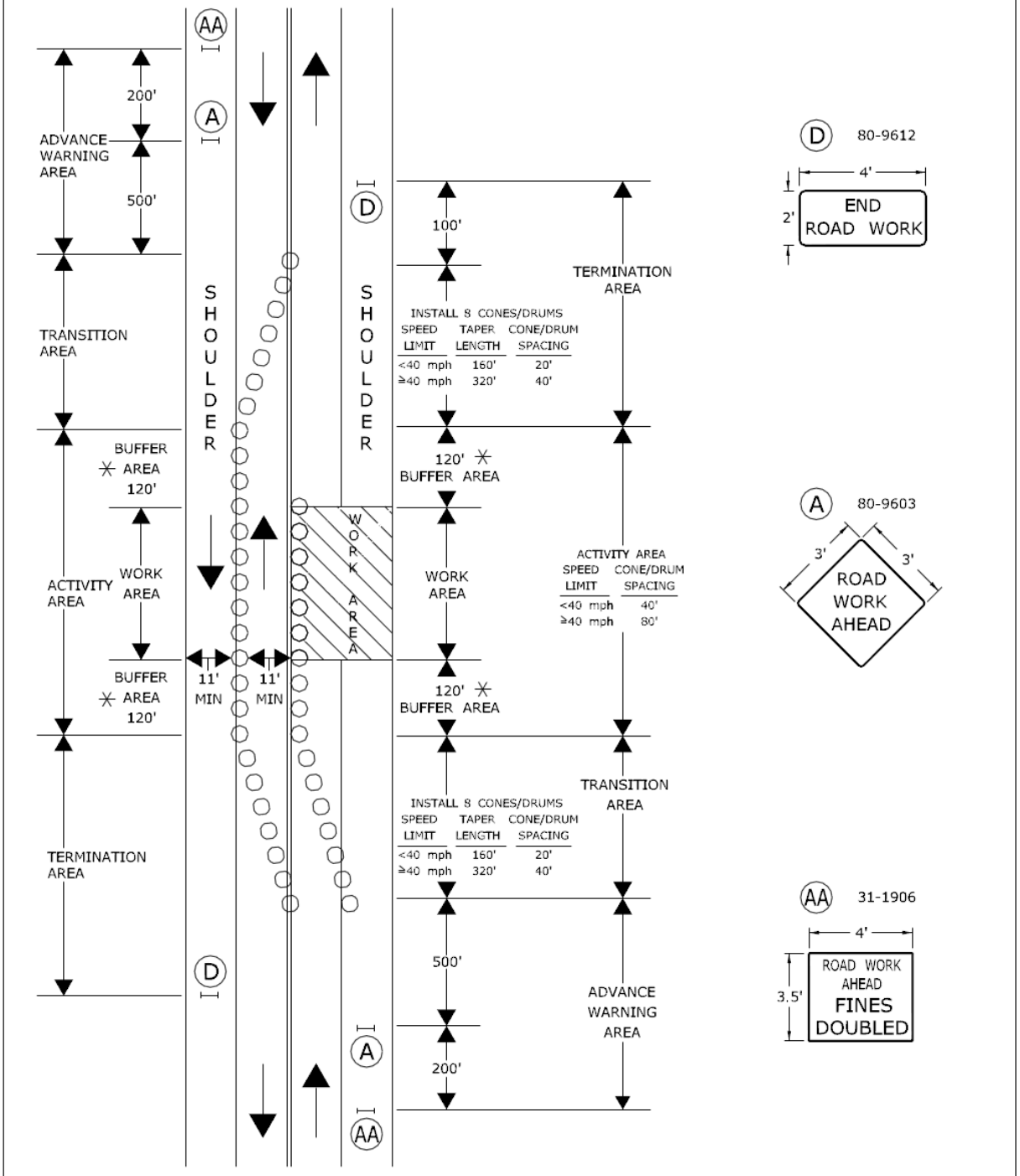
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.06.05 15:56:09-04'00'
PRINCIPAL ENGINEER

Date: 09/05/2025

WORK IN TRAVEL LANE AND SHOULDER
TWO LANE HIGHWAY

SIGN FACE
62 SQ. FT (MIN.)



TRAFFIC CONE **OR** TRAFFIC DRUM
OPTIONAL TRAFFIC DRUM PORTABLE SIGN SUPPORT
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 15

SEE NOTES 1, 2, 4, 6, 7, 8

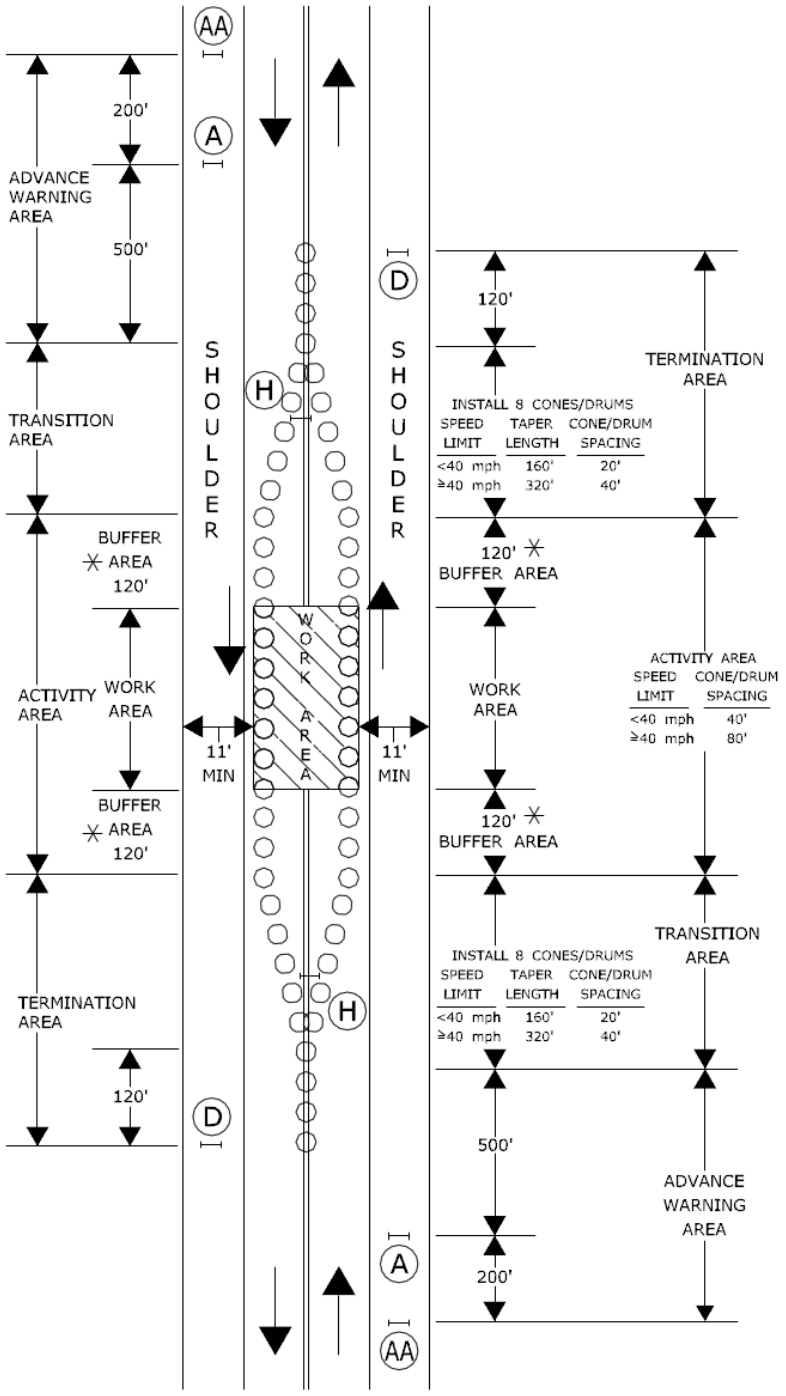
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

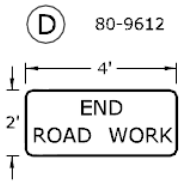
APPROVED Charles S. Harlow 2012.06.05 15:56:29-04'00'
PRINCIPAL ENGINEER

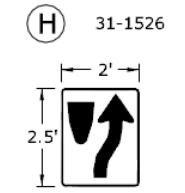
Date: 09/05/2025

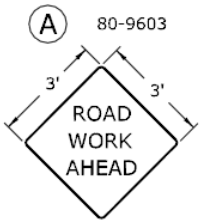
WORK IN MIDDLE OF ROADWAY
TWO LANE HIGHWAY

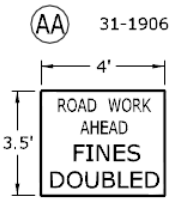
SIGN FACE
72 SQ. FT (MIN.)











◯ TRAFFIC CONE **OR** TRAFFIC DRUM
✳ OPTIONAL ⊗ TRAFFIC DRUM ⊢ PORTABLE SIGN SUPPORT
⇦ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

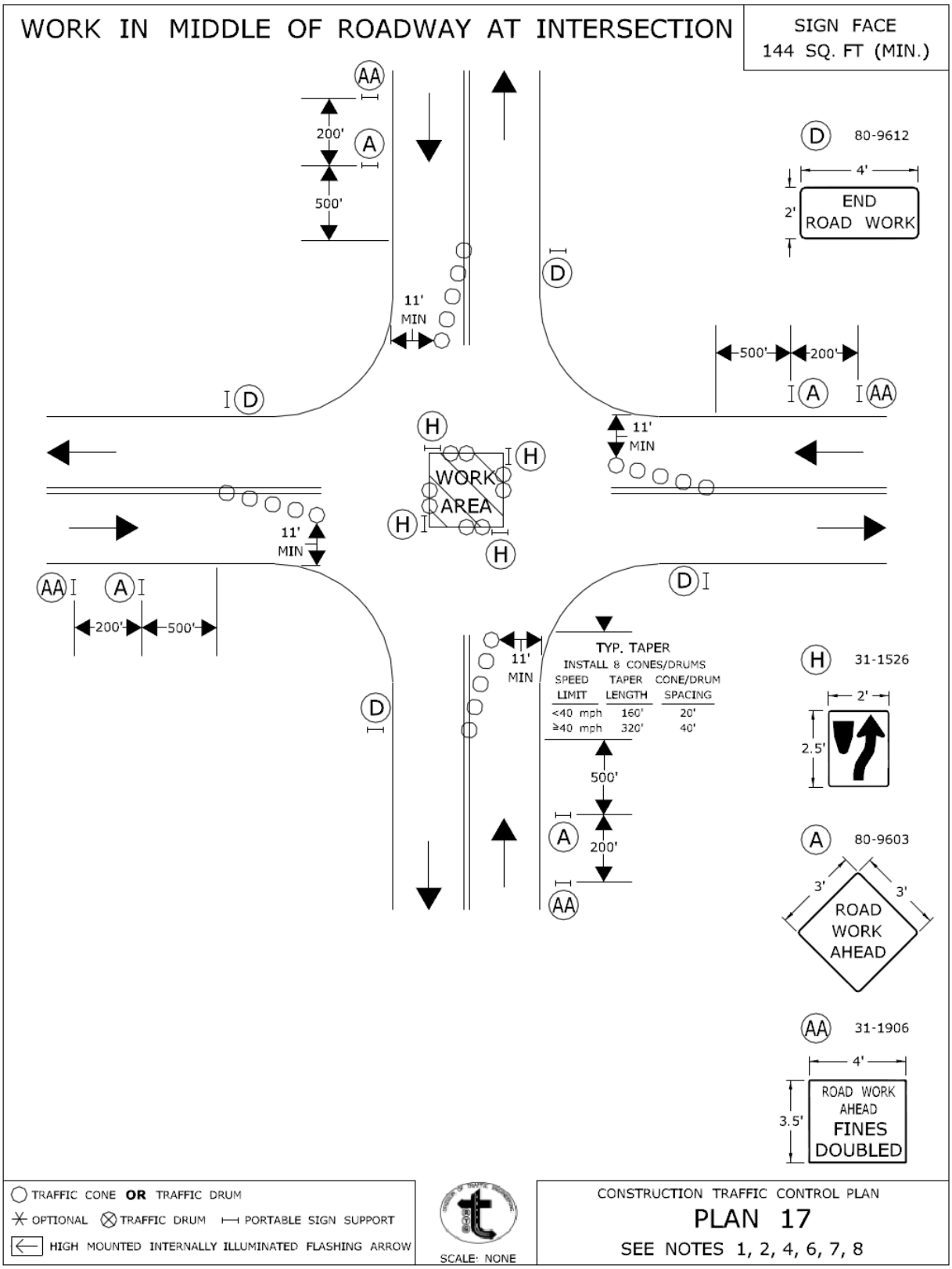
PLAN 16

SEE NOTES 1, 2, 4, 6, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED _____ PRINCIPAL ENGINEER
Charles S. Harlow
2012.06.05 15:56:51-04'00'

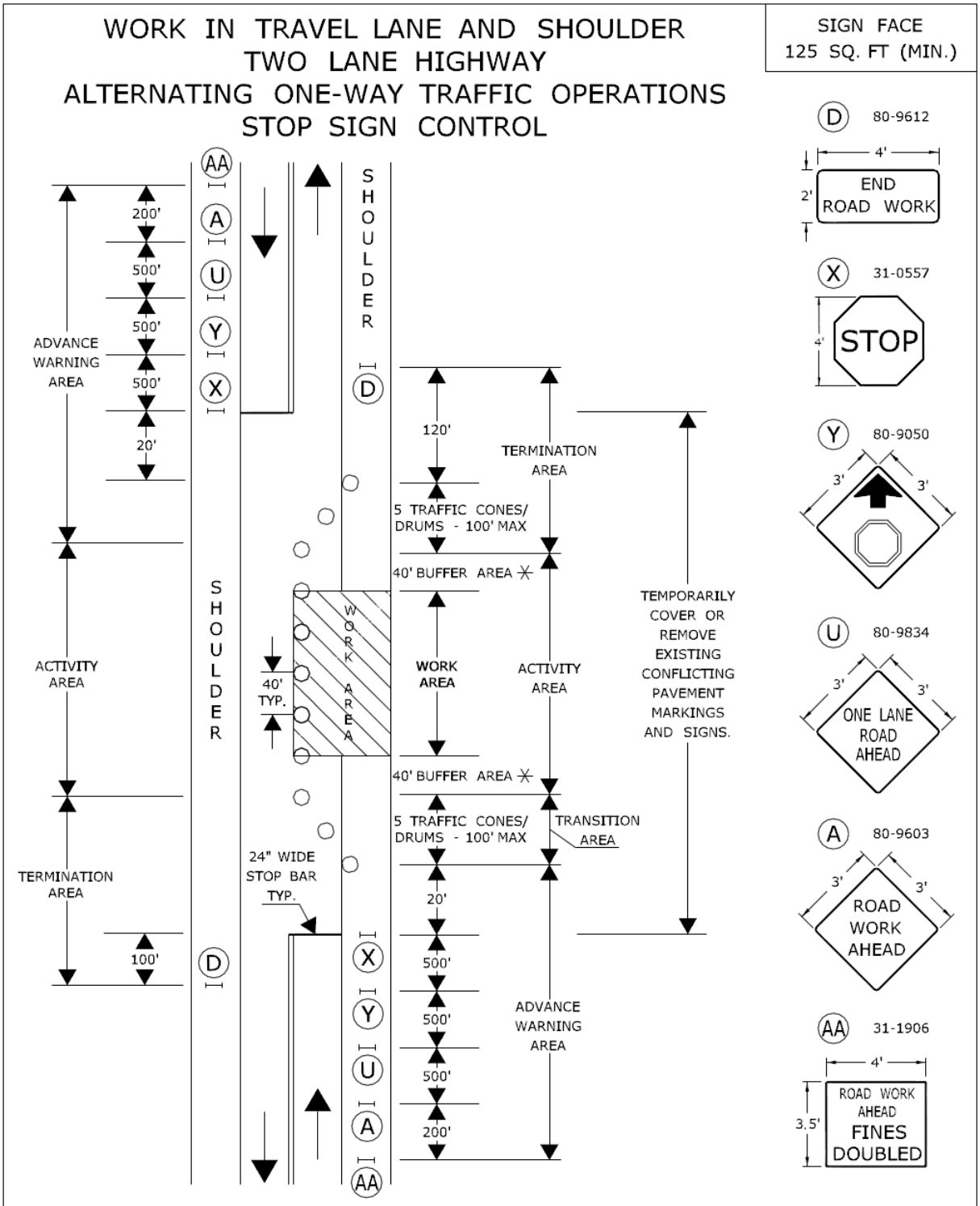
Date: 09/05/2025



CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.06.05 15:57:16-04'00'
PRINCIPAL ENGINEER

WORK IN TRAVEL LANE AND SHOULDER
TWO LANE HIGHWAY
ALTERNATING ONE-WAY TRAFFIC OPERATIONS
STOP SIGN CONTROL



TRAFFIC CONE **OR** TRAFFIC DRUM
OPTIONAL TRAFFIC DRUM PORTABLE SIGN SUPPORT
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

SCALE: NONE

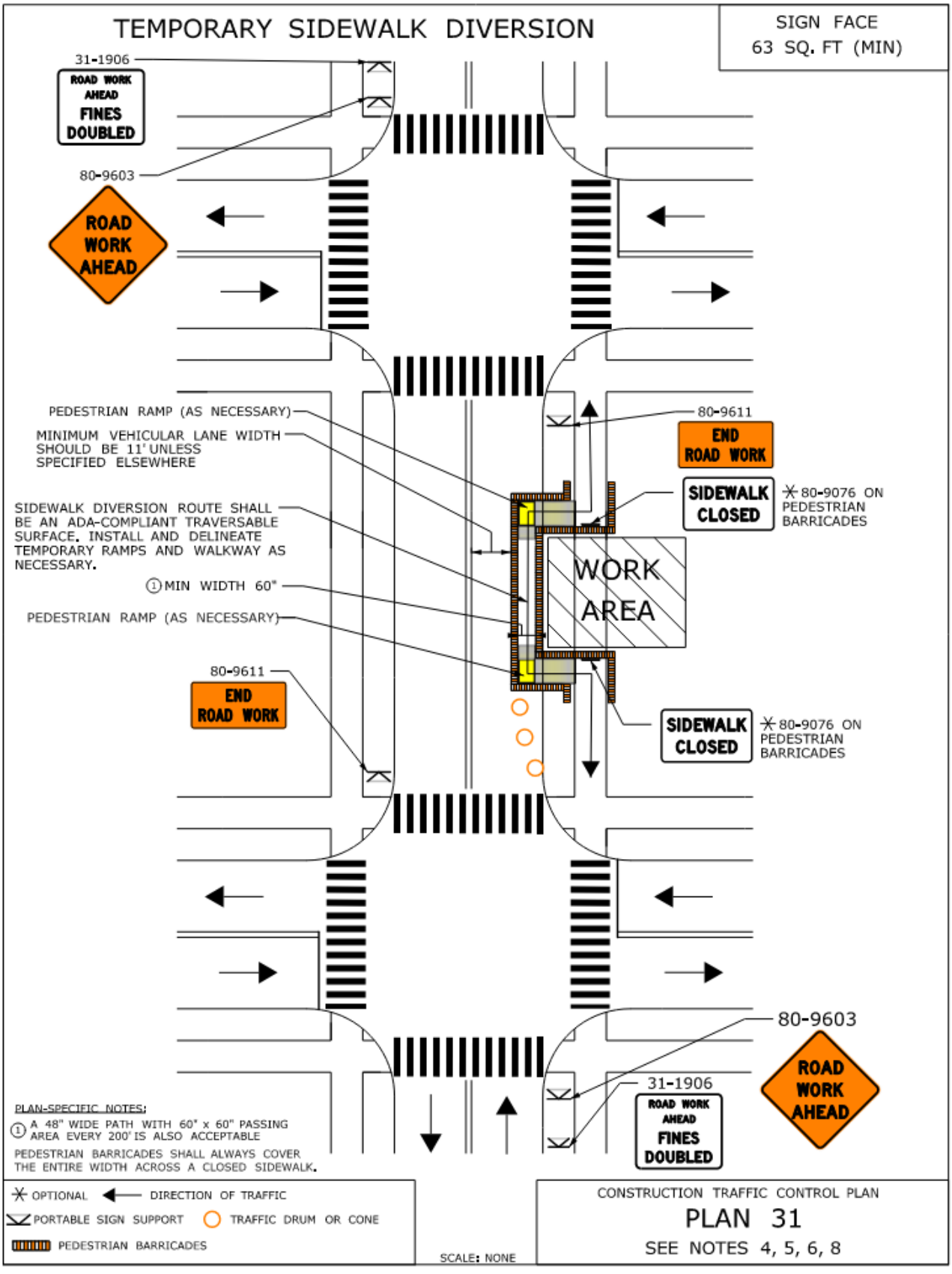
CONSTRUCTION TRAFFIC CONTROL PLAN

PLAN 18

SEE NOTES 1, 2, 4, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED Charles S. Harlow 2012.06.05 15:57:37-04'00'
PRINCIPAL ENGINEER


