

SPECIAL PROVISIONS, SECTIONS AND NOTICES

TO CONTRACTOR INDEX PAGE

Notice to Contractor – Contract Time and Liquidated Damage

Notice to Contractor – Portland Cement Concrete (PCC) Mix Classifications

Notice to Contractor – Adhesive Bonded Anchor and Dowel Installation, Inspection, and Testing Requirements

Notice to Contractor – Environmental Investigation

Notice to Contractor – Utility Coordination

Notice to Contractor – Utility Generated Schedule

Notice to Contractor – Advanced Notification

Notice to Contractor – Maintaining Access to CR Parkside Limited Partnership

Notice to Contractor – Increased Requirements for Construction Field Office

Section 1.07 – Legal Relations and Responsibilities

Section 1.08 – Prosecution and Progress

Section 1.10 – Environmental Compliance

Section 6.10 – Drilling Holes and Bonding Anchors and Dowels

Section 8.22 – Temporary Traffic Barrier

Item #0020763 A – Disposal of Sediments

Item #0101000 A – Environmental Health and Safety

Item #0101117 A – Controlled Materials Handling

Item #0101128 A – Securing, Construction and Dismantling of a Waste Stockpile and Treatment Area

Item #0101130 A – Environmental Work – Solidification

Item #0201199 A – Remove and Reset Fence

Item #0202216 A – Excavation and Reuse of Existing Channel Bottom Material

Item #0202217 A – Supplemental Streambed Channel Material

Item #0202315 A – Disposal of Controlled Materials

Item #0202308 A – Management of Reusable Controlled Materials

Item #0204151 A – Handling Water

Item #0204213A – Handling Contaminated Groundwater

Item #0205005 A – Trench Excavation 0’-15’ Deep

Item #0205005 A – Rock in Trench Excavation 0’-15’ Deep

Item #0406194 A – Joint and Crack Sealing of Bituminous Concrete Pavement

Item #0601088 A – Concrete Form Liners

Item #0601541 A – 24’ X 11’ Precast Concrete Box Culvert

Item #0601542 A – 12’ X 10’ Precast Concrete Box Culvert

Item #0606906 A – Rebuild Masonry Wall

Item #0707001 A - Membrane Waterproofing (Woven Glass Fabric)

Item #0716000 A – Temporary Earth Retaining System

Item #0728008 A – 3/8” Crushed Stone

Item #0817006 A – 6” X 10” Granite Stone Curbing for Bridges

Item #0819002 A – Penetrating Sealer Protective Compound

Item #0904051 A – 3 Tube Curb Mounted Bridge Rail

Item #0969062 A – Construction Field Office, Medium

Item #0971001 A – Maintenance and Protection of Traffic

Item #1206023 A – Removal and Relocation of Existing Signs

Item #1301082 A – 8” Ductile Iron Pipe (Water Main)

Item #1302004 A – 8” Gate Valve

Item #1303198 A – Hydrant Water Main

Item #1303201 A – Relocate Hydrant (Complete)

Item #1401246 A – 16” Ductile Iron Pipe (Sanitary Sewer)

Item #1401259 A – 27” Ductile Iron Pipe (Sanitary Sewer)

Item #1401260 A – 30” Ductile Iron Pipe (Sanitary Sewer)

Item #1401675 A – Sanitary Manhole (6’ Dia.) 10’ to 20’ Deep

Item #1403115 A – Inverted Siphon Inlet Chamber (Sanitary Sewer)

Item #1403116 A – Inverted Siphon Outlet Chamber (Sanitary Sewer)

Item #1504010 A – Temporary Support of Utilities

DATE
FEDERAL AID PROJECT NO. H020(001)
STATE PROJECT NO. 79-212

REPLACEMENT OF BRIDGE NO. 04185
CENTER STREET OVER HARBOR BROOK

City of Meriden
Federal Aid Project No. H020(001)

The State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges, Facilities and Incidental Construction, Form 818, 2020, as revised by the Supplemental Specifications dated July 2021 (otherwise referred to collectively as "ConnDOT Form 818") is hereby made part of this contract, as modified by the Special Provisions contained herein. Form 818 is available at the following DOT website link <http://www.ct.gov/dot/cwp/view.asp?a=3609&q=430362>. The Special Provisions relate in particular to the Center Street Bridge in the City of Meriden.

CONTRACT TIME AND LIQUIDATED DAMAGES

Three Hundred and ninety-seven (397) calendar days will be allowed for completion of the work on this Contract and the liquidated damages charge to apply will be One Thousand Dollars and No Cents (\$ 1,500.00) per calendar day.

NOTICE TO CONTRACTOR - PORTLAND CEMENT CONCRETE (PCC) MIX CLASSIFICATIONS

SECTIONS 6.01 and M.03 MIX CLASSIFICATION EQUIVALENCY

Sections 6.01 *Concrete for Structures* and M.03 *Portland Cement Concrete* have been revised to reflect changes to item names and nomenclature for standard Portland cement concrete (PCC) mix classifications. Special Provisions, plan sheets and select pay items in this Contract may not reflect this change. Refer to the Concrete Mix Classification Equivalency Table below to associate the Concrete Mix Classifications with Former Mix Classifications that may be present elsewhere in the Contract.

Concrete Mix Classification Equivalency Table

New Mix Classification (Class PCCXXYZ ¹)	Former Mix Classification
Class PCC03340	Class "A"
Class PCC03360	Class "C"
Class PCC04460 ²	Class "F"
Class PCC04462 ²	High Performance Concrete
Class PCC04481, PCC05581	Class "S"

Table Notes:

1. See Table M.03.02-1, Standard Portland Cement Concrete Mixes, for the new Mix Classification naming convention.
2. Class PCC04462 (formerly Class "HP1" Concrete; also called low permeability concrete) is to be used for the following cast-in-place bridge components: decks, bridge sidewalks, and bridge parapets.

Where called for in the Contract, **Low Permeability Concrete** shall be used, as specified in Sections 6.01 and M.03. Please pay special attention to the requirements for Class PCC04462, including:

- Submittal of a mix design developed by the Contractor and a concrete supplier **at least 90 days prior to placing the concrete**
- Testing and trial placement of the concrete mix is to be developed and discussed with the Department

The Department will not consider any requests for change to eliminate the use of Low Permeability Concrete on this Project.

**NOTICE TO CONTRACTOR – ADHESIVE BONDED ANCHOR AND
DOWEL INSTALLATION, INSPECTION AND TESTING REQUIREMENTS**

The Contractor is hereby notified that all adhesive bonded anchors and dowels shall be installed by qualified installers. Personnel instructed and trained on the installation of the adhesive bonded anchors and dowels in accordance with the manufacturer's printed installation instructions (MPII) by the adhesive bonding material manufacturer shall be considered qualified installers.

Anchors and dowels that are installed in horizontally drilled holes subject to sustained tension shall be installed by personnel with current ACI Adhesive Anchor Installer Certification credentials.

The installation of all anchors and dowels with adhesive bonding material shall be inspected by a Contractor-hired inspector holding current ACI Post-Installed Anchor Inspector Certification credentials. The installation of any horizontally oriented anchors and dowels subject to sustained tension load shall be continuously inspected