TEMPORARY SIDEWALK DIVERSION
SIGN FACE
63 SQ. FT (MIN)
31-1906
ROAD WORK AHEAD
FINES DOUBLED
80-9603
ROAD WORK AHEAD
PEDESTRIAN RAMP (AS NECESSARY)
MINIMUM VEHICULAR LANE WIDTH SHOULD BE 11' UNLESS SPECIFIED ELSEWHERE
SIDEWALK DIVERSION ROUTE SHALL BE AN ADA-COMPLIANT TRAVERSABLE SURFACE. INSTALL AND DELINEATE TEMPORARY RAMPS AND WALKWAY AS NECESSARY.
① MIN WIDTH 60"
PEDESTRIAN RAMP (AS NECESSARY)
80-9611
END ROAD WORK
80-9611
END ROAD WORK
SIDEWALK CLOSED
✳ 80-9076 ON PEDESTRIAN BARRICADES
WORK AREA
SIDEWALK CLOSED
✳ 80-9076 ON PEDESTRIAN BARRICADES
80-9603
ROAD WORK AHEAD
31-1906
ROAD WORK AHEAD
FINES DOUBLED
PLAN-SPECIFIC NOTES:
① A 48" WIDE PATH WITH 60" x 60" PASSING AREA EVERY 200' IS ALSO ACCEPTABLE
PEDESTRIAN BARRICADES SHALL ALWAYS COVER THE ENTIRE WIDTH ACROSS A CLOSED SIDEWALK.
✳ OPTIONAL
DIRECTION OF TRAFFIC
PORTABLE SIGN SUPPORT
TRAFFIC DRUM OR CONE
PEDESTRIAN BARRICADES
SCALE: NONE
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 31
SEE NOTES 4, 5, 6, 8

Article 9.71.05 – Basis of Payment *is supplemented by the following:*

The temporary relocation of signs and supports, and the furnishing, installation and removal of any temporary supports shall be paid for under the item “Maintenance and Protection of Traffic”.

ITEM #0979005A – PEDESTRIAN BARRICADE

Section 9.79 is supplemented and amended as follows:

9.79.01—Description:

Replace the entire Article with the following:

Under this item the Contractor shall furnish all Pedestrian Barricades required on the Project as stated in the item "Maintenance and Protection of Traffic," as shown on the Plans, and as directed by the Engineer.

Pedestrian barricades visible to vehicular traffic shall have retroreflective sheeting compliant with the Retroreflective Sheeting: Construction Barricade Sheeting section of the Department's Qualified Product List on the side(s) facing vehicular traffic.

9.79.02—Materials:

Replace the entire Article with the following:

Pedestrian Barricades used on the Project shall be listed on the Department's Qualified Product List under the Pedestrian Barricade category as follows:

- The barricades listed under the Test Level 3 category may be used on roadways with a posted speed limit of 60 miles per hour or less;
- The barricades listed under the Test Level 2 category may be used on roadways with a posted speed limit of 40 miles per hour or less;

Water filled Pedestrian Barricades shall only be used when the air temperature is above 33ºF. Such barricades shall only be filled with water and may not contain additional chemicals.

9.79.03 - Construction Methods:

Add the following:

Pedestrian Barricades shall be installed per manufacturer guidelines.

Barricade supports shall not protrude more than 4 inches into the pedestrian facility.

Pedestrian Barricades used to close a pedestrian facility shall cover the entire width of the pedestrian facility.

Pedestrian Barricades used for channelizing pedestrian traffic shall meet the following requirements:

1. Barricades along the pedestrian path shall be interlocked and the gap between adjacent devices shall not exceed 1 inch;

2. Barricades shall be installed to produce a smooth continuous length of barrier, except for locations where access to, or crossing, a pedestrian facility is allowed;

9.79.04—Method of Measurement:

Replace the entire Article with the following:

Pedestrian Barricades will be measured as the number of feet along the top rail of pedestrian barricades installed and accepted on the Project.

9.79.05—Basis of Payment:

Replace the entire Article with the following:

Pedestrian Barricades will be paid at the Contract unit price per linear foot for "Pedestrian Barricade." The length of Pedestrian Barricades will be paid for once, regardless of the number of times used on the Project.

Pay Item	Pay Unit
Pedestrian Barricade	l.f.

Date 2/10/2026

ITEM #1020037A – TEMPORARY LIGHTING

Description:
The Contractor shall design, furnish and maintain temporary roadway lighting at the Oregon Road/Route 70 (River Road) intersection and at the existing and temporary crosswalk locations. Illumination levels/intensities provided shall be equal to or greater than those provided by the existing equipment prior to construction. Temporary illumination shall be placed to avoid disabling glare while adequately illuminating the required areas. The Contractor shall prepare temporary lighting plans and shall submit them for approval to the Engineer and the City of Meriden. Temporary Lighting Plans must be approved by the Engineer prior to the installation of temporary lighting.

Materials:
All materials required to provide a fully operational temporary lighting system including items such as poles, luminaires, wires, conduits, and prefabricated temporary/mobile illumination units. If applicable, the Contractor shall coordinate power with Eversource, and all materials shall meet the requirements of Eversource. Other sources of power such as solar or from a generator are acceptable.

All electrical work and materials shall conform to the National Electric Code, Connecticut Standard specifications, local codes and utility company regulations.

Construction Methods:
Temporary Lighting shall be erected such that any poles, bases, mobile trailers or other supporting structures, not including luminaires and luminaire brackets, remain outside of the paved travel path including shoulders, and outside the clear zone. Luminaires and luminaire brackets, if/when extended over the roadway shall be positioned to maintain a minimum vertical clearance of 16’-6” over the roadway. If used, prefabricated temporary/mobile illumination units shall be installed in accordance with this special provision and in accordance with manufacturer’s recommendations.

Wiring and connections shall be tested for continuity and ground before service conductors are connected.

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

Basis of Payment:
Payment for this item will be made at the contract unit price per lump sum for “Temporary Lighting” measured as described above, which price shall include all costs of materials, equipment, labor, work, installation, relocation, repair, maintenance, permits, and electricity.

Pay Item	Pay Unit
Temporary Lighting	Lump Sum

ITEM #1117111A – RECTANGULAR RAPID FLASHING BEACON (RRFB) – TYPE B

ITEM #1117115A – TEMPORARY RECTANGULAR RAPID FLASHING BEACON (RRFB) – TYPE B

ITEM #1117116A – REMOVAL OF EXISTING FLASHING BEACON

Description:
Furnish and install a solar powered Rectangular Rapid Flashing Beacon (RRFB) and/or Temporary Rectangular Rapid Flashing Beacon (RRFB) – Type B at the location indicated on the plan or where directed by the Engineer. Removal of existing flashing beacons.

Each RRFB will be a complete assembly consisting of but not limited to the following:

- RRFB unit with two rapidly flashed rectangular-shaped yellow LED indications
- Controller cabinet (circuit breaker, timer or solid-state circuit boards etc.) or any electrical component hardware
- Pedestal/Base
- Pedestal Foundation (Item 1117111A) for permanent installations
- Pedestrian Pushbutton with accessible features
- Pushbutton Signs
- Mounting hardware
- All solar equipment
- Crosswalk Illuminator

Type B:
Double sided RRFB will contain four rapidly flashed rectangular-shaped yellow LED indications (two indications on each side facing traffic)

Temporary Reactangular rapid Flashing Beacon:
The Contractor shall furnish and maintain MUTCD compliant temporary RRFB (Rectangular Rapid Flashing Beacon) systems on both sides of temporary crosswalks through the duration of construction. RRFB units shall be push button actuated and display crosswalk signing and flashing beacons in both directions on both sides of the road, signing shall be as shown on the M&PT (Maintenance and Protection of Traffic) plans or as directed by the Engineer.

Removal of Existing Flashing Beacon:
Removal of existing flashing beacons shall include removal of all pedestals, poles, beacons, attached signs, and mounting hardware. Removal of foundations (where required) will be handled under earth excavation. Existing flashing beacons shall be carefully removed to prevent damage and they shall be salvaged and delivered to the City of Meriden Department of Public Works. The Contractor shall coordinate salvage and drop off with the City Engineer:
Brian Ennis, P.E. (City Engineer)

City of Meriden
Department of Public Works
142 East Main Street, Meriden, CT 06450
(203) 630-4020

Materials: The materials for the work shall be specified in the following:

Article M.16.03 - Pedestals
Article M.16.08 – Pedestrian Push Button – as revised by special provision M.16.08
Article M.16.10 – Cabinet

Article M.16.08 - Pedestrian Push Button:

For RRFB (Rectangular Rapid Flashing Beacon):

Delete the entire section and replace with the following:

A. General

- Size and force compliant with ADA, Section 14.2.5, Crossing Controls.
- Tamper-proof, and Vandal-proof, Weatherproof, Freeze-proof, Impact-resistant design, and construction.
- Completely insulated to preclude electrical shock under any weather conditions.
- Wire entrance through the rear.
- Stainless steel mounting hardware.
- Any features in conflict with this spec and MUTCD shall be disabled.
- Accessible features shall:
  - conform to the Manual on Uniform Traffic Control Devices (MUTCD) - FHWA
  - provide the speech message "warning lights are flashing" that shall be spoken twice.
  - include tactile arrow on the button.
  - include a locator tone.
  - not use vibrotactile indications or percussive indications for the audible information
    - The vibrotactile feedback shall be disabled.
- Bluetooth® Low Energy level 5 radio to provide wireless communication features.
- Operation programming method: Either or combination of:
  - Windows Laptop Computer with USB Cable
  - iOS Device and Bluetooth Wireless Connection
  - Android Device and Bluetooth Wireless Connection

B. Audible Pushbutton Locator Tone

- Frequency: repeating tone at one (1) second intervals
- Tone duration: ≤ 0.15 seconds
- Volume:
  - Minimum setting of zero
  - Manually adjustable initial setting
  - Automatically adjusted after initial setting. Volume increased in response to a temporary increase in ambient noise and subsequently decreased with a decrease in ambient noise.
  - Maximum volume: 100 dBA which is the approximate sound pressure of a gasoline powered lawn mower nearby.

- Automatic volume adjustment independent of other Audible Information Devices at the intersection.
- Should not be disabled but have the capability of being disabled without affecting operation of other features.

- Silent only when RRFB yellow lights are flashing. Active all other times.

C. Tactile Arrow Pushbutton:

- Pushbutton contained in a circular assembly which fits inside the housing and is attached to the housing with 4 screws.
- The confirmation light shall flash simultaneously with the RRFB indications.
- ADA compliant: Size: ≥ 2.0" diameter, Actuation force: ≤ 5 ft-lb
- Shape: Circular, raised slightly above housing so that it may be actuated with the back of a hand
- Tamper-proof, vandal-proof, weatherproof, freeze-proof, impact-resistant design, and construction.
- Tactile Arrow:
  - Attached to surface of the button assembly by a tamperproof method.
  - Raised slightly above surface of pushbutton, minimum 0.125."
  - Size: Length ≥ 1.5", Height ≥ 1.0"
  - Color: Sharp contrast to background color of pushbutton and housing

D. Housing

- Frame and button cover made of die cast aluminum meeting requirements of ASTM B85.
- Housing made of reinforced, UL-listed thermoplastic or aluminum. Designed to attach 9" x 12" four-hole advisory sign.
- Flat back to facilitate surface mount.
- Mounting plate made of aluminum mounts to pole with two ¼"-20 stainless steel bolts. Mounting plate separates from the button during installation and maintenance.
- Available extension bracket of a size indicated on the plan – 24" maximum.

E. Painting/Powder Coating

- Finish: Cover/Frame and all mounting brackets either:
  1. Painted with 3 coats of infrared oven-baked paint before assembly.
     - Primer: Shall be iron oxide baking primer and shall meet or exceed performance
     - specification of FS TT-P-664.
     - Second coat: Exterior-baking enamel, light gray, which meets or exceeds FS TT-E-527.
     - Third coat: YELLOW exterior-baking enamel and shall meet the requirements of FS A-A 2962. The color shall be AMS-STD-595 Color No. 13538.
  2. Electrostatic powder coated after chemically cleaned. Pre coating material prep in accordance with ASTM_D1730-09 to include all parts sent through a multi-stage phosphate wash process and preheat prior to any application of powder coat.

Construction Method:

- Each Rectangular Rapid Flashing Beacon (RRFB) Type B indication will be mounted on a standard aluminum pedestal and in accordance with dimensions and details shown on the plan.

- Each Temporary Rectangular Rapid Flashing Beacon (RRFB) – Type B shall be installed per manufacturer specifications and shall be positioned so as to be stable and visible to motorists while remaining outside of the traveled way.

- Each Solar RRFB will require a location free of any vegetation or obstruction which will inhibit solar charging.

- Each RRFB shall initiate operation only upon pedestrian actuation and shall cease operation after a programed time as shown on the plan or determined by the Engineer (based on MUTCD procedures).

- All RRFBs associated with a given crosswalk (including those with an advance crossing sign, if used) shall, when activated, simultaneously commence operation of their rapid-flashing indications and shall cease operation simultaneously.
- Install the pedestrian pushbutton according to the manufacturer's instructions.

- Install the pushbutton so that it is within 10" maximum lateral reach of a pedestrian in the ramp landing area. Position the pedestrian pushbutton so the plane of the sign face is parallel to the crossing (sign is facing perpendicular) and the arrow is pointing in the same direction as the crossing, not necessarily at the ramp. Notify the Engineer if there is any discrepancy or ambiguity between the plans and field conditions that prevent placement of the pedestrian pushbutton as shown on the plan.

- Set the minimum sound levels of the locator tone and the speech message when there is little or no ambient noise as in nighttime operation. Set the volume of speech message and pushbutton locator tones to a maximum of 5dBA louder than ambient sound. The locator tone should be audible 6' to 12' from the pushbutton or to the building line, whichever is less. Confirm the volume of both speech message and the locator tone increases with an increase in ambient sound and subsequently decreases when the ambient noise decreases.

Mechanical and Electrical Requirements:

a) Dimensions:
   - Each indication shall be at least 5" wide by 2"high.
- The indications shall be aligned horizontally, with the longer dimension horizontal and with a minimum space of 7" between the two indications.
   - The outside edges of the indications, including any housing, shall not project beyond the outside edges of the sign that it supplements.

b) Power:
   - Hardwired:
     - AC input, 100-240 VAC, 50/60Hz
     - DC output, 12 VDC, +/- 1%
   - Solar:
     - DC input, 12 VDC, 80W (min.)
     - DC output, 12 VDC, +/- 1%

c) Temperature & Humidity:

- All components will be capable of continuous operation in accordance with NEMA Standards

d) Indications:
- Flash Pattern:
  - When actuated, the two yellow indications in each RRFB unit shall flash in a rapidly flashing sequence and shall provide 75 flashing sequences per minute.
    - Shall comply with MUTCD Optics
  - ITE LED
- Light Intensity:
  - During daytime conditions: shall meet the minimum specifications for Class 1 yellow peak luminous intensity in the Publication "Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles J595," Society of Automotive Engineers (SAE.).
  - During nighttime conditions: an automatic signal dimming device shall be used to reduce the brilliance of the indications.
- Housing Color:
  - Federal Yellow

e) Control Cabinet:
- Shall be NEMA 3R type.

f) Crosswalk Illuminator:
- Power Input – 12 VDC
- Power Consumption – 700mA to 1.4A
  - Activation – Initiated with pedestrian pushbutton activation and synchronized with the flash interval of RRFB.
- Installation Height – 12 to 15 feet
- Housing – Aluminum and weather resistant polycarbonate
- Mounting - Adjustable Bracket
- Operating Temperature Range - -40°F to 176°F
- Wind Rating – Up to 120 mph (dependent upon pole size and system arrangement)

Method of Measurements:

Rectangular Rapid Flashing Beacon (RRFB) Type B:
This work will be measured as the number of RRFB furnished, installed and accepted in place.

Temporary Rectangular Rapid Flashing Beacon (RRFB) – Type B:
This work will be measured by the total number of calendar days each unit is employed. No direct payment will be made for unit relocations, it will be included in the cost of the work.

Removal of Existing Flashing Beacons:
This work will be measured by the number of complete assemblies removed, salvaged and delivered to the City.

Basis of Payment:

Rectangular Rapid Flashing Beacon (RRFB) Type B:
This work will be paid for at the contract unit price of each "Rectangular Rapid Flashing Beacon (RRFB)" of the type specified which will include the cost of RRFB unit, hardware, controller cabinet complete with all necessary equipment, pedestal, pedestal foundation, pedestrian pushbutton, pushbutton sign, ground rod, ground cable, paint and all materials, equipment, tools and labor included thereto.

Temporary Rectangular Rapid Flashing Beacon (RRFB) – Type B:
Will be paid for based on total number of calendar days each unit is employed. No direct payment will be made for unit relocations and it will be included in the cost of the work.

Removal of existing flashing beacons shall include the complete removal of all pedestals, poles, beacons, attached signs, and mounting hardware. Removal of existing foundations (where required) will be paid for as Earth Excavation.

The following items will be paid for separately:

- Sign Face – Sheet Aluminum for the warning signs
- (No.) Conductor #()
- (Size) (Kind) Conduit
- Trenching and Backfilling

Pay Items	**Pay Unit**
Rectangular Rapid Flashing Beacon (RRFB) Type B	Ea.
Temporary Rectangular Rapid Flashing Beacon (RRFB) – Type B	Day
Removal of Existing Flashing Beacon	Ea.

ITEM #1208931A – SIGN FACE - SHEET ALUMINUM (TYPE IX RETROREFLECTIVE SHEETING)

ITEM #1208937A – SIGN FACE - SHEET ALUMINUM (TYPE XI RETROREFLECTIVE SHEETING)

Section 12.08 is supplemented and amended as follows:

12.08.01—Description:

Add the following:

All signs shall use Type XI retroreflective sheeting with the exception of side-mounted signs with white background which shall be Type IX.

This item shall also include field testing of metal sign base posts as directed by the Engineer.

Signs shall conform to the sign details located at https://portal.ct.gov/DOT/Traffic-Engineering/Catalog-of-Signs with legend for variable signs as shown in the plans.

12.08.03—Construction Methods:

Delete the last sentence and add the following:

Metal sign base posts shall be whole and uncut. Sign base post embedment and reveal lengths shall be as shown on the plans. The Contractor shall drive the metal sign base posts by hand tools, by mechanical means or by auguring holes. If an obstruction is encountered while driving or placing the metal sign base post, the Contractor shall notify the Engineer who will determine whether the obstruction shall be removed, the sign base post or posts relocated, or the base post installation in ledge detail shall apply. Backfill shall be thoroughly tamped after the posts have been set level and plumb.

Field Testing of Metal Sign Posts: When the sign installations are complete, the Contractor shall notify the Engineer the Project is ready for field testing. Based on the number of posts in the Project, the Engineer will select random sign base posts which shall be removed by the Contractor for inspection and measurement by the Engineer. After such inspection is completed at each base post location, the Contractor shall restore or replace such portions of the work to the condition required by the Contract. Refer to the table in 12.08.05 for the number of posts to be field tested.

12.08.04—Method of Measurement:

Add the following:

The work required to expose and measure sign base post length and embedment depth using field testing methods, and restoration of such work, will not be measured for payment and shall be included in the general cost of the work.

12.08.05—Basis of Payment:

Replace the entire Article with the following:

This work will be paid for at the Contract unit price per square foot for "Sign Face - Sheet Aluminum" of the type specified complete in place, adjusted by multiplying by the applicable Pay Factor listed in the table below. The price for this work shall include the completed sign, metal sign post(s), span-mounted sign brackets and mast arm-mounted brackets, mounting hardware, including reinforcing plates, field testing, restoration and replacement of defective base post(s), and all materials, equipment, and work incidental thereto.

Pay Factor Scale: Work shall be considered defective whenever the base post length or base post embedment depth is less than the specified length by more than 2 inches. If the number of defects results in rejection, the Contractor shall remove and replace all metal sign base posts on the Project, at no cost to the Department.

Number of Posts to be Tested and Pay Factors (Based on Number of Defects)

Number of Posts in Project =>	**51-100**	**101-250**	**251-1000**	**>1000**
Sample Size=>	**5 Posts**	**10 Posts**	**40 Posts**	**60 Posts**
0 Defects	1.0	1.0	1.025	1.025
1 Defect	0.9	0.95	0.975	0.983
2 Defects	Rejection	0.9	0.95	0.967
3 Defects	Rejection	Rejection	0.925	0.95
4 Defects	Rejection	Rejection	0.9	0.933
5 Defects	Rejection	Rejection	Rejection	0.917
6 Defects	Rejection	Rejection	Rejection	0.9
7 or more Defects	Rejection	Rejection	Rejection	Rejection

Note: Projects with 50 or fewer posts will not include field testing

Date: 02/11/2026

ITEM #1301771A – FURNISH AND INSTALL PRE-INSULATED 12" DUCTILE IRON WATER MAIN ON BRIDGE

ITEM #1301861A – FURNISHING AND INSTALLING 12" DUCTILE IRON PIPE, VALVES AND MISCELLANEOUS FITTINGS

Description: The Work specified in this Section includes furnishing and installing ductile iron pipe, fittings and appurtenances of the sizes indicated to the lines and grades shown on the Contract Drawings complete as shown, specified or directed. The work includes, but is not limited to, furnishing, installing and field testing ductile iron (standard and pre-insulated) pipelines to the extents identified on the plans, complete with lacings and harnessing, joint restraint, thrust blocks and anchors, tapping sleeves, tapping gate valves, gate / butterfly valves, air valves, chlorination inlet / blow off, gate valve boxes, blow off assemblies, bends, tees, utility identification tape, casing sleeve with end seals, casing spacers, pressure reducing valves, vaults, excavating test pits, transporting materials, clearing, trenching, disposing of unused excavated materials, water mains or other abandoned utilities and concrete blocks, rock removal, removing concrete road base, backfilling trenches, furnishing additional material for backfilling, trench compaction and testing, traffic control, temporary and permanent surface restoration, miscellaneous grading, resetting miscellaneous items, sheeting bracing, pumping and all incidental work where required except as otherwise provided for.

Materials: All materials used shall be from manufacturers and models as approved by City of Meriden Water and Sewer unless otherwise approved by the Engineer.

MECHANICAL JOINT DUCTILE IRON PIPE

Submittals: The manufacturer's literature and/or shop drawings for the materials of this section shall be submitted for approval. The Contractor shall furnish detailed drawings as follows and no work shall be fabricated until they have been approved by the Engineer:

1. Dimensions and general details for typical length of pipe.

2. Detail of joint between pipes for both push-on and restrained joints together with installation instructions.

3. Dimensions and general details for all fittings including joint details for both mechanical and restrained joints.

4. Location plans or lists showing number of pipes and fittings and other such information as needed for installation.

A certified statement that inspection and all the specified tests have been made and met shall also be submitted.

References

The following standards based on the latest edition form a part of this specification as referenced:

ANSI/AWWA C110/A21.10 – American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-Inch through 48-Inch, for Water and Other Liquids

ANSI/AWWA C111/A21.11 – American National Standard for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

ANSI/AWWA C151/A21.51 – American National Standard for Ductile-Iron Pipe Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water and Other Liquids

ANSI/AWWA C153/A21.53 – American National Standard for Ductile-Iron Compact Fittings, 3-Inch through 48-Inch (75 mm through 300mm), for Water and Other Liquids

ANSI/AWWA C600 – AWWA Standard for Installation of Ductile Iron Water Mains and their Appurtenances

DIPRA's Installation Guide for Ductile Iron Pipe

The City of Meriden Water and Sewer Standard Details

Quality Assurance

All pipe and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured.

All pipe and fittings shall be subject to inspection by the Engineer after delivery to the job site and may also be subject to inspection at the foundry by a representative of the City of Meriden.

In addition, the City of Meriden reserves the right to have any or all pipe, fittings and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or tests shall be at the City of Meriden's expense.

Ductile Iron Pipe

The ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, ANSI/AWWA C111/A21.11, ANSI/AWWA C104/A21.4 and the following additional requirements:

All pipes for water shall be Class 54.

All pipes shall be lined with double-thickness, cement-mortar in accordance with ANSI/AWWA C104/A21.4.

All pipes shall have push - on joints employing a single elongated grooved rubber gasket as specified in ANSI/AWWA C111/A21.11, unless otherwise specified.

The restrained joint pipe shall employ ductile iron locking segments inserted through slots in the bell face and a retainer weldment on the spigot end of the pipe to provide a positive axial lock, or an equivalent restraining method. The restrained joint pipe shall be as manufactured by the American Cast Iron Pipe Company, McWane, Super Lock, HDSS Pipe by U.S. Pipe or approved equal.

Restrained joint pipe that is cut in the field to fit into a restrained joint pipe bell shall be provided with a field applied retainer weldment on the field cut spigot end or special gripper rings provided by the restrained joint pipe manufacturer for that specific purpose.

All pipes will be coated inside and outside with an approved bituminous material in accordance with ANSI/AWWA C104/A21.4 and ANSI/AWWA C151/A21.51.

The grade of ductile iron shall be 60-42-10.

All pipes shall be marked in accordance with ANSI/AWWA C151/A21.51.

All requirements of the American National Standards Institute Specifications will be rigidly enforced.

The grooved rubber gaskets and joint lubricant shall be furnished with the pipe. The gasket shall be plainly identified as to pipe size and packaged in a suitable and satisfactory manner for shipment.

All joint accessories shall be furnished with each pipe and shall be plainly identified as to pipe size.

THE FOLLOWING ARE ACCEPTABLE PIPE MANUFACTURERS:

American Cast Iron Pipe Company (ACIPCO)
McWane Ductile
United States Pipe

DUCTILE-IRON OR GRAY-IRON FITTINGS

The ductile iron or gray iron fittings shall conform to ANSI/AWWA C110/A21.10, ANSI/AWWA C111/A.21.11, ANSI/AWWA C104/A21.4, ANSI/AWWA C153/A21.53 and the following additional requirements:

All fittings shall be lined with double-thickness cement-mortar in accord with ANSI/AWWA C104/A21.4, except sleeves, caps, and plugs.

All fittings will be coated inside and outside with an approved bituminous material in accordance with ANSI/AWWA C104/A21.4 and Section 10-9 of ANSI/AWWA C110/A21.10. All fittings shall have mechanical joints as specified in ANSI/AWWA C111/A21.11.

All cast and ductile iron fittings shall have a pressure rating of at least 150 psi.

Bolt holes in the mechanical joint bells of all fittings shall straddle the vertical centerline of the fitting (laying in horizontal position).

All joints' accessories shall be furnished with each fitting and shall be plainly identified as to size.

Compact ductile iron fittings that meet AWWA Specifications may be used if approved by the Engineer.

MECHANICAL JOINT RESTRAINT

Restraint devices for mechanical joint fittings and appurtenances conforming to either ANSI/AWWA C111/A21.11 or ANSI/AWWA C153/A21.53 shall conform to the following:

Restraint devices for nominal pipe sizes 3 inch through 48 inch shall consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of ANSI/AWWA C110/A21.10.

The devices shall have a working pressure rating of 350 psi for 3-16 inch and 250 psi for 18-48 inch. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

Gland body, wedges and wedge actuating components shall be cast from grade 65-45-12 ductile iron material in accordance with ASTM A536.

Ductile iron gripping wedges shall be heat treated within a range of 370 to 470 BHN. Three (3) test bars shall be incrementally poured per production shift as per Underwriter's Laboratory (U.L.) Specifications and ASTM A536. Testing for tensile, yield and elongation shall be done in accordance with ASTM E8.

Chemical and nodularity tests shall be performed as recommended by the Ductile Iron Society, on a per ladle basis.

An identification number consisting of year, day, plant and shift (YYDDD) (plant designation) (Shift number), shall be cast into each gland body.

All physical and chemical test results shall be recorded such that they can be accessed via the identification number on the casting. These Material Traceability Records (MTR's) are to be made available, in hard copy, to the purchaser that requests such documentation and submits his gland body identification number.

Production pieces that are too small to accommodate individual numbering, such as fasteners and wedges, shall be controlled in segregate inventory until such time as all quality control tests are passed. These component parts may then be released to a general inventory for final assembly and packaging.

All components shall be manufactured and assembled in the United States. The purchaser shall, with reasonable notice, have the right to plan visitation at his/her expense.

Mechanical joint restraints shall require conventional tools and installation procedures per AWWA C600, while retaining full mechanical joint deflection during assembly as well as allowing joint deflection after assembly.

Proper actuation of the gripping wedges shall be ensured with torque limiting twist off nuts.

Restraint devices shall be Listed by Underwriters Laboratories (3" through 24" inch size) and Approved by Factory Mutual (3" through 12" inch size).

Mechanical joint restraints shall be Megalug Series 1100 produced by EBAA Iron Inc., Uni-Flange Series 1400 produced by Ford Meter Box Co., Style 612 produced by Romac, Stargrip Series 3000 produced by Star Pipe Products or approved equal.

12-INCH AND SMALLER GATE VALVES

Submittals

In accord with the General Conditions, six (6) sets of the manufacturer's literature and/or shop drawings for the materials of this section shall be submitted for approval.

A certified statement that inspection and all of the specified tests have been made and met shall also be submitted.

References

The following standards based on the latest edition form a part of this specification as referenced:

ANSI/AWWA C111/A21.11 - American National Standard for Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings

ANSI/AWWA C500 - American National Standard for Gate Valves for Water and Sewerage Systems
ANSI/AWWA C509 - American National Standard for Resilient - Seated Gate Valves for Water and Sewage Systems

ANSI/AWWA C550 – Protective Epoxy Interior Coatings for Valves And Hydrants.

ASTM A 36 - Standard Specification for Structural Steel

ASTM A 123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings

ASTM A536 - Standard Specification for Ductile Iron Castings

Quality Assurance

All gate valves, accessories and gate valve boxes shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured.

A certified statement that inspection and all the specified tests have been made and met shall also be submitted at the time of delivery.

All gate valves, accessories and gate valve boxes shall be subject to inspection by the Engineer after delivery to the job site and may also be subject to inspection at the foundry by a representative of the City of Meriden.

In addition, the City of Meriden reserves the right to have any or all materials inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere at the City of Meriden’s discretion. Such inspection and/or tests shall be at the City of Meriden's expense.

Gate Valve

The gate valve shall conform to ANSI/AWWA C500, ANSI/AWWA C509 and the following additional requirements:

Valve shall be resilient sealed.

Body and bonnet shall be constructed of ASTM A536 ductile iron.

Wedges shall be constructed of ASTM A536 ductile iron and encapsulated with EPDM.

All other materials not specified shall be as specified in ANSI/AWWA C500 and C509.

Bolts and nuts for connecting O-ring seal plates and bonnet to body shall be stainless steel.

Valve shall be furnished with O-ring seals utilizing two O-rings, consistent with appropriate specifications. Valves shall be capable of having O-rings replaced while the valve is under pressure.

Valves shall have mechanical joint ends, unless otherwise specifically indicated, which shall conform to ANSI/AWWA C111/A21.11. All joint accessories shall be furnished with each valve.

Valves shall be non-rising stem.

Direction to open (right-hand or left-hand) shall be as shown in the Contract Drawings and the Meriden Water Standard Details.

Operating nut shall be 2" square.

Valves, linings, and coatings shall conform to NSF Standard 61.

Valves shall have a working pressure rating of 250 psi.

Provide all internal and external wetted parts coated with a fusion bonded epoxy in accordance with ANSI/AWWA C550.

Gate Valve box

The gate valve box shall conform to the following requirements:

Cast iron shall conform to ASTM A-48, Class 25 “Dwyer” Style, ISO 9000 or domestic.

Top section shall be of the top flange design and shall have no bead on the bottom.

The word "WATER" shall be cast with raised letters in the center of the cover.

Base section shall be of the Dwyer design which centers the operating nut for positive access to the valve.

For specific gate valve box details, see the Contract Drawings and the Meriden Water Department Standard Details.

Ten (10”) inch gate valve box to be used for 10” gate valve and greater.

Extension Stem

The extension stem shall be fabricated from stainless steel conforming to ASTM A36. Galvanizing shall conform to the latest edition of ASTM A 123.

BLOW OFF ASSEMBLY

Submittals

In accord with the General Conditions, six (6) sets of the manufacturer's literature and/or shop drawings for the materials of this section shall be submitted for approval.

A certified statement that inspection and all the specified tests have been made and met shall also be submitted.

References

The following standards based on the latest edition form a part of this specification as referenced:

The City of Meriden Water and Sewer Standard Details Manual

Quality Assurance

All blow-off assemblies, including gate valves and fittings shall be inspected and tested at the foundry as required by the standard specifications to which the material is manufactured.

All blow-off assemblies, including gate valves and fittings shall be subject to inspection by the Engineer after delivery to the job site and may also be subject to inspection at the foundry by a representative of the City of Meriden.

In addition, the City of Meriden reserves the right to have any or all blow-off assemblies including gate valves, fittings and special castings inspected and/or tested by an independent service at either the manufacturer's plant or elsewhere. Such inspection and/or the tests shall be at the City of Meriden's expense.

Gate Valve Box

The gate valve box shall conform to the following requirements:

Cast iron shall conform to ASTM A-48, Class 25, “Dwyer Style ISO 9000 or domestic.

Top section shall be of the top flange design and shall have no bead on the bottom.

The word "WATER" shall be cast with raised letters in the center of the cover.

Base section shall be of the Dwyer design which centers the operating nut for positive access to the valve.

UNDERGROUND WARNING TAPE
The non-detectable warning tape shall be polyethylene tape manufactured in accordance with the following technical data:

TECHNICAL DATA

PROPERTIES	TEST METHOD	VALUE
Thickness	ASTM 02103	0.004” (4 mils)
Elongation	ASTM D882-75B	> 400%
Tensile Strength	ASTM 0882	MD: 1830 psi TO: 2350 psi

Tape shall be 6 inches wide.

The warning tape shall be heavy gauge 0.004 inch polyethylene and shall be resistant to acids, alkalis and other soil components. It shall be highly visible in the following colors with the associated phrases stamped in black letters and repeated at a maximum interval of 40 inches.

Type of Utility	Color	Warning Message
Water	Blue	Caution – Water Line Buried Below

The tape shall be of the type specifically manufactured for marking and locating utilities.

Casing Pipe

Submittals

In accord with the General Conditions, six (6) sets of the manufacturer's literature and/or shop drawings for the materials of this section shall be submitted for approval.

A certified statement that inspection and all the specified tests have been made and met shall also be submitted.

References

The following standards based on the latest edition form a part of this specification as referenced:

American National standards Institute (ANSI)

AWWA C200: Standard for Steel Water Pipe Six inches and Larger

AWWA C210-08 – Standard for Liquid Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines

AWS D1.1 – Structural Welding Code – Steel

The City of Meriden Water and Sewer standards

Quality Assurance

Steel pipes shall be the product of a single domestic manufacturer. Pipe shall be tested and inspected at the foundry as required by ASTM A53 and as required by the standard specifications to which the material is manufactured.

Casing pipes shall be electric resistance weld steel pipe conforming to ASTM A53B and AWWA C200. Steel pipes have minimum yield strength of 35,000 psi. The inside diameter of the casing pipe shall be twenty (20) inches with a minimum of three (3) inches greater than the largest outside diameter of the carrier pipe, joints or coupling and have a minimum wall thickness of 0.500 inches.

The steel pipe shall have two coats of black coal tar epoxy on the interior and exterior in accordance with AWWA C210.

Casing pipe ends shall be beveled with a single V-groove for field welding. Pipe joints shall be butt-welded and shall be full penetration on the outside circumference of the pipe. The single V-groove butt weld shall conform to the latest AWS Welding Code. All joints of the casing pipe shall be butt-welded, by a certified welder, prior to being installed.

Casing Spacers

Casing spacers shall be provided and installed where shown on drawings and in accordance with these specifications. The spacer insulator “system” shall be designed and fabricated for the specific project and application for which they are furnished.

The casing spacer shall have a minimum 14-gauge 304 stainless steel band. Bands shall be two segments, 8-inch wide.

Grade 304 stainless steel, minimum 10-gauge thickness stainless steel risers shall be fabricated to support the carrier pipe and its liquid load. Risers shall be sized to restrain and position the carrier pipe in the center of the casing, support all loads and provide proper contact for the isolation function.

The casing spacers/isolators shall have a flexible PVC liner of 0.09-inch thickness with a Durometer "A" 85-90 hardness and a min. 50,000-volt dielectric strength

Runners shall be of high pressure molded Glass Reinforced Polymer with a minimum compressive strength of 18,000-psi, 2-inch in width and a minimum of 7-inches long. Polyethylene runners are not an acceptable alternative.

The band section shall be bolted together with 304 stainless steel studs, nuts and washers. Hardware shall be 5/16-inch.
Each spacer/isolator shall be manufactured at a facility that has a Registered ISO 9001:2000 Quality Management System. Copy of current ISO 9001:2000 Registration shall be provided with material submittal.

Stainless steel casing spacers with risers shall be Model SSI Centered and Restrained as manufactured by Advance Products & Systems, Inc. (APS), Model CCS Centered and Restrained as manufactured by Cascade Waterworks Mfg. or approved equal.

Construction Methods:

PRE-INSULATED DUCTILE IRON PIPE

The pre-insulated ductile iron pipe shall be installed from back of abutment wall to back of abutment wall through provided penetrations in the abutment back wall and utilizing the hanger system and rollers already installed in the utility diaphragms. The Contractor shall coordinate with City of Meriden Water and Sewer and the Engineer prior to installation of the pre-insulated ductile iron pipe. Prior to setting pipe within hanger system, pre-insulated pipes and fittings shall be subjected to careful inspection just before being laid or installed.

MECHANICAL JOINT DUCTILE IRON PIPE

Prior to pipe-laying, the Contractor shall dig test pits where the new pipe connects to the present water main to ascertain the location, elevation and cross-sectional dimensions of the present mains.

Pipes and fittings shall be subjected to careful inspection and a hammer test just before being laid or installed.

The pipe and fittings shall be transported from the place of manufacture, all permits which may be necessary shall be secured and the requirements of the City of Meriden, cities and towns, concerning heavy transporting over state, city and town highways shall be complied with.

During loading, transporting and unloading, more than ordinary care shall be taken to prevent injury to the pipes. Such work shall be done with each section of the pipe under the full control at all times and under no conditions shall a pipe be dropped on the ground. Pipes shall be placed on sand beds or other methods may be employed to avoid chances of the pipe being frozen to the ground surface. The ends of pipe shall be plugged or cupped to prevent entering water, materials, animals, etc.

In distributing the pipes in the field, as permitted, each piece shall be placed as near as possible to the point where it is to be installed and faced in the proper direction. In case any pipe should be damaged from handling or other cause and made unacceptable to the Engineer, it shall be replaced with a new pipe at no additional cost to the City of Meriden. The Contractor is cautioned that state, city authorities may not permit storing pipes, etc., within street or highway limits.

Pipe and accessories shall be handled to ensure delivery to the trench in sound, undamaged condition, including no injury to the pipe coating or lining. If the coating or lining of any pipe or fitting is damaged, the repair shall be made by the Contractor in a satisfactory manner, at no additional cost to the City of Meriden. No other pipe or material shall be placed inside a pipe or fitting after the coating has been applied. Pipe shall be carried into position and not dragged. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. The interior of pipe and accessories shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations by plugging or other approved method. Before installation, the pipe shall be inspected for defects. Material found to be defective before or after laying shall be replaced with sound material without additional expense to the City of Meriden. Rubber gaskets that are not to be installed immediately shall be stored in a cool and dark place.

No trees within streets and highways, or adjacent to the normal trench therein, shall be damaged or removed unless ordered by the Engineer. Any requirements in any permit related to trees shall be adhered to.

In streets and highways where there is no permanent paving, only those trees, bushes or shrubs shall be removed and disposed of as may be required for construction and as approved by the Engineer. The unlimited removal of trees and brush will generally not be required or permitted.

Pavements shall be cut by suitable methods as approved by the governing authority having jurisdiction.

Laying Ductile Iron Pipe

In general, trenching for the installation of the pipeline(s) shall be in accord with Contract Documents. Proper and suitable tools and appliances for safe and convenient handling and laying of pipes shall be used, and care shall be taken to prevent coating from being damaged, particularly on the inside of the pipes.

Pipe and accessories shall be carefully lowered into the trench by means of derrick, ropes, belt slings, or other authorized equipment. Water-line materials shall not be dropped or dumped into the trench. Abrasion of the pipe coating shall be avoided. Except where necessary in making connections with other lines or as authorized by the Engineer, pipe shall be laid with the bells facing in the direction of laying. The full length of each section of pipe shall rest solidly upon the pipe bed, with recesses excavated to accommodate bells, couplings, and joints. Pipe that has the grade or joint disturbed after laying shall be taken up and relayed. Pipe shall not be laid in water

or when trench conditions are unsuitable for the work. Water shall be kept out of the trench until joints are complete. When work is not in progress, open ends of pipe, fittings, and valves shall be securely closed so that no trench water, earth, or other substance will enter the pipes or fittings. Where any part of the coating or lining is damaged, the repair shall be made by and at the Contractor's expense in a satisfactory manner in accord with the pipe manufacturer's recommendations. Pipe ends left for future connections shall be valved, plugged, or capped, and anchored, as shown.

Pipe work shall not be started until the following minimum equipment is available and on site:

Wheel pipe cutters, hydraulic pipe cutter or a pipe saw for the sizes of pipe to be laid;

Ratchet type socket wrenches for mechanical joint bolt and nuts;

At least two expandable pipe stoppers of the proper size for closing the end of the piping being laid when not actually laying pipe.

All pipes shall be carefully examined for defects and no pipe or other casting shall be laid which is known to be defective, and should any defective pipe or other casting be discovered after being laid, it shall be removed and replaced with a sound casting at no additional cost to the City of Meriden.

The pipe shall be laid upon sound soil, cut true and even, so that the barrel of the pipe will have a bearing for its full length. In the event the trench is excavated below the grade of the bottom of the pipe, the trench will be brought up to grade with gravel, pneumatically tamped, before the pipe is laid. Should rock/ledge be occasioned said materials shall be removed and the pipe shall be installed on compacted sand bedding minimum 6" in depth from the lowest project of the pipe in accord with Contract Documents.

The underground warning tape shall be placed approximately two (2) feet above the top of the pipe.

When not actually laying pipe (e.g. overnight, weekends, holidays, etc.) the open ends of the pipe shall be kept plugged with approved watertight end caps.

All necessary precautions shall be taken to prevent water from entering the pipe during installation of the pipeline.

Unless directed otherwise by the Engineer all the following criteria shall be applied:

The pipeline shall be installed a minimum of four (4) feet - six (6) inches below finished grade.

The pipeline shall also be installed to provide at least eighteen (18) inches of vertical clearance between the water pipe and storm drains or sanitary sewers.

When vertical clearance cannot be met concrete separation shall be installed as directed by the Engineer.

Cutting Pipe

Whenever the pipes require cutting, an approved saw, wheel or hydraulic type cutter shall be used. This work shall be done at no additional cost to the City of Meriden, in a manner satisfactory to the Engineer, and only experienced men shall be engaged thereon.

Joints

On pipe with rubber gasket push-on joints, the gasket shall be installed in the socket of the pipe previously laid and the gasket then lubricated. The plain end of the pipe being laid shall then be inserted and pulled or pushed to the full depth of the socket. An approved jack-type tool shall be used to assemble pipe 10-inches and larger. Plain ends of cut pipe shall be filed or ground to a taper to prevent damage to the gasket during the insertion.

On fittings, butterfly and gate valves with mechanical joints, the follower ring and rubber gasket shall be placed on the plain end of the pipe being (or previously) laid and entered into the socket of the fitting. The gasket shall then be evenly seated in the socket, the follower ring moved up to the face of the gasket and the "T" bolts inserted and made finger-tight. The "T" bolts shall then be tightened with a ratchet or torque wrench as indicated in the manufacturer’s instructions for installing the restrain system.

All mechanical joint style restrained joint fittings shall be installed in accordance with manufacturer recommendations, and as described below:

Where shown on the Contract Drawings, Contractor shall conduct test pits on existing fittings to confirm presence of joint restraint. Contractor shall also re-torque all bolts on existing fittings to confirm proper restraint.

Mechanical or pneumatic methods cannot be used to torque off nuts (where applicable). All twist-off nuts shall be hand tightened using a clockwise only turning socket wrench,

Restrained joint fittings cannot be backfilled until inspection by City of Meriden Water and Sewer.

Contractor shall collect all torqued nuts from restrained joint installations. City of Meriden reserves the right to request Contractor to provide torqued nuts for proof of proper installation.

Where shown on the Contract Drawings, Contractor shall coordinate with City of Meriden to shut down existing main during tie-in work. A minimum of 14 day notice shall be provided to Engineer in advance of this work.

The maximum allowable deflection shall be as given in AWWA C600. If the alignment requires deflection in excess of the above limitations, special bends or a sufficient number of shorter lengths of pipe shall be furnished to provide angular deflections within the limit set forth.

Thrust Restraint

Plugs, caps, tees, reducers and bends deflecting more than the allowable deflection as given in AWWA C600, either vertically or horizontally, on waterlines 4 inches in diameter or larger, and fire hydrant laterals, shall be provided with thrust restraints. Valves shall be securely anchored or shall be provided with thrust restraints to prevent movement. Thrust restraints shall be either thrust blocks or, for ductile-iron pipes, restrained joints as detailed in the City of Meriden Water and Sewer requirements or as directed by the Engineer.

Thrust blocking shall be concrete of a mix not leaner than: 1 cement, 2-1/2 sand, 5 gravel; and having a compressive strength of not less than 2,000 psi after 28 days. Blocking shall be placed between solid ground and the hydrant or fitting to be anchored. Unless otherwise indicated or directed, the base and thrust bearing sides of thrust blocks shall be poured directly against undisturbed earth. The sides of thrust blocks not subject to thrust may be poured against forms. The area of bearing shall be as shown or as directed. Blocking shall be placed so that the fitting joints will be accessible for repair. Steel rods and clamps, protected by galvanizing or by coating with bituminous paint, shall be used to anchor vertical down bends into gravity thrust blocks. Where any section of a water line is provided with concrete thrust blocking for fittings or hydrants, the hydrostatic tests shall not be made until at least 7 days after installation of the concrete thrust blocking and providing that the concrete thrust blocking had a minimum compressive strength of not less than 2,000 psi after 7 days or unless otherwise approved by the Engineer.

The restraint system for push-on joint pipe and mechanical joints shall be installed in full accord with the recommendations of the manufacturers and as approved by the Engineer.

Cleaning

Before, and after, if required, the installation of the pipeline, but prior to filling the line with water, the interior of the pipelines shall be cleaned to the satisfaction of the Engineer, by such means as the Engineer approves.

Field Testing

Prior to disinfection, the pipeline shall be tested for leakage between test bulkheads and/or main line valves. The pipeline will be filled with water and tested in accord with the latest ANSI/AWWA C600 under a pressure of 150 psi at the lowest point in the pipeline. Under the test pressure, all visible leaks shall be made tight to the satisfaction of the Engineer. The total leakage per 24 hours from the line thus tested shall not exceed the allowed leakage as determined by the Engineer based on the latest ANSI/AWWA C600. Visible leaks shall be repaired even

though the total leakage of the portion in question may be less than the above-mentioned permissible limit. Test pressure shall be applied for at least two hours and as much longer as required to permit inspection for leaks. Should the leakage exceed the maximum specified amount and investigation show this leakage to be at the joints or caused by defective work elsewhere, such defective work shall be repaired to the satisfaction of the Engineer or, if he so orders, the pipe or pipes shall be replaced at no additional cost to the City of Meriden and repairs or replacement shall be continued and the test repeated until the leakage under the test pressure is within the limit prescribed and the work left in a manner entirely satisfactory to the Engineer.

The Contractor shall be responsible for any damage to the pipeline or to adjoining property due to the testing.

Disinfecting and Flushing Water Mains

The Work specified in this Section describes continuous feed method of disinfecting newly constructed potable-water mains. The Contractor installing water mains and appurtenances such as pipe, valves, fittings and accessories within the City of Meriden service area is responsible for disinfecting the water main and pipe sections. The City of Meriden requires the Contractor to adhere to the strict standards stipulated in latest edition of AWWA C651, “Standard for Disinfecting Water Mains” when performing disinfection procedures. The standards represent the physical, chemical and bacteriological parameters that must be satisfied prior to determining if newly installed water mains can be placed into service.

The Contractor installing water mains and appurtenances within the City of Meriden service area is responsible for all operations related to disinfecting water mains and pipe sections smaller than 16-inches in diameter, except for work related to the existing distribution system. This work shall also include dechlorination and flushing of water mains. The gates within the existing distribution system shall be operated only by the City of Meriden. The City of Meriden shall provide disinfection solution and injection of disinfection solution for all water mains 16-inches in diameter and larger. The City of Meriden shall also provide services related to the dechlorination of water mains larger than 16-inches in diameter. The Contractor will be required to provide all labor and appurtenances required to direct flushing discharge to an approved disposal location for all water mains, regardless of pipe size. Flushing discharge to existing combined sewers shall be limited and quantity of flows restricted so as not to trigger an overflow condition. The Contractor shall be required to issue a submittal for the Subcontractor that will be performing the chlorine injection. The submittal shall include a minimum of three disinfection jobs of equal size and scope within the last two years and three references with contact information to establish the minimum level of required experience to perform the chlorine injection on the project. The Contractor shall be allowed to proceed with the implementation of this Section only if the submittal has been approved by the City of Meriden.

After flushing and subsequent to performing the disinfection operation, the City of Meriden will collect and analyze two complete sets of water samples**.** The two sets of water samples will be collected approximately twenty-four hours apart from each other. The first sample will be taken 2 hours after flushing and the second sample 24 hours after the first sample. Anticipate

approximately two business days for sampling and test results. The City of Meriden will compare the results from the water samples collected to the maximum allowable limits for each parameter. If all parameters are satisfactory then the water main is considered to have passed and can now be opened for service. It is important to note that if any one parameter fails then two additional water samples will be collected twenty-four hours apart from each other. The parameters used to compare to the water sample results are listed in Table 1.

Use of City of Meriden supplied water for flushing purposes may be limited during periods of high demand or when temperatures exceed 95 degrees Fahrenheit.

Submittals

The Contractor shall be responsible for developing a detailed plan that discusses at a minimum the scouring full pipe diameter flushing, methods for handling the volume of water from the flushing operation, disinfecting procedure with liquid sodium hypochlorite solution, de-chlorination procedure and sampling for each section of new water main to be tested. The Contractor shall provide a detailed submittal to the Engineer and City of Meriden that outlines the specifics of the proposed procedures for each location.

References

The following standards based on the latest edition form a part of this Specification as referenced:

ANSI/AWWA C651-99 – AWWA Standard for disinfecting water mains

Sodium Hypochlorite Solution

Sodium hypochlorite conforming to ANSI/AWWA B300 is available in liquid form in glass, rubber-lined or plastic containers typically ranging in size from 1 quart to 5 gallons. Sodium hypochlorite contains approximately 5% to 15% available chlorine, and the storage conditions and time must be controlled to minimize its deterioration.

EXECUTION

General

The sanitary handling of materials, the practices during construction, and the continual inspection of the work are the primary means for ensuring the sanitary condition of the water main. The effectiveness of disinfection depends on maintaining clean pipes and avoiding major contamination during construction activities.

PREVENTATIVE AND CORRECTIVE MEASURES DURING CONSTRUCTION

Heavy particles generally harbor bacteria and prevent elevated chlorine concentrations from contacting and killing these organisms. The procedures of this Specification must be observed to assure that a water main and its appurtenances have been thoroughly cleaned for the final disinfection by chlorination. Also, any connection of a new water main to the active distribution system prior to the receipt of satisfactory physical and bacteriological sample results may constitute a cross-connection. Therefore, new water mains must be isolated until physical and bacteriological tests, immediately after and 24 hours following flushing of the water main, are satisfactorily completed and meeting City of Meriden specifications.

Keeping Pipe Clean and Dry: A successful disinfection process begins at the early stages of construction. The Contractor must protect piping systems from contamination including interiors of pipes, fittings and valves. Pipe and appurtenances delivered for construction shall be capped or bagged to minimize the entrance of foreign material. All openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons, such as rest breaks or meal periods. Rodent-proof plugs may be used when watertight plugs are not practicable and when thorough cleaning will be performed by flushing or other means. The sanitary handling of materials, the practices during construction, and the continual inspection of the work are the primary means for ensuring the sanitary condition of the water main.

Delay in placement of delivered pipe invites contamination. The more closely the rate of delivery is correlated to the rate of pipe laying, the lower the risk of contamination.

Joints: Joints of all pipes in the trench shall be completed before work is stopped. If water accumulates in the trench, the plugs shall remain in place until the trench is dry.

Sealing Materials: No contaminated material or any material capable of supporting prolific growth of microorganisms shall be used for sealing joints. Sealing material or gaskets shall be handled in a manner that avoids contamination. The lubricant used in the installation of sealing gaskets shall be suitable for use in potable water and approved by the pipe manufacturer, and not contribute odors. It shall be delivered to the job in closed containers and shall be kept clean and applied with dedicated, clean applicator brushes.

Cleaning and Swabbing: Each pipe section that is being readied for assembly in the field and just prior to installation, shall have the interior pipe surface swabbed with a 1% to 5% hypochlorite disinfecting solution using mechanical means like pulling a chlorine soaked mop or pigging device through the pipe or by power washing . If in the opinion of the Engineer, any dirt enters the pipe while being installed, the pipe will be swabbed again with 1% to 5%. The cleaning method used shall not force mud or debris into the interior pipe-joint spaces and shall be acceptable to the Engineer.

Wet Trench Construction: If it is not possible to keep the pipe and fittings dry during installation, the water that may enter the pipe-joint spaces shall contain an available chlorine concentration of approximately 25 mg/L. This may be accomplished by adding calcium hypochlorite granules or

tablets to each length of the pipe before it is lowered into a wet trench or by treating the trench water with hypochlorite tablets.

Flooding by Storm or Accident During Construction: If the main is flooded during construction, it shall be cleared of the floodwater by draining and flushing with potable water until the main is clean. The section exposed to the floodwater shall then be filled with chlorinated potable water that, at the end of a 24-hour holding period, will have a free chlorine residual of not less than 25 mg/L. The chlorinated water may then be drained or flushed from the main.

Pre-flushing of Source Water

The source water used for disinfection and pressure testing shall be flushed prior to its use to ensure that normally occurring contaminants or debris are not introduced into the new water main pipe. The City of Meriden will be responsible for operating gate valves in the street as necessary. Adequate drainage must be provided during flushing, away from the construction area. The Contractor shall be responsible for constructing temporary discharge piping and/or materials as necessary, at no additional cost to the City of Meriden.

Field Testing

Refer to Ductile Iron Pipe Field Testing for field pressure testing procedures. This testing is to be satisfactorily completed prior to initiating the flushing/disinfection procedures covered in this Section.

Continuous Feed Method of Chlorination

Hypo-chlorination utilizes a concentrated dose of chlorine solution, usually 25 ppm for a 24 hour period, to eradicate bacterial contamination. This is a critical operation that requires skilled personnel and therefore the City of Meriden reserves his right to request the replacement of any Contractor/Subcontractor’s personnel for lack of skills performing these tests The Contractor shall not be compensated for the replacement of his Subcontractor or its personnel if requested by the City of Meriden as a result of lack of skills in performing these tests. These procedures allow for disinfecting a new section of the water distribution system, minimizing the risk to the field crews, to customers and to the environment. These procedures are to be followed when disinfecting all new pipelines which utilize the injection of sodium hypochlorite.

Final Flushing

After the applicable retention period of 24 hours, heavily chlorinated water should not remain in prolonged contact with the pipe. In order to prevent damage to the pipe lining or to prevent corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main, fittings, valves and branches until chlorine measurements show that the concentration in the main is no higher than that generally prevailing in the distribution system.

The Contractor shall make arrangements with the City of Meriden to flush the new water main following disinfection. City of Meriden forces shall be responsible for operating the gate valves in the street as necessary. It is important to note here that the new water main shall be kept isolated from the active distribution system using a physical separation until disinfectant has been flushed and satisfactory bacteriological, physical and VOC testing has been completed. Operation of all valves used in filling and flushing the line shall be performed by City of Meriden personnel.

The Contractor shall be responsible for supplying necessary materials, equipment and appurtenances for neutralizing the chlorine and to perform all flushing operations except the operating of gate valves within the existing water distribution system. The minimum materials and equipment required to flush and neutralize the water main are:

Five 3-inch x 20-foot rubber hoses, each with 3-inch male x female Camlock Couplings.
Dechlorination device, model 3M-CLA.
Standard hydrant wrench.
90-degree ductile iron elbow with retaining gland, either 4 or 6-inch depending on blow off size.
Customized 4 or 6-inch, 3/8-inch thick metal plate that bolts on to the 90- degree ductile iron elbow with 2-1/2-inch male fire connection (NST) thread. 4 or 6-inch depends on the blow off size.
Ascorbic acid powder.

The Contractor shall also be responsible for determining where the water will drain during the flushing operation so as not to cause localized flooding or cause damage to property or the environment. The environment to which the chlorinated water is to be discharged shall be inspected. Following neutralization of the chlorinated water, the level of chlorine shall be between 0.1 and 0.8 mg/l and in no case higher than the chlorine level in the distribution system. It is important to note that during the summer month's water mains tend to take longer to disinfect due to higher ambient temperatures increasing the bacterial count. Usually, additional flushing will result in successfully disinfecting the water main.

Disinfection Tests

Following disinfection and flushing, City of Meriden forces will collect and analyze water samples from the new main utilizing a copper sterilization sampling fitting located no more than every 1,200 feet along the newly constructed water main. Two sets of water samples will be collected: the first approximately 2 hours following the flushing operation, and the second set of samples will be collected 24 hours after the first set of samples was taken. The results are available approximately two business days following collection. The analytical results for the samples will be compared to the maximum allowable limits for each parameter as established by the City of Meriden shown in Table 1. If the parameters are satisfactory for BOTH sets of water samples, then the water main is considered passing and can be opened for service.

To ensure the water sample integrity, the City of Meriden requires the person taking the sample to complete a "Chain of Custody" form, see attachment. This form must accompany the water sample when transporting to the City of Meriden's preferred testing facility.

Table 1
Physical, Chemical and Bacteriological Parameters for Water Mains

Parameter	**Maximum Allowable Limit**
pH	6.4 to 10
Color	15 units
Turbidity	1.0 NTU
Odor	2
Hardness	60 ppm.
Specific Conductance	150 microhms at 25 oC
Coliform Bacteria	0 per 100 milliliters at 35% oC
Standard Heterotrophic Plate Count	< 500 per milliliter at 35 oC
Chlorine Residual	<0.1- 0.8 ppm.
Volatile Organic Compounds (VOC)	See C. Below

For VOC concentrations less than 100 ppb the water main is approved to be placed in service. For VOC concentrations of 100 to 200 ppb, the full volume of the water main will be flushed to remove the VOCs and the water main will be approved to be placed in service. For VOC concentrations over 200 ppb, the water main shall be re-sampled for VOC's, but not HPC's if the bacteriological samples passed the test.

Resampling

If the initial disinfection fails to produce satisfactory physical and bacteriological results for EITHER set of water samples, the new main shall be re-flushed and resampled (two sets of water samples).

If the new water main fails two rounds of sampling, the City of Meriden shall determine if re-disinfection is needed or if the new main should only be flushed.

Date: 02/11/2026

ATTACHMENT-CHAIN OF CUSTODY FORM

Sample Collection \ Chain of Custody
Distribution Specials
New Mains

Project DVW (when applicable to Developer Permit Agreement):

Project Name (for all projects): _____

Town: _____

Sample I.D.	Location (street)	Size of Main	Length of Main
S1			
S2			
S3			
S4			

Is a VOC being submitted? YES / NO

Time Collected

S1	S2	S3	S4

Chlorine residual

S1	S2	S3	S4

Collected by _____

Any observations that might affect the physical and bacteriological quality of the water should be noted below:

_____

_____

Relinquished By:	Date / Time:
Received By:	Date / Time:
Relinquished By:	Date / Time:
Received By:	Date / Time:

12-INCH AND SMALLER GATE VALVES

Inspection before Installation

The gate valve, gate valve box, joint restraints etc. shall be subject to a careful inspection before being installed. The valve shall be run through a full open-close cycle to insure proper operation.

Installation of Gate Valve, Gate Valve Box and Joint Restraints

The gate valve shall be installed according to the details shown in the Contract Drawings, the City of Meriden Water and Sewer requirements and to the satisfaction of the Engineer.

All debris and foreign material shall be cleared from valve openings and seats. All mechanisms shall be checked and all nuts and bolts checked for tightness.

The gate valve box shall be set plumb and centered directly over the operating nut of the valves. Earth fill shall be carefully tamped around the gate valve box to a distance of 4 feet on all sides or to the undisturbed trench face, if less than 4 feet.

Where and as shown on the Contract Drawings, or ordered, a valve extension stem shall be installed. An extension stem will be ordered when the valve-operating nut is more than 4.5’ feet below finished grade.

Excavation, shoring, dewatering, and refill and traffic control shall conform to the requirements under other applicable Contract Sections.

BLOW OFF ASSEMBLY

Inspection before Installation

Blow-off assemblies including gate valves, pipe, fittings, gate valve boxes, etc. shall be subject to a careful inspection before being installed. Valves shall be run through a full open-close cycle to insure proper operation.

Installation of Blow Off Assembly

Blow-off assemblies including piping, gate valves, fittings, etc. shall be installed according to the details shown in the Contract Drawings, the City of Meriden Water and Sewer requirements and to the satisfaction of the Engineer.

All debris and foreign material shall be cleared from valve openings. The blow-off assembly shall be set plumb. Blow-off assemblies and connecting pipe shall have at least the same depth of cover as the distributing main.

Trench refill shall be placed over the pipe and fittings from the bottom of the trench to 2 feet above the top of the pipe and fittings.

Ductile iron pipe and harnessing shall be installed in accordance with Contract Documents.

The underground warning tape shall be placed approximately two (2) feet above the top of the pipe.
Gate valves and gate valve boxes shall be installed in accordance with Contract Documents.

AIR VALVE / CHLORINATION INLET / BLOW OFF

Inspection before Installation

All tubing and fittings shall be carefully examined for defects and no material shall be installed which is known to be defective and should any defective tubing or fitting be discovered after being installed, it shall be removed and replaced with sound material at no additional cost to the City of Meriden.

Installation of Air Valve / Sterilization Inlet / Blow Off

The air valves, sterilization inlet and blow-off shall be installed according to the details shown in the Contract Drawings, the City of Meriden Water and Sewer requirementsand to the satisfaction of the Engineer. To properly receive the air valve or other assembly the ductile iron pipe shall be drilled and tapped. All tapped holes for corporation stops shall be tapped Mueller Thread.

All tapped holes in ductile iron pipe shall be cleaned by running the correct size tap into the hole immediately prior to installing the corporation.

Gate valve boxes shall be set plumb and centered on the fitting, etc. Earth fill shall be carefully tamped around the gate valve box to a distance of 4 feet on all sides or to the undisturbed trench face, if less than 4 feet.

Chlorination inlet / blow off shall be removed once the water main passes all tests. Corporation shall either be converted to standard air valve or abandoned prior to final pavement restoration.

Excavation and refill shall conform to the requirements under other applicable Contract Sections.

UNDERGROUND WARNING TAPE

Installation of Underground Warning Tape

All buried pipe and fittings shall be installed with non-detectible underground warning tape located approximately 24” above top of pipe.

CASING PIPE

The casing pipe shall be installed by open trench.

Care shall be taken in loading, transporting and unloading to prevent injury to the pipe or coatings. Pipe shall not be dropped. All pipe shall be examined before laying and no piece shall be installed which is found to be defective. Any damage to the pipe coatings shall be repaired as directed by the Engineer.

All pipe shall be subjected to a careful inspection prior to being installed. If the pipe fails to meet the specified requirements, it shall be removed and replaced with a satisfactory replacement at no additional expense to the City of Meriden.

The carrier pipe shall be installed within the casing using spacers as specified. Each joint shall be thoroughly checked prior to being inserted into the casing.

After the casing pipe has been completely installed, thoroughly clean the interior of the casing pipe and remove all excess material leaving a smooth interior throughout.

Dewatering through the casing during construction will not be permitted. The Engineer shall approve all dewatering methods before work begins. Install end seals after the carrier pipe has been installed.

CASING SPACERS

When installing the casing spacers, Contractor is to ensure that the spacers are lined up perfectly straight on the carrier pipe. All runners should line up straight.

Contractor is to ensure that the load of the carrier pipe is uniformly applied to all casing spacers on each joint of pipe. Caution should be taken to not set down the carrier pipe with casing spacers attached unless it is on a cut-a-way section of the casing pipe. The weight should be uniformly distributed to all bottom runners at one time. Contractor could also lay pipe with casing spacers installed onto sand bags or similar material to bear the weight of the carrier pipe.

Spacing between casing spacers shall be a maximum of 8-ft. Spacing between casing spacers and the joints of the casing pipe shall be 2-ft. See manufacturer’s recommendations for more information.

Contractor shall restrict or minimize rotation or rifling of the carrier pipe within the casing unless the spacers are designed with equal length runners and specifically intended to allow for rotation. See manufacturer’s recommendations for more information.

Method of Measurement:

Furnish and Install Pre-Insulated 12" Ductile Iron Water Main on Bridge: This work will be measured for payment by the actual number of linear feet of ductile iron pipe, in the sizes indicated, complete as shown, specified and directed. The length of pipe to be measured shall be the length of the line after the pipes have been installed, measured or computed along the center line of the pipe from the back of back wall between abutments as shown on Contract Documents.

Furnishing and Installing 12" Ductile Iron Pipe, Valves & Misc. Fittings: This work will not be measured for payment but paid as Lump sum which includes ductile iron pipe, in the sizes indicated, complete as shown, specified and directed. The limits of work shall be from the back of abutment back walls to the main line valves or face of the terminal pipe or fitting, as shown on the Contract Drawings.

Gravel fill from the bottom of the trench to the level 24-inches above the top of the pipe will not be measured for payment but included in the lump sum cost.

Basis of Payment: This work will be paid for at the contract unit price per linear foot for "Furnish and Install Pre-Insulated 12" Ductile Iron Water Main on Bridge" and Lumpsum for "Furnishing and Installing 12" Ductile Iron Pipe, Valves & Misc. Fittings", of the appropriate size, complete and in place. The price shall also include the cost of digging test pits; transporting the materials; clearing, trenching; disposing of excavated materials, removing and disposing of the present water pipes and any appurtenances as needed; furnishing and installing the pipelines complete as shown on plans or as directed, with restraint where required, including fittings, pressure reducing valves, vaults, bends, restraint, filter fabric, bank gravel, sand, blow off assemblies, gate/butterfly valves, air valves, sterilization fittings, tapping sleeves, tapping gate valves, casing sleeve with end seals, casing spacers, gate valve boxes, tees, thrust blocks, anchors, utility identification tape and fire hydrant assemblies; refilling trenches; furnishing the additional materials; temporary and permanent resurfacing; grading; sheeting; bracing; pumping and all incidental work, except as otherwise herein provided for. No claim will be allowed because the number of pipes and joints may be greater than estimated by the Contractor. The price shall also include all material, transportation, labor, including labor required to assist the City of Meriden during the testing, and equipment necessary to construct the pipelines in accord with the Contract Drawings, the Specifications and the requirements of the Engineer there under.

The cost of all excavation, disposing of excavated material, except that which is suitable for refilling, and furnishing other materials for refilling, unless otherwise specified, will be considered as having been included in the lump sum price bid.

No direct payment will be made for any work done or materials used in making the pipeline tight.

Pay Item	Pay Unit
Furnish and Install Pre-insulated 12" Ductile Iron Water Main On Bridge	L.F.
Furnishing and Installing 12" Ductile Iron Pipe, Valves & Misc. Fittings	L.S.

Date:11/07/2024

ITEM #1301952A – STEEL PIPE SLEEVE

Description:

Work under this item shall consist of furnishing, preparing, and installing steel pipe sleeves, pipe seals, and associated hardware to facilitate the passing of utilities through the stem of the proposed wingwall as shown on the plans.

Materials:

Steel pipe sleeves: Pipe sleeves shall be galvanized steel. The steel sleeve can be Flexicraft standard-weight steel sleeve or similar.

Pipe Seal: Pipe seal shall be a watertight mechanical seal. The material shall be a Flexicraft PipeSeal or similar.

Construction Methods:

The steel pipe sleeve shall be cast directly in the wingwall stem.

The pipe seal shall be installed to cover both ends of the steel sleeve.

Installation of the pipe seal shall follow manufacturer recommendations.

Method of Measurement:

This work will be measured for payment by the actual number of locations of steel pipe and pipe seal furnished and installed. The pipe seal and associated hardware will not be measured for payment.

Basis of Payment:

This work will be paid at the contract unit price each for 'Steel Pipe Sleeve', complete and accepted in place, which price shall include all pipe seals, associated hardware, and all materials, equipment, tools, and labor incidental thereto.

Pay Item	Pay Unit
Steel Pipe Sleeve	EA

ITEM # 1401246A 10" DUCTILE IRON PIPE (SANITARY SEWER)

Description:

Work under this item includes all work related to construction of a sanitary sewer main in conformance with the plans and specifications. This work shall also consist of trench excavation and backfilling, shoring and dewatering operations, pipe tests, pipe connections, pipe bedding material, and other miscellaneous work required in completing the sanitary sewer as shown on the plans and as directed by the Engineer.

Materials:

General: Steel and Iron products shall comply with the "Buy America" requirement set forth in 23 USC 313 and 23 CFR 635.410.

Pipe: The requirements of this specification are to provide pipe and fittings suitable for non-Pressure drainage or sewage and certain other liquid wastes where toughness, resistance to deterioration from the action of water and chemicals, dimensional stability, resistance to aging and tight joints are required.

Dimensions: The standard length of pipe used in house connections and/or laterals shall not exceed 6.5 feet in length unless otherwise approved by the Engineer. All pipes shall be dimensioned in inches and shall be manufactured to the following dimensions:

NOMINAL SIZE	OUTSIDE DIAMETER	MINIMUM WALL THICKNESS DR-42	DR-35
6	6.275	0.180	0.180
8	8.400	0.200	0.240
10	10.500	0.250	0.300
12	12.500	0.300	0.360
15	15.300	0.375	ASTM 3033

Joints: Joints shall be the bell and spigot type subject to the approval of the Engineer. All joints shall meet the requirements of ASTM D 3212 Standard Specifications for "Joint and Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals". Joints shall be sealed with a rubber compression gasket, approved by the Engineer and shall be of a composition and texture which is resistant to common ingredients of sewage, industrial wastes, including oils and ground water, and which will endure permanently under the conditions likely to be imposed by this use. The tensile strength shall be at least 1,300 psi. The elongation at rupture shall be such that two-inch gauge marks shall stretch to not less than ten inches. Hardness shall be between 40 and 50, as measured with a Shore Durometer. The compression set (constant deflection) shall not exceed 25 percent of the original deflection. The tensile strength after accelerated aging joint, when assembled, must be able to withstand a hydraulic pressure internally of at least 10 psi.

Fittings: Wyes, tees, bends, and adapters, and any other fittings required by the Engineer shall be provided. Plans for such fittings showing cross-sectional views with dimensions shall be provided, and such plans and fittings shall be approved by the Engineer prior to their use. The

materials used in the manufacture of fittings shall conform with the requirements for the pipe with which they shall be used, and any variation of such requirements shall be subject to the approval of the Engineer. Sizes of fittings shall be to the dimensions of standard pipe, as shown above. If dimensions, structural design, or materials from which they are manufactured vary from other provisions of this specification, it shall be done so only with the approval of the Engineer.

Testing: Pipe shall be tested and all sizes of pipe so designated shall be tested in accordance with ASTM D-2412-68 Standard Method of "Test for External Loading Properties of Plastic Pipe by Parallel-Plate Loading". The minimum value of pipe stiffness at five percent deflection computed from data obtained from the above testing procedure shall be indicated in Table 1.

TABLE 1

Minimum Value of Pipe Stiffness at 5% Deflection	NOMINAL PIPE SIZE	PIPE
STIFFNESS	6 Inch	32 PSI
	8 Inch	28 PSI
	10 Inch	17 PSI
	12 Inch	17 PSI
	15 Inch	17 PSI

Marking: Pipe shall be marked along the outside of the barrel in bold type and shall indicate the manufacturer's name, pipe size, PVC compound used, i.e. PVC Type 1, Grade 1 and the ASTM material specification for the PVC compound used, i.e. ASTM D-1784.

Ductile Iron Sewer Pipe: Ductile iron sewer pipe shall conform to ANSI A21.50 (AWWA C150) and ANSI A21.51 (AWWA C151). Ductile iron pipe shall be Class 52 and furnished in nominal 18-foot lengths, with push-on or mechanical joints (where specified) as manufactured by U.S. Pipe and Foundry Company, Griffin Pipe Co., Clow Corporation, or approved equal with gaskets conforming to AWWA C111 ANSI A21.11 "Rubber Gasket Joints". The ductile iron pipe shall be unlined inside and asphalt seal coated on the outside.

Crushed Stone: Crushed stone for sewer bedding and haunching shall be 3/8" nominal diameter or shall conform to No. 8 stone per Section M01.01 of the Standard Specifications Form 819 or latest.

Synthetic Fabric: Synthetic drainage fabric for crushed stone sewer bedding shall be manufactured by TenCate Geosynthetics North America, Hanes Geo Components, or an approved equal product.

Construction Methods:

TRENCHING, BACKFILLING, AND CONSOLIDATION

1.1 Trenching and backfilling shall be completed in conformance with Section 2.05.03 of the Standard Specifications.

2.0 TRENCH DEWATERING

2.1 To ensure proper conditions at all time during construction, the Contractor shall provide and maintain ample means and devices (including spare units kept ready for immediate use in case of breakdown) with which to intercept and/or remove promptly and dispose properly of all water entering trenches and other excavations. Such excavations shall be kept dry until the structures, pipes, and appurtenances to be built therein have been completed to such extent that they will not be floated or otherwise damaged.

All water pumped or drained from the work shall be disposed of in an environmentally suitable manner in accordance with Section 1.10 Environmental Compliance of the Standard Specifications, and without undue interference with other work, damage to pavements, other surfaces, or property. Suitable temporary pipes, flumes, or channels shall be provided for water that may flow along or across the site of the work.

2.2 Temporary Underdrains:

Temporary Underdrains, if used, shall be laid in trenches beneath the grade of the structure. Trenches shall be of suitable dimensions to provide room for the chosen size of underdrain and its surrounding gravel. Underdrain pipe shall be acceptable PVC or ADS pipe of standard thickness.

Underdrains, if used, shall be laid at an approved distance below the bottom of the normal excavation wrapped in synthetic fabric, and entirely surrounded by graded gravel or crushed stone to prevent the admission of sand or other soil into the underdrains. The distance between the top of the bell of the underdrain pipe shall be at least three (3) inches unless otherwise permitted. The space between the underdrain and the pipe or structure shall be filled and crushed stone which shall be rammed, if necessary, and left with a surface suitable for laying the pipe or building the structure.

2.3 Drainage Wellpoint System:

If required, the Contractor shall dewater the excavations by means of an efficient drainage system which will drain the soil and prevent saturated soil from flowing into the excavation. The wellpoints shall be designed especially for this type of service. The pumping unit shall be designed for use with the wellpoints and shall be capable of maintaining a high vacuum and of handling large volumes of air and water at the same time.

If required, the installation of the wellpoints and pump shall be done under the supervision of a competent representative of the manufacturer. The Contractor shall do all special work such as surrounding the wellpoints with sand or gravel or other work which is necessary for the wellpoint system to operate for the successful dewatering of the excavations.

3.0 CRUSHED STONE SEWER PIPE BEDDING

3.1 The Contractor shall lay and cover all sanitary sewer pipe in a bedding of compacted crushed stone or as directed by the Engineer.

3.2 Crushed Stone Foundation Bedding:

Unless otherwise provided or directed by the Engineer for a particular portion of a project, all pipe used for main sewers, laterals, connected thereto, shall be laid on a foundation of six inches of 3/8- inch crushed stone as required by the Engineer.

Crushed stone shall be placed in the trench to a sufficient height so that upon completion of compaction, as required in the specifications, the entire upper surface of the crushed stone shall be no lower than the bottom of the barrel of the pipe to be laid thereon. The upper surface of the crushed stone shall be shaped as necessary to provide proper grade for the pipe to be laid thereon, bell holes shall be made in the crushed stone so that the pipe shall be supported on its barrel portion only, and the pipe laid thereon to line and grade in the manner described in the specifications.

When the pipe is properly positioned, crushed stone, unless otherwise required by the Engineer, shall be pulled or scraped up against the pipe suitably rammed into place along the barrel of the pipe only to firmly hold the pipe in position. Care shall be taken during these operations to assure that the pipe shall not be disturbed.

3.3 Crushed Stone Haunching:

Unless otherwise provided for a particular portion of a project, all pipe used for main sewers, laterals connected thereto, in sizes up to and including 12-inch and plastic pipe larger than 12-inch size shall be haunched with crushed stone from the crushed stone foundation to a point at least half-way up the side of the pipe and to this same elevation out to the trench wall. The size of the crushed stone shall be ¾-inch. Care shall be taken when placing this crushed stone haunching to assure that the pipe shall not be disturbed. The Contractor shall use any means necessary to assure firm compaction of this crushed stone haunching and adequate side support for the pipe.

3.4 Pipe Laid in Rock Trench:

In trenches excavated through rock, the rock shall be removed so that there are no points or spurs of rock that project within the limits described elsewhere herein as minimum clearances for rock excavation. The average clearances on sides of pipe shall be not less than six inches for pipe 18 inches or less in size, eight inches for larger pipe. The bottom of the trench will then be

filled with crushed stone, as required or ordered.

In filling under, around, and directly over pipe laid in rock cuts, no fragments of broken rock more than three inches in longest dimension will be allowed to be placed within four inches of any part of the pipe. No fill of larger rock fragments will be allowed on sides of pipe or until pipe has been covered to a depth of at least one foot with fine, compacted material.

3.5 Synthetic Drainage Fabric on top of Crushed Stone Bedding:

At locations indicated on the plans and as directed by the Engineer, the Contractor shall furnish and install synthetic drainage fabric on top of the crushed stone bedding.

The crushed stone surface shall be formed to an even surface prior to placement of the fabric, and any sharp object shall be removed to avoid fabric punctures. The fabric shall not be placed until the Engineer has approved the surface upon which it will be placed.

The fabric shall be placed in double layers and turned up at trench sides to the height shown on the plans, or as directed by the Engineer. At joints, fabric shall be overlapped at least three feet. Inadvertent tears or punctures in the fabric may be repaired by placing an additional layer of fabric over tear or puncture with an overlap of three feet from the damaged area.

After the fabric has been placed and approved by the Engineer, approved trench backfill material shall be placed and compacted to dimensions as shown on the plans or as directed by the Engineer. If the fabric is punctured during placing of the backfill, fabric shall be repaired to the satisfaction of the Engineer at the expense of the Contractor.

5.0 DUCTILE IRON SEWER PIPE

5.1 Installing Pipe and Fittings:

No defective pipe or fittings shall be laid or placed in the piping, and any piece discovered to be defective after having been laid or placed shall be removed and replaced by a sound and satisfactory piece.

Each pipe and fitting shall be cleared of all debris, dirt, etc. before being laid and shall be kept clean until accepted in the complete work.

Pipe and fittings shall be laid accurately to the lines and grades indicated on the drawings or as required. Care shall be taken to ensure a good alignment both horizontally and vertically. In buried pipelines, each pipe shall have a firm bearing along its entire length.

When mechanical joint, push-on joint, or similar pipe is laid, the bell of the pipe shall be cleaned of excess tar or other obstruction and wiped out before the cleaned and prepared spigot of the next pipe is inserted into it. The new pipe shall be shoved firmly into place until properly seated and held securely until the joint has been completed.

Casting to be encased in masonry shall be accurately set with the bolt holes, if any, carefully aligned. Immediately prior to being set, castings shall be thoroughly cleaned of all rust, scale, and other foreign material.

5.2 Temporary Plugs:

At all times when pipe laying is not actually in progress, the open ends of pipe shall be closed by temporary watertight plugs or by other approved means. If water is in the trench when work is resumed, the plug shall not be removed until all danger of water entering the pipe has passed.

5.3 Assembling Push-On Joints:

Push-on joints shall be made up by first inserting the gasket into the groove of the bell and applying a thin film of special non-toxic gasket lubricant uniformly over the inner surface of the gasket that will be in contact with the spigot end of the pipe. The chamfered end of the plain pipe shall be inserted into the gasket and then forced past it until it seats against the bottom of the socket.

5.4 Bolted Joints:

Materials for bolted joints shall be as hereinbefore specified. Before the pieces are assembled, rust-preventive coatings shall be removed from machined surfaces. Pipe ends, sockets, sleeves, housings, and gaskets shall be thoroughly cleaned and all burrs and other defects shall be carefully smoothed.

5.5 Assembling Flanged Joints:

Flanged joints shall be made up tight, care being taken to prevent undue strain upon pump nozzles, valves, and other pieces of equipment.

5.6 Assembling Mechanical Joints:

Surfaces against which the gasket will come in contact shall be thoroughly brushed with a wire brush prior to assembly of the joint. The gasket shall be cleaned. The gasket, bell and spigot shall be lubricated by being washed with soapy water. The gland and gasket, in that order, shall be slipped over the spigot, and the spigot shall be inserted into the bell until it is correctly seated. The gasket shall then be seated evenly in the bell at all points, centering the spigot, and the gland shall be pressed firmly against the gasket. After all bolts have been inserted and the nuts have been made finger-tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint to the proper tension, preferably by means of a torque wrench.

The correct torque as indicated by a torque wrench and the length wrench (if not a torque wrench) used by an average man to produce such range of torque shall not exceed the values specified in the tabulation entitled “Torque Range Values”.

TORQUE RANGE VALUES

Nominal Pipe Size, in.	Bolt Diameter, in.	Range of Torque, Ft. – Lb.	Length of Wrench, in.
3	5/8	40-60	8
4-24, incl.	3/4	60-90	10
30, 36	1	70-100	12
42, 48	1-1/4	90-120	14

If effective sealing of the joint is not attained at the maximum torque indicated above, the joint shall be disassembled and thoroughly cleaned, then reassembled. Bolts shall not be over stressed to tighten a leaking joint.

6.0 LATERAL CONNECTIONS

6.1 The work under this item shall consist of the installation of building connection laterals in accordance with details as shown on the plans and as specified herein. Construction shall be at locations shown on the plans or as determined by the Engineer.

6.2 General:

Unless otherwise specified on the drawings or contract documents, or otherwise approved by the Engineer, sewer lateral connections shall be constructed using a nominal pipe diameter of 6 inches and shall be of the same material as that used for the main sewer line. The Contractor shall furnish stoppers for plugging the unconnected ends of laterals. Stopper configuration shall be as recommended by the manufacturer of the lateral pipe as approved by the Engineer. Stoppers shall be watertight once installed.

6.3 Installation:

Lateral connections shall be laid to the grade and to the points ordered. They will not be laid on a grade flatter than one percent, and will usually have eight feet of cover at the curb or street line in most residential streets or zones. On business streets, or streets adjacent to the business section of the city, or where the adjacent land is low, they will have not less than ten feet of cover at the curb, if possible. If so directed, the whole of the trench shall be dug to the required grade before any pipe is laid herein, and the pipe shall be laid closely to line and grade, using a grade line, hand level, or straight edge as may be ordered.

House lateral connections will generally be laid at right angles to the main sewer from Y-branches on sewers by means of 45-degree bends of approved form, or from drop inlets or chimneys built into the sewers. The Contractor shall take proper means to temporarily locate all wyes, etc. in the main sewer before connections are laid and will be responsible for finding wyes, etc. from which the Contractor is to lay connections or laterals.

Extra care shall be taken to make smooth, close-fitting joints at all bends. Pipes shall be trimmed or extra bends used when ordered to accomplish this, without extra charge. So far as

possible, every pipe shall be swabbed out inside after being installed. All requirements for laying pipe of this size, as described elsewhere herein, shall be observed in laying lateral connections so far as those requirements apply.

The end of each lateral connection shall be closed with an approved stopper. Stoppers shall be watertight and yet be installed in a manner which would allow them to be removed with reasonable ease without causing damage to any portion of the lateral.

A stout stake to mark the location and elevation of the end of each lateral will be driven as directed by the inspector near the end of each lateral.

This stake will be protected and maintained undisturbed until the Engineer has completed all his measurements and, if so ordered, will thereafter be removed by the Contractor.

Except where otherwise indicated or ordered, house lateral connections will be of six-inch pipe. If pipe larger than six inches is ordered in a lateral or connection where such larger size had not previously been indicated, and where the price for lateral or connection was based on use of six-inch pipe, the Contractor will be paid the additional cost of the larger size pipe over and above what would have been the cost of equivalent six-inch pipe and fittings.

6.4 Sheeting at Branches:

Sheeting shall be cut away and removed from in front of capped wyes and other branches or inlets in sewer for future connections to permit conveniently finding them and making future connections with them. If required by drawings or directed by the Engineer, a 45-degree bend will be set in Y-branches or a short piece of pipe set into inlets left in the sewer, the end of the bend or pipe stub being capped in the manner described previously so that a future connection can be made thereto without excavating against the side of the main sewer.

6.5 Markers at Branches:

A piece of lumber not less than two-inch by four-inch will be set vertically and left in place, extending from a point directly in front of, but not in contact with, the capped end of the lateral connection to a point about two feet below the ground surface or finished street grade to guide persons who in future years may have occasion to excavate to find the connections, and to protect the end of the lateral connection from damage when making such excavation.

7.0 PIPE TESTS

7.1 The pipeline shall be made as nearly watertight as practicable, and pipe tests and measurements shall be made after the pipeline has been backfilled.

Where the groundwater level is more than one foot above the top of the pipe at its upper end, the Contractor shall conduct an infiltration test. However, if the groundwater level is four feet or less at this point, a low-pressure air test may be performed instead. Where the groundwater is less than one foot above the top of the pipe at its upper end, the contractor shall conduct either exfiltration or low-pressure air tests as determined by the Engineer.

Tests will be made after the pipe installation is complete including all laterals as indicated on the plan, manholes are installed and backfill in the trench has been placed and compacted or consolidated as required by the Engineer.

7.2 Visual Alignment Test:

Upon completion of a pipe section, the contractor will request that a visual inspection be made by the Engineer. All associated appurtenances installed in conjunction with the installation of the pipeline will also be examined for compliance with these specifications. Prior to the visual inspection, the contractor shall ensure that the line has been properly cleaned of all foreign materials that might have entered the pipeline.

If, in the opinion of the Engineer, the installed pipe does not conform to the alignment indicated on the drawings or does not satisfy the requirements outlined under "Allowable Pipe Deflection", the Contractor shall take accurate measurements as outlined elsewhere within these specifications. All pipeline determined to be outside the noted tolerances shall be corrected to the satisfaction of the Engineer at no cost to the Town.

7.3 Low Pressure Air Test:

7.3.1 General:

When the Engineer specifies or directs that pipe tests shall be made using the low-pressure air test method, the Contractor will be required to provide all equipment, test plugs in the required sizes, appurtenances, connecting hose or pipe, labor, and materials necessary to conduct and control the test as herein specified.

The tests may be conducted by the Contractor using the contractor's equipment, or a subcontractor approved by the Engineer. All equipment proposed for use in conducting the low-pressure air test shall be subject to the approval of the Engineer. The Contractor shall submit shop drawings on the proposed equipment for review by the Engineer. These shop drawings must be in sufficient detail to show the details, set-up, and proposed operation of the low-pressure air test equipment, and no testing will be permitted without prior approval of the proposed equipment by the Engineer.

7.3.2 Procedure:

The Contractor shall determine the elevation of the groundwater table in the area of the pipeline being subjected to the low-pressure air test in a manner approved by the Engineer.

After cleaning and flushing the line, test plugs will be installed in the pipeline being subjected to the low-pressure air test, and braced as necessary to secure the plugs in place.

Utilizing the approved equipment, air at low pressure will be slowly introduced into the pipeline

until the pressure within the pipeline being tested increases to 4 PSIG greater than the back pressure exerted by the groundwater table over the pipe being tested (back pressure = 1 PSIG per 2.31 feet of water), as determined above. If the water table is not a level above the pipe, the test pressure should be brought up to 4 PSIG. Allow at least two minutes to elapse prior to starting the test. If necessary, allow a small amount of air to slowly enter into the pipeline in order to maintain a pressure of 4 PSIG above the back pressure due to the water table, or 4 PSIG if there is no back pressure to compensate for.

At this point, start measuring the time for the pressure in the pipeline to drop 1 PSIG.

The time necessary to drop 1 PSIG shall not be less than that indicated in Table 7.3 for the size and length of pipeline being tested. If the time is less than that indicated in Table 7.3, the line will be considered as having failed the test.

Any section of pipeline which fails to meet this test will be repaired or replaced as necessary by the Contractor, and retested at no additional expense to the Town.

No pipeline will be considered acceptable until it successfully passes the requirements of this test.

All testing will be conducted by the Contractor or his approved subcontractor in the presence of the Town's inspector. The contractor or subcontractor shall keep a written record which will show the results of the tests conducted. The records should include sufficient data on length of line, pressure levels, time for pressure drop, and related features noted during the testing of each segment of the line. A copy of this record shall be given to the Town.

TABLE 7.3
LOW PRESSURE AIR TEST
MINIMUM TIME REQUIRED FOR A 1 PSIG PRESSURE DROP

Pipe (in)	Specification Time for Lengths Below (Min:Sec)											Time for Longer Length (Sec)
	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	500 ft	550 ft	600 ft	
6	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:25	7:07	7:50	8:33	0.854 x L (ft)
8	7:33	7:33	7:33	7:33	7:36	8:52	10:08	11:24	12:40	13:56	15:12	1.519 x L (ft)
10	9:27	9:27	9:27	9:54	11:52	13:51	15:50	17:48	19:47	21:46	23:45	2.374 x L (ft)
12	11:20	11:20	11:20	14:15	17:06	19:57	22:48	25:39	28:30	31:20	34:11	3.419 x L (ft)
15	14:10	14:10	17:48	22:16	26:43	31:10	35:37	40:04	44:31	48:58	53:25	5.342 x L (ft)
18	17:00	19:14	25:39	32:03	38:28	44:52	51:17	57:42	64:06	70:31	76:56	7.692 x L (ft)
21	19:50	26:11	34:54	43:38	52:21	61:05	69:48	78:32	87:15	95:59	104:42	10.47 x L (ft)
24	22:48	34:11	45:35	56:59	68:23	79:47	91:10	102:34	113:58	125:22	136:46	13.67 x L (ft)
27	28:51	43:16	57:42	72:07	86:33	100:58	115:24	129:49	144:14	158:40	173:05	17.3 x L (ft)
30	35:37	53:25	71:14	89:02	106:51	124:39	142:28	160:16	178:05	195:53	213:41	21.36 x L (ft)
33	43:06	64:38	86:11	107:44	129:17	150:50	172:23	193:55	215:28	237:01	258:34	25.85 x L (ft)

Note:
If the section of pipe to be tested is composed of both main line and more than a total of 100 feet of laterals, 1 minute 30 seconds must be added to the length of time indicated above for the test required for the main pipe.

7.4 Exfiltration Tests:

For making the exfiltration tests, the pipe shall be subjected to an internal pressure by plugging the pipe at the lower end and then filling the pipelines and manholes with clean water to a height of two feet above the top of the pipe at its upper end. Where conditions between manholes may result in test pressures which would cause leakage at the stoppers in branches, provisions shall be made by suitable ties, braces, and wedges to secure the stoppers against leakage resulting from the test pressure.

The rate of leakage from the pipe shall be determined by measuring the amount of water required to maintain the level two feet above the top of the pipe.

Leakage from the pipes under test shall not exceed the requirements for leakage into pipes as hereinbefore specified.

The equipment used to introduce the low-pressure air into the pipeline shall include a safety valve or release device located in the equipment at a point which will ensure that during the build-up of test pressure, the pipeline being tested will not be subjected to an internal pressure that could damage a properly installed pipe.

All tests shall be conducted on the completed pipeline between manholes. Testing of shorter sections of pipeline will only be permitted with the approval of the Engineer.

Immediately prior to testing, all lines will be cleaned and flushed with water. Pipe manufactured in accordance with ASTM Specifications C-76, C-428, C-644 and/or C-700 shall be soaked for a period of 12 hours to saturate the pipe wall prior to testing with low pressure air.

All gages, controls, and appurtenances for equipment used to conduct the test will be located out of manholes. Connections to the line under test, test plugs, and other equipment will be made with hose or pipe extensions which will safely contain the pressures necessary to conduct and control the test.

The gage used to measure the drop in pressure shall have a four-inch diameter face with a scale of 0 to 15 PSI in 0.1 PSI increments, or as approved by the Engineer.

The Contractor is cautioned of the importance of properly installing the end caps used to plug hubs, wyes, bends, ends of laterals, and other inlets, and securing them against movement during the installation of pipe. Failure to take this precaution can cause a properly installed pipeline to fail the low-pressure air test.

The Contractor is cautioned further regarding the safety of personnel during the test. Low pressure air can exert a substantial force on a test plug, even on small diameter pipe plugs. The Contractor will be responsible to ensure that all test plugs utilized are in good condition and that they will not be pressurized beyond the limits recommended by their manufacturer.

No one will be permitted in a manhole containing a test plug while air is under pressure in the pipeline being subjected to the test.

The pipes shall be tested before any connections are made to buildings.
The Contractor shall construct weirs or other means of measurements as may be required.

Suitable bulkheads shall be installed, as required, to permit the test of the pipe.

Should the sections under test fail to meet the requirements, the Contractor shall do all work of

locating and repairing the leaks and retesting as the Engineer may require without additional compensation.

The water used to conduct an exfiltration test shall not be allowed to enter any active sewer.

If, in the judgment of the Engineer, it is impracticable to follow the foregoing procedures for any reason, acceptable modifications in the procedures shall be made as required, but in any event, the Contractor shall be responsible for the ultimate tightness of the line within the above test requirements.

7.5 High Pressure Water Test:

Except as otherwise directed, all pipelines shall be given combined pressure and leakage tests in sections of approved length.

The Contractor shall furnish and install suitable temporary testing plugs or caps, all necessary pressure pumps, pipe connections, meters, gages, and other necessary equipment, and all labor required.

Subject to approval, and provided that the tests are made within a reasonable time considering the progress of the project as a whole, and the need to put the section into service, the Contractor may make the tests when the Contractor desires.

However, pipelines in excavation or embedded in concrete shall be tested prior to the backfilling of the excavation or placing of the concrete, and exposed piping shall be tested prior to field painting.

Unless it has already been done, the section of the pipe to be tested shall be filled with water of approved quality, and all air shall be expelled from the pipe. If blow-offs are not available at high points for releasing air, the Contractor shall make the necessary excavations and do the necessary backfilling and make the necessary taps at such points and shall plug said holes after completion of the test.

The section under test shall be maintained full of water for a period of 24 hours prior to the combined pressure and leakage test being applied.

The pressure and leakage test shall consist of first raising the water pressure (based on the elevation of the lowest point of the section under test and corrected to the gage location) to a pressure in pounds per square inch numerically equal to the pressure rating of the pipe, but not to exceed 150 PSI.

While maintaining this pressure, the Contractor shall make a leakage test by metering the flow of water into the pipe. If the average leakage during a two-hour period exceeds a rate of ten gallons per inch of diameter per 24 hours per mile of pipeline, the section shall be considered as having failed the test. All joints within chambers and all flanged joints shall have no visible leakage.

8.0 MISCELLANEOUS

Miscellaneous materials not specified herein, shall be of the type, size, material and manufacture as shown on the drawings, required by the manufacturer for the installation, or as specified by the City of Meriden Water Pollution Control Division.

Method of Measurement:

The number of linear feet of 10" Ductile Iron Pipe (Sanitary Sewer) measured for payment shall be the number of linear feet of sewer main of the size installed and accepted measured along the horizontal projection of the centerline of the completed sewer to the connection at existing mains or manholes or a capped or terminated end, including any fittings or couplings attached thereto. The diameter of manholes (as measured between the inside walls of the manholes) shall be deducted there from.

Basis of Payment:

All work covered by this item will be paid for at the contract unit price under the following pay item:

- 10" Ductile Iron Pipe (Sanitary Sewer) l.f.

The above pay item shall be complete and accepted in place, including all materials, equipment, tools and labor incidental thereto, including, but not limited to;

A. Trenching and excavation, removal of existing (bituminous or concrete) pavement, sheeting, shoring, bracing, aggregate or stone bedding or cover, pervious or other backfill material, backfilling and compacting, disposal of surplus and unsuitable excavated materials, cleaning pipelines and appurtenances, markers, filter fabric, laying and jointing pipe, digging of test pits, dewatering, restoration of trench surfaces, and other incidental work.

B. Sawcutting of neat lines for trench limits prior to excavation.

C. Temporary bituminous concrete pavement or patch in pavement or sidewalk areas.

D. Removal, resetting and replacement of curbs and sidewalks.

E. All fittings and specialized joints, including flexible couplings, transition couplings, mechanical joints, tees, bends, anchor couplings, joint restraints, etc.

F. Pipe tests and all other materials, equipment, tools and labor incidental thereto.

G. Planning and coordination of all work.

The contract unit price for the pay items for 10" Ductile Iron Pipe (Sanitary Sewer) shall also include concrete encasement for watercourse crossings, making of connection to existing pipes or manholes, resetting, replacing or rebuilding items removed or disturbed, and all labor, equipment, material, and maintenance connected therewith.

The Contractor will be responsible for all costs and delays incurred due to efforts to locate and repair leaks in any pipeline which fails the low-pressure air test, regardless of whether the failure is due to workmanship, material failure, the result of an improperly installed or braced end cap, or any pipeline damaged due to improper testing procedure. Payment made under the appropriate item shall be considered full compensation for conducting the specified test.

Rock-in-trench excavation or excavation of unsuitable material beyond the limits of the trench will be paid as extra work as outlined in Section 02.86 - Drainage Trench Excavation, Rock In Drainage Trench Excavation. Additional stone foundation material or concrete mat for areas of unsuitable foundation material shall also be paid as additional work under items if provided for these materials or as negotiated under Section 1.09 of the Standard Specifications Form 819, or latest.

PAY ITEM	**PAY UNIT**
10” Ductile Iron Pipe (Sanitary Sewer)	l.f.

ITEM #1401662A SANITARY MANHOLE (4' DIA.) 0' TO 10' DEEP

1.0 DESCRIPTION

A. The work covered by this section includes the furnishing of all plant, labor, equipment, appliances and materials and performing all operations in connection with the satisfactory installation of precast reinforced concrete manholes frame and cover, and all incidental work, complete, in strict accordance with the specifications and applicable drawings and conditions of the contract.

B. The work also covers the abandonment and removal of existing sanitary sewer manholes as indicated on the plans.

C. The Contractor shall provide the Engineer with shop drawings for all precast materials with a description of all methods of jointing. In addition, shop drawings for manhole steps, manhole frames and manhole covers shall be submitted to the Engineer for approval prior to installation.

D. It is the intention of these specifications and the desire of the Engineer that the manholes, including all component parts, have adequate space, strength and leak proof qualities considered necessary by the Engineer for the intended service. Space requirements and configurations, shall be as shown on the drawings. Manholes shall be an assembly of precast sections with steel reinforcement, with approved jointing or concrete cast monolithically in place with reinforcement. In any approved manhole, the complete structure shall be of such material and quality as to withstand loads of 8 tons (H2O loading) without failure and excess leakage, as defined in paragraph 3g, for the life of the structure. A period generally in excess, of 25 years is to be understood as the life of the structure.

E. Manholes shall be constructed at the locations, to the elevations, and in accordance with notes and details shown on the drawings.

2.0 MATERIALS

A. Precast reinforced concrete units:

1. Precast reinforced concrete manhole bases, risers, tops and grade rings shall be of the types indicated or as directed.

2. Precast reinforced concrete manhole bases, risers, transition sections and tops shall conform to the requirements of ASTM C478, latest revision except as modified herein, and/or on the drawings.

3. The height and diameter of manhole bases shall be as required to accommodate the size of sewer pipe used.

4. The manhole risers shall be available in 2, 3, or 4-foot lengths. Manhole tops of the eccentric cone type shall be 3 or 4 feet high with a 36-inch inside

diameter opening at the top. Wall thickness of manhole risers shall not be less than 5 inches.

5. When shallow installations do not permit the use of a cone type top or where directed, flat slab tops shall be used. Flat slab tops shall not be less than 6 inches thick and shall have an opening with an inside diameter of 36 inches.

6. Transition sections shall be similar to the tops and used as reducers to join the larger bases with the four-foot diameter risers. The transition sections shall be of the length required and have a four-foot opening at the top. Wall thickness of transition sections and cone type tops shall not be less than 5 inches at the base and shall taper to a thickness not less than 8 inches at the top.

7. Manhole steps shall be provided in each manhole. Manhole steps shall be arranged in the manhole bases, transition sections, risers and cones so as to provide a manhole step ladder approximately 12 inches on center for the full height of installation. Manhole steps shall be copolymer polypropylene plastic coated 1/2"grade 60 I steel reinforced step Model No. PS2-PFSL in conformance with ASTM C478 paragraph 11 as revised, as manufactured by M.A. Industries, Peachtree City, Ga.

8. All manhole bases, transition sections, risers and tops shall be joined using Butyl Rubber Section Joints conforming to Federal Specification SS-S-210.

9. The exterior surfaces of all manholes shall be shop coated with two coats of Super Service Black as manufactured by Koppers Company Inc., or Heavy Duty Black 46-449 as manufactured by Tnemec or approved equal.

B. Openings in Manhole Bases and Risers

1. Openings for pipes entering manhole bases and risers shall be provided at the locations and to the arrangements and dimensions shown on the approved shop drawings.

2. Openings in manhole bases and risers shall be provided with a prefabricated mechanical type joint seal between manhole walls and entering pipes. Joint seal shall be of a type to insure water tight jointing between manhole and pipes under all conditions of installation. The type of joint seals to be used shall be subject to approval and shall be as shown on the approved shop drawings.

C. Mortar Grout

Non-shrink type mortar or grout shall be a factory-mixed ready-to-use product containing an especially prepared metallic aggregate, cement and sand and other components which shall produce a mortar or grout with properties to counteract

shrinkage, increase density, withstand impact, improve workability and produce watertight joints.

D. Concrete

1. The concrete used for precast manhole bases, transition sections, risers and tops shall have an average strength of 5,000 psi at 28 days.

2. Strength shall be determined by tests on 6-inch by 12-inch vibrated test cylinders cured in the same manner as the manhole bases, transition sections, risers and tops or by any other approved method.

3. Not less than two concrete strength tests shall be made for each 100 linear feet of manhole bases, transition sections, risers and tops.

4. Testing may be conducted at the manufacturer's plant or at an approved testing laboratory and shall be the responsibility of the Contractor, at no additional expense to the Owner.

E. Reinforcing steel

1. Reinforcing steel used for precast manhole bases, transition sections, risers, and tops shall conform to ASTM A18S, latest revision.

F. Cement

Cement shall be moderate heat-of-hardening portland cement conforming to ASTM Designation C 150, latest revision, Type 1 for Brick work and Type 11 for precast units.

G. Absorption

Absorption is to be determined by absorption test described in ASTM Designation C 478, latest revision, and shall not exceed 8 percent of dry weight.

H. Brick

1. Brick for manholes shall conform in all respects to ASTM Designation C 32, Grade SM, latest revision, size 2-1/2 inches by 3-3/4 inches by 8 inches.

2. Bricks that are broken, warped, cracked or of improper size or quality or unduly chipped or otherwise defective shall not be used in the work and shall be removed from the site.

I. Mortar Plaster

1. Mortar and plaster for brick work shall be composed of one part Portland cement and two parts sand with only sufficient water added to make a stiff plastic mortar of a consistency and texture satisfactory to the owner.

2. Mortar shall be used so that it will be in place before the initial setting of cement has taken place; retempering of mortar in which the cement has started to set will not be permitted.

J. Sand

1. Sand for mortar shall be graded uniformly from fine to coarse and when dry shall pass a screen having 8 meshes to the inch.

2. Sand shall consist of an aggregate having clean, hard, durable, strong, uncoated grains and free from deleterious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam or other deleterious substances.

3. The sand shall be washed clean before loading on delivery trucks. Natural sand which shows a color darker than the standard color when tested in accordance with the Standard Method of Test for Organic Impurities of ASTM Designation C 40, latest revision, will be cause for rejection.

K. Water

Mixing water for concrete and mortar shall be clean and fit to drink and obtained preferably from the municipal supply.

L. Bedding Materials

1. Gravel bedding shall consist of hard durable material free from roots, sod, rubbish, organic material, clay or loam and meeting ASTM C33 stone size No. 67 as follows:

100%	passing	1" screen
90 -100%	passing	3/4" screen
20 -55%	passing	3/8" screen
0 -10%	passing	#4 sieve
0 -5%	passing	#8 sieve

2. Where ordered by the Engineer to stabilize the base, screened gravel or crushed stone 1/2 inch to 1-1/2 inches shall be used.

M. Manhole Frames and Covers

1. Cast-iron manhole covers and cast-iron watertight frames and covers shall conform to the details, types and styles as specified and as shown on the drawings. Shop drawings shall be submitted to the Owner for approval before fabrication.

2. Gray iron castings shall conform to the requirements of AASHTO Designation: H 105-49, Class 30, latest revision. Iron castings shall be true to pattern in form and dimensions, free from pouring faults, sponginess, cracks, blow-holes and other defects in positions effecting the strength and value for the service intended. The finished castings shall be painted with a coal-tar epoxy coating so as to produce a smooth, finished coating, tough and tenacious when cold and not tacky or with any tendency to scale off under reasonable temperature changes.

3. The cast-iron manhole covers and cast-iron watertight manhole frame and covers for manhole structures shall be as manufactured by E.L. LeBaron Foundry Company, Campbell Foundry Company Cat. No. LJ 116 or equal.

3.0 CONSTRUCTION METHODS

A. Inspection

1. All manhole bases, transition sections, risers, tops, steps, frames and covers will be inspected upon delivery. Those which do not conform to these specification requirements will be rejected and shall be removed immediately from the site by the Contractor. The Contractor shall furnish all labor and facilities necessary to assist the inspector in inspecting the material.

2. All manhole bases, transition sections, risers, tops, steps, frames and covers which have been damaged after delivery or during installation shall be removed and replaced by the Contractor with new, sound and approved material, at no additional expense to the Owner. At the time of inspection, the surfaces of bases, transition sections, risers and tops shall be dense and close-textured. Cores shall serve as a basis for rejection of manhole bases, transition sections, risers and tops if poor bond with reinforcement steel exists or reinforcement is exposed.

3. The quality of all materials, processed of manufacture, and the finished manhole bases, transition sections, risers, and tops shall be subject to inspection and approval by the Owner. Such inspection may be made at the place of manufacture and/or on the site, and the manhole bases, transition sections, risers, and tops shall be subject to rejection at any time on account of failure to meet any of the specification requirements, even though sample manhole bases, transition sections, risers, and tops may have been accepted as satisfactory.

B. Excavation and Backfilling

1. Excavation, backfilling and compacting shall be completed in accordance with Section 02221.

C. Installation of Manhole Bases and Sections

1. Precast bases shall be placed on a six-inch layer of compacted bedding material as described in Paragraph 2. The excavation shall be properly dewatered while placing bedding material and setting the base.

2. Each manhole base, transition section, riser, and top shall be eased into its: position in the trench using materials and methods as recommended by the manufacturer of the precast units. The Contractor shall provide all necessary slings, straps and other devices for the safe and satisfactory handling and support of manhole bases, transition sections, risers and tops during lifting, installation and final positioning. Lifting holes may be permitted provided the holes are plugged and sealed watertight with mortar, all as approved.

3. Manhole bases, transition sections, risers and tops shall be installed using approved jointing methods which are completed in accordance with the manhole manufacturer's recommendations, and as approved. Manhole bases, transition sections, risers, and tops shall be installed level and plumb. Water shall not be permitted to rise over newly made joints until after inspection and acceptance. All jointing shall be done in a manner to ensure watertight joints.

4. Openings shall be provided in the precast manhole bases and risers to receive entering pipes, and these openings shall be made at the place of manufacture. The openings for all entering pipes shall be provided with the approved type mechanical joint sealing device shown on the approved shop drawings and the installation of pipes entering the manholes and the installation of the mechanical joint sealing device made in strict conformance with the manhole manufacturer's printed recommendations and so as to obtain watertight joints between manholes and pipe and in a satisfactory manner. Five copies of the manufacturer's printed recommendations shall be furnished to the owner.

5. Care shall be taken to assure that the openings are made to permit setting of the entering pipe at its correct elevation as indicated or directed. Mortar used in sealing spaces between entering pipes and , openings in manhole walls shall be of the non-shrink type. Damaged bases and risers by jointing devices will be rejected and shall be replaced by the Contractor at no additional expense to the Owner.

6. Manhole bases, transition sections, risers and tops shall be installed so that the manhole steps are in alignment.

7. Manhole steps shall be installed in accordance with the requirements of the U.S. Department of Labor, Occupational Safety and Health Administration, CFR 29, Part 1910.27g, as amended.

D. Drop Manhole Connections

Drop manhole connections shall be constructed as shown on the drawings. The encasement for the drop pipe shall be constructed after the installation of the pipe. Special care shall be taken to provide a watertight seal between the pipe and the manhole wall.

E. Installation of Cast Iron Frames and Covers

1. Cast iron frames and covers shall be installed where shown on the plans and listed in the specifications. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

2. The cover shall not have vent holes, and shall fit firmly within the existing frame, with the top being flush with the existing frame. Gaskets or fillers will not be allowed. The cover shall have concealed pick holes.

F. Installation -Cast Iron Watertight Frames and Covers

1. Cast iron watertight frames and covers shall be installed where shown on the plans and listed in the specifications. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

2. The cover shall fit firmly within the frame with the top being flush. The entire installation shall be watertight.

G. Masonry Construction

1. Brick masonry shall include brick masonry walls for extending manhole walls to grade when directed; formed brick masonry for constructing manhole inverts and invert tables, cement-mortar plaster on exterior surfaces of masonry walls, mortar, building-in or manhole steps and pipes and appurtenant work.

2. Brick masonry shall be provided to the details and dimensions indicated or as directed. All exterior surfaces of brick masonry manhole walls shall be plastered with a 1:2 Portland cement and sand mortar plaster to provide a minimum thickness of 1/2 inch; mortar plaster shall be applied with sufficient pressure to ensure a dense plaster completely filling all voids and thoroughly bonded to the brick work.

3. Inverts shall have a cross section shaped to conform with connecting sewers; changes in size shall be made gradually and evenly.

4. Brick masonry construction shall be done in a manner to ensure watertight construction ", and all leaks in brick masonry shall be sealed. Brick masonry shall be repaired or replaced so as to obtain watertight construction at no additional expense to the Owner.

5. All workmanship shall conform to the best standard practice and all brick masonry shall be laid by skilled workmen. Brick masonry walls shall be constructed to the thickness indicated. All beds on which masonry is to be laid shall be cleaned and wetted properly. Brick shall be wetted as required and shall be damp but free of any surface water when placed in the work.

6. Bed joints shall be formed of a thick layer of mortar which shall be smoothed or furrowed slightly. Head joints shall be formed by applying to the brick to be laid a full coat of mortar on the entire end or on the entire sides as the case requires, and then shoving the mortar-covered end or side of the brick tightly against the bricks laid previously; the practice of buttering at the corners of the brick and then throwing mortar or scrapings into the empty joints will not be permitted. Dry or butt joints will not be permitted. Joints shall be uniform in thickness and shall be approximately 1/4 inch thick. Joints on the inside face of walls shall be tooled slightly concave with an approved jointer when the mortar is thumbprint hard, the mortar shall be compressed with complete contact along the edges to seal the surface of the joints.

7. Brickwork shall be constructed accurately to dimensions and brickwork at top of manholes shall be to the dimensions of the flange of the cast iron frames.

8. No water shall be allowed to flow against brickwork or to rise on the masonry for 10 hours after it has been laid and any brick masonry damaged in this manner shall be replaced as directed at no additional expense to the Owner.

9. Adequate precautions shall be taken in freezing weather to protect the masonry from damage by frost.

10. All pipes, or castings to be embedded in the brickwork shall be accurately set and built-in as the work progresses; pipe stubs shall be closed with suitable plugs in an approved manner.

11. The outside face of all brickwork shall be plastered to the thickness and using the mortar specified herein; plaster shall be troweled to a smooth, hard finish and no backfill shall be placed until the mortar has thoroughly hardened.

H. Leakage Tests

1. Leakage tests shall be made by the Contractor at his expense and observed by the Engineer on each manhole. The test shall be by vacuum in accordance with ASTM Specification C-828-80. Notarized records of the test results shall be submitted by the Contractor to the Owner for approval.

2. The vacuum testing system shall be as supplied by NPC Systems, Inc., or approved equal. The testing shall be done immediately after assembly of the manhole and before back-filling. A GO-inch/lb. torque wrench shall be used to tighten the external clamps that secure the test cover to the top of the manhole. All lift holes shall be plugged with a non-shrinking mortar, as specified in this Specification. The Contractor shall plug the pipe openings, taking care to securely brace the plugs and the pipe to prevent the pipes from being drawn into the manhole. A vacuum of 10 inches Hg (4.9 psi) shall be drawn and the vacuum pump shut off. The test shall pass if the vacuum remains at 10-inches of Hg or drops to 9 inches Hg (4.4 psi) in a time greater than one minute.

3. If the manhole fails the initial test, the Contractor shall locate the leak and make proper repairs. Leaks may be filled with a wet slurry of accepted quick setting material. The manhole shall then be retested, repeatedly, if necessary, by the Contractor, until the required conditions are met, at no additional expense to the owner.

4.0 METHOD OF MEASUREMENT

A. Precast concrete manholes shall be measured for payment by the unit. "each" as listed in the Bid. The depth of a unit shall be the total depth from the top of the manhole frame to the invert of the sewer at the center of the manhole.

5.0 BASIS OF PAYMENT

A. Precast concrete manholes measured in place as provided in the preceding paragraph, will be paid for at the contract unit price bid "each", as listed in the bid.

B. The price and payments listed above shall constitute full compensation for furnishing and constructing precast manhole bases, transition sections, risers, cones, flat tops, complete with cast iron frames and covers, including watertight frames and covers, all pipe and pipe fittings and encasements for drop manholes, steps, brick masonry, for furnishing openings and connecting existing sewer pipelines, excavating and backfill, and appurtenant work, for leakage tests, removal of existing sanitary sewer manholes, complete " in place; and for all labor, equipment, tools, materials, and all other costs and appurtenant work incidental and necessary to complete the items as specified, as indicated and as directed by the Owner.

Pay Item	Pay Unit
Sanitary Manhole (4’ Dia.) 0’ to 10’ Deep	Each

ITEM #1401947A - REMOVE EXISTING PIPE (SANITARY SEWER)

Description:

The existing bridge supports an active gravity based 10" sanitary sewer, which is an insulated ductile iron pipe, owned and operated by the City of Meriden WPCF (WPCF). Work performed under this item consists of removal of sanitary sewer pipe and support elements from the existing bridge superstructure and the buried sections of the sanitary sewer pipe called out on the plans. In advance of the work of this item, the contractor shall install proposed 10" sanitary sewer main during stage 1 of the bridge construction as noted in the Plans or as approved by the engineer. Once the proposed sanitary sewer is accepted and in service, the work of this item may proceed as authorized by the WPCF.

Included is coordination with the WPCF for each phase of the work. The contractor shall submit a plan for approval by the Engineer and the WPCF, outlining steps for the safe draining of the sanitary sewer, joint disassembly, removal of sanitary sewer pipe sections and support elements, stripping of insulation and disposal of metals and non-metal components of the former sanitary sewer main. The plan shall include provisions for capture of residual sewage spillage as joint disassembly progresses.

The existing sanitary sewer main insulation is believed to be an ordinary closed cell thermoplastic foam product, to be handled via standard disposal procedures. The contractor is cautioned that if any non-thermoplastic foam insulation is found to notify the Engineer immediately.

Included in this work shall be all labor, tools, materials, accessories, appurtenances, equipment, lifting and hoisting apparatus, hauling, transport, disposal, incidentals, coordination, shop drawing submissions, documentation, temporary supports, venting and draining provisions, and any incidental work not specifically mentioned but necessary to result in a complete and acceptable, demolition and disposal, all included in the lump sum cost.

Materials:

Provide tools, equipment, temporary supports, debris shields, working platforms, falsework, incidentals, consumables, containers, covers, wraps and all such items to support the safe draining, disassembly, demolition, temporary storage as approved, and disposal of the sanitary sewer mains and related support elements.

Construction Methods:

The contractor shall prepare and submit written procedures and working drawings in accordance with Section 1.05.02 of Form 819. The submittal shall include the following:

- Proposed equipment and removal method
- Operating and storage location(s) of equipment and materials
- Containment and disposal of debris, including insulation and outer jacket, and lead paint where required
- Installation and removal of any required debris shields, working platforms, and falsework

Cleaning and draining of the sanitary sewers shall be done in a manner acceptable to the Engineer and the WPCF, and that prevents release of sewage into the Quinnipiac River and that would otherwise endanger personnel or property, or cause erosion and sedimentation. Means and methods shall be approved by the Engineer and the WPCF.

Flame cutting of pipe or pipe support elements shall not be done without the Engineer and WPCF approval. Abrasive saw cutting, grinding, and any other methods for severing pipe support elements form bridge connection plates, shall be approved by the Engineer.

The contractor shall employ a temporary staged or cabling and support system to prevent sanitary sewer main sections from falling during disassembly due to the failure of lifting or hoisting equipment, or jointing or support materials that can become overloaded by cantilevered weight from partially disassembled sections. Measures shall be taken for the temporary safe support of remaining lengths of pipe. The contractor is cautioned that the existing bridge deflection may decrease and the bridge move up as the weight of lengths of sanitary sewer main is removed, increasing load on remaining pipe supports that may pull up on restrained pipe joints, requiring temporary adjustment and/or supplemental supports to safely mitigate sudden or unintended failure.

Demolition of sanitary sewer main shall not proceed when personnel, equipment, or traffic is passing within a safe length beyond the closest remaining pipe support to the work area, as submitted and approved by the Engineer.

Insulation, jacket, and non-metallic components shall be stripped off the pipe and segregated for disposal. Once sanitary sewer main piping sections have been stripped of insulation and jacket and cleaned as necessary for the receiving location, they shall be loaded and removed from the site for disposal. If sanitary sewer main piping sections are temporarily stockpiled prior to stripping of insulation, they shall be covered to prevent blowing off of loose insulation or jacket damaged in the removal. Insulation and jacket stripped from pipe sections shall be immediately placed in covered containers, to prevent wind from disbursing them. The work area shall be maintained free of demolition debris.

Pipe, aluminum insulation jacket, steel support elements and any other metals shall be recycled to the maximum extent possible.

Any damage to remaining elements of the bridge, or to public or private property resulting from the contractor's work in removal and disposal of the sanitary sewer main, shall be repaired by the contractor to the satisfaction of the owner at no additional cost to the City.

Method of Measurement:

This work, being lump sum, will not be measured for payment.

Basis of Payment;

Payment for removal of sanitary sewer will be made at the Contract lump sum price for removal of sanitary sewer main from the bridge and buried portions as indicated in the plans, and off-site legal disposal.

Pay Item	Pay Unit
Remove Existing Pipe (Sanitary Sewer)	L.S.

ITEM #1403030A – DOGHOUSE MANHOLE (SANITARY SEWER)

DESCRIPTION:

The work under this item shall include all structures, labor, equipment and materials required for the complete construction of dog-house style sanitary sewer manholes to the lines, grades, dimensions and details on the plans.

MATERIALS:

A. Pre-cast Manholes

1. Provide watertight precast concrete structures in types and sizes indicated on Drawings and as detailed in Shop Drawings approved by the Engineer.

2. All precast sections shall be designed for H-20 loading.

3. Precast concrete manholes shall conform to M.08.02 (4). Precast Manhole Components shall conform to ASTM designation C-478. Cones, sections, bases and tops shall be substantially free from cracks and surface roughness.

4. Precast manhole bases shall be of the "base unit" type, with an integral base and barrel section. The barrels shall be constructed in increments of one (1) foot to provide the indicated height with the fewest joints. Openings for pipe connections will not be permitted closer than one (1) foot to the nearest joint. Mark the date of manufacture and name of trademark of manufacturer in the inside of each section.

5. Normally an eccentric type cone top shall be furnished. For manholes too shallow for this, a flat precast slab, properly reinforced, shall be furnished.

6. Joints for precast units shall be rubber O-ring gaskets (ASTM C443) or butyl rubber gaskets (ASTM C443), or mastic joint sealer consisting of a homogenous blend of bitumen, inert filler and suitable solvent approved by the Engineer. The mastic joint sealer shall be used in accordance with the recommendations of the manufacturer.

7. All concrete structures shall be water-proofed with an exterior bituminous coating meeting the requirements of M.12.05.

8. Connections to manholes shall be made with stainless steel, double banded, rubber boots cast into the manhole wall. The stainless steel bands shall be protected from corrosion with a bituminous coating.

B. Manhole Accessories

1. Manholes steps: Copolymer polypropylene plastic with ½” grade 60 steel reinforcement. Steps shall be positioned 12 inches on center, level and plumb, and imbedded a minimum of three inches (3”) in the concrete components.

2. Manhole frames and covers shall be fabricated of close-grained gray iron and shall conform to ASTM Specifications, Designation A-48, Class Number 30. Casting shall be smooth, true to pattern and free from projections, sand holes or blowholes, accurately cast to provide true and even bearing. All covers must be stamped with the name "Sewer". All frames and covers shall be designed for H-20 loading.

3. Concrete building brick shall conform to the requirements of ASTM C55.

4. Brick for building up and leveling manhole frames and covers shall conform to ASTM C32 Grade MS.

5. Brick for sewer manhole inverts shall conform to ASTM C32 Grade SM.

6. Mortar shall conform to the requirements of ASTM C270, Type M.

CONSTRUCTION METHODS:

RELATED WORK

A. Excavation, sheeting and shoring, backfill, compaction and dewatering shall be in accordance with the requirements of Sections 2.03 and 2.04 of Form 819.

B. Sanitary sewer service and flows shall remain fully operational during construction.

QUALITY ASSURANCE

A. All items shall be new, clean and in accordance with material specifications. In no instance shall second-hand or damaged materials be acceptable.

All materials being incorporated into the work of this Section will be approved by the Engineer. Approval of materials may be by certification, written permission of the Engineer, or prior test and/or inspection. All work in which materials are used without: (1) approved certification, (2) written permission of the Engineer or (3) prior test and/or inspection may be considered unauthorized and therefore not paid for.

SUBMITTALS

A. The Contractor shall prepare and submit written procedures and working drawing in accordance with Section 1.05.02 of this Contract including the following:

1. Installation schedules.

2. Proposed equipment and methods.

3. Installation plan.

4. Product data, shop drawings, and manufacturer's instructions to the Engineer for approval prior to ordering materials.

5. Manufacturer's catalog cuts, specifications, and installation instructions.

6. Shop Drawings for approval:

   a. Design and construction details of all precast concrete units.

   b. Fabrication, assembly and installation details for all castings and miscellaneous metal works.

7. Results of manhole vacuum testing.

PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the site in a timely manner to prevent interruption of the Work.

B. All materials shall be inspected by the Contractor upon delivery to the site. The Contractor shall notify the Engineer of any loss or damages. Replace loss or repair damage to new condition at the Contractor's expense.

C. Store materials to allow easy access for inspection and identification.

D. Equip and protect factory-fabricated structures to prevent damage, including chipping and cracking during transportation, storage and handling. Do not install damaged units; remove and replace damaged units from project site at the Contractor's expense.

PRECAST MANHOLES

A. Base units shall be placed on bedding material (thickness and type as shown on plans), and be set at the proper elevation, carefully leveled, and aligned.

B. Barrel units shall be set vertical with steps (if applicable) and sections in proper alignment. Joints shall be installed in accordance with manufacturer's recommendations.

C. Lifting holes shall be sealed tight with non-shrink grout or non-shrinking grout in combination with a tapered solid rubber plug driven into the hole and the remaining void filled with grout on the outside only. Inside to be finished flush.

D. All work shall be protected against flooding and flotation. Dewater construction as necessary to provide a dry, stable base for setting of structure.

PIPE CONNECTIONS

Pipe connections to structures shall be installed true to line and grade as shown on the Drawings. Wall fittings shall be watertight, compatible with the sewer pipe joint. Connections shall conform to the details shown on the Drawings.

INVERT CHANNEL AND BENCH WALLS

A. An invert channel and bench walls shall be constructed in sanitary sewer manholes as shown on the Drawings to provide a smooth transition in flow through the manhole as well as flow from the drop inlet. The invert channel and bench wall shall be constructed of brick & mortar. Benches shall be built-up to the height called for on the Drawings, or as directed by the Engineer. Care shall be taken to slope all benches for proper drainage to the invert channel.

FRAMES & HATCHES

A. Frames shall be firmly set and bonded at the proper grade to conform to the finished grade shown on the Drawings.

B. Frames shall be built up to finish grade using brick and mortar. Mortar shall be parged to provide a smooth finish on the interior of the manhole.

C. Frames for structures in unpaved areas shall be set at an elevation 1-inch higher than finished grade, or as directed by the Engineer.

WATERTIGHTNESS

A. All structures shall be free of visible leakage. Each manhole shall be inspected, and all leaks shall be repaired in a manner approved by the Engineer.

B. Outer surfaces of structures shall be given two coats of bituminous damp proofing at a rate of 30-60 sq. ft. per gallon in accordance with manufacturer's instructions and M.12.05.

VACUUM TESTING

A. After a manhole has been constructed, conduct a Manhole Acceptance Test using the following procedure:

1. Plug all lift holes with an approved non-shrink grout.

2. Plug all pipes entering the manhole, taking care to securely brace the plug from being drawn into the manhole.

3. The test head shall be placed at the inside of the top of the cone section and the seal inflated in accordance with the manufacturer's recommendations.

4. Draw a vacuum of 10 inches of mercury and shut off the vacuum pump. With the valves closed, the time shall be measured for the vacuum to drop to 9 inches. The manhole shall pass if the time is greater than:

   0 ft to 10 ft deep manholes: 1 min. 0 sec.
   10-ft to 15-ft deep manholes: 1 min. 15 sec.
   15-ft to 25-ft deep manholes: 1 min. 30 sec.

5. If the manhole fails the initial test, necessary repairs shall be made with a non-shrink

grout. Retesting shall proceed until a satisfactory test is obtained.

CLEAN-UP

A. Each structure shall be cleaned of accumulated silt, debris, or foreign matter prior to acceptance of the Work.

METHOD OF MEASUREMENT:

Item #1403030A - Dog-House Manhole (Sanitary Sewer) will be measured for payment by the number of dog-house manholes set and accepted.

BASIS OF PAYMENT:

The price for Dog-House Manhole (Sanitary Sewer) will be paid for at the Contract unit price per "each" complete in place and accepted, which price shall include furnishing and installing precast manhole bases, transition sections, risers, and cones complete with cast iron frames and covers, invert channels, steps, brick masonry, damp-proofing, and pipe connections; excavation, sheeting, shoring, bracing, dewatering, removal and disposal of surplus material, backfill, and compaction; leakage tests complete in place; and for all labor, equipment, tools, materials, and work incidental thereto.

Pay Items	Pay Unit
Dog-House Manhole (Sanitary Sewer)	Ea.

ITEM #1403501A – RESET MANHOLE (SANITARY SEWER)

Description: Work under this item shall include furnishing materials, equipment and labor for the resetting of sewer manholes within the project limits to meet the proposed grades at each location as ordered by the Engineer.

Materials: Brick intended for use below ground level shall conform to ASTM C-32-04 except that the table therein is amended to provide that the required minimum compressive strength in pounds per square inch shall be for any individual brick 3,000 pounds, for the average of five brick selected at random 4,000 pounds, and the maximum absorption of water by five-hour boiling test shall not exceed 18% for any individual brick or 15% for the average of any five brick selected at random. The above strength and absorption requirements, being somewhat less exacting than part of those of ASTM, are intended to admit the use of the product of most, but not all, of the brick manufacturing plants in the vicinity of Hartford.
Mortar shall be composed of one part portland cement and two parts, by volume, of surface dry fine aggregate.

Construction Methods: For sewer manholes where extension rings are not used, bituminous concrete pavement and/or reinforced concrete base shall be removed around the frame, the walls or sides shall be rebuilt to conform to the required elevation of the new construction and the frames and grates or covers reset to within 1/4” of proposed grade.
When a new precast section is added, it is the responsibility of the contractor to ensure that the joint of the new precast section will interlock properly with that of the existing section below. All washers and bolts shall be replaced and tightened prior to acceptance.
If frames or covers are found to be broken or damaged, they shall be replaced with new material conforming to the requirements of the City of Meriden.
Frames and covers to be reset shall be removed from their existing beds. The existing brick work or concrete shall be cleaned to ensure a good bond prior to laying fresh brick and mortar against it. The walls or sides of the manhole shall be rebuilt to conform to the requirements of the City of Meriden and the frames and covers reset on full mortar beds.
Each brick shall be thoroughly wet before laying and shall be laid with a push joint, that is, by placing sufficient mortar on the bed and forcing the brick into it; so as to fill every joint with mortar in one operation, whether on the bottom side, or end of the brick.
Mortar joints shall not be over 1/4” except on the outside curved manhole walls. All brick work shall be raked brick, unless toothing is specifically ordered by the Engineer.
The outside of all brick work which is below ground shall be covered, as soon as possible after laying with a coat of mortar not less than 1/4" in thickness.

Method of Measurement: “Reset Manhole (Sanitary Sewer)” will be measured for payment as units, completed and accepted by the Engineer.

Basis of Payment: Payment for this work will be measured by the number of units of “Reset Manhole (Sanitary Sewer)" completed and accepted and will be paid as follows:

Pay Item	Pay Unit
Reset Manhole (Sanitary Sewer)	ea.

ITEM #1403517A – REMOVE SANITARY MANHOLE (SANITARY SEWER)

Description: Work under this item shall consist of removal and disposal of sanitary manhole (sanitary sewer) in locations as indicated on the plans or as directed by the Engineer.

Materials: No material is required for this work.

Construction Methods: Sanitary sewer manholes shall be flushed/cleared of any sanitary residues and shall be removed in their entirety including top, frame, steps, cones, risers and base. Once removed, they shall become the property of the Contractor and shall be disposed of in an approved manner. Any holes left after the removal of the existing sewer manholes shall be backfilled & compacted to give a neat appearing job, and the hole areas seeded as appropriate.

Method of Measurement: This work will be measured for payment by the actual number of sanitary sewer manholes removed in its entirety and disposed of.

Basis of Payment: This work will be paid for at the contract unit price per each of "Remove Sanitary Manhole (Sanitary Sewer)" complete in place, which price shall include equipment, tools, labor and work incidental thereto and shall include the proper disposal thereof.

Pay Item	Pay Unit
Remove Sanitary Manhole (Sanitary Sewer)	Ea.

ITEM #1507000A – PROTECTION AND SUPPORT OF EXISTING UTILITIES

Description: Work under this item shall consist of the design, construction, maintenance and removal of temporary protection and temporary support for existing utilities.

Contractors are cautioned that it is their responsibility to verify locations, conditions and field dimensions of all existing features, as actual conditions may differ from information indicated on the plans or contained in these specifications. Utility contacts within the project limits can be found within Section 1.07 Legal Relations and Responsibilities.

Materials: The materials for this work shall be of satisfactory quality for the purpose intended and shall be approved by the Engineer. The material shall be intended for use in structures, trench or excavations and shall be sound and capable of safely carrying the specified loads.

Construction Methods: The Contractor is herein made aware that construction will require the installation of shoring or other lateral support work and will require construction beneath or adjacent to active conduits and duct banks.

The Contractor is advised that no service interruption resulting from their operations will be allowed, except as otherwise provided for in Section 1.08 - Prosecution and Progress.

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

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

Basis of Payment: The work will be paid for at the contract lump sum price for "Protection and Support of Existing Utilities," which price shall include designing and detailing the temporary supports and furnishing and installing permanent supports, temporary plating or shields, periodic inspection and removing temporary supports and installing permanent supports, and all materials, equipment, tools, and labor incidental thereto.

Pay Item	Pay Unit
Protection and Support of Existing Utilities	l.s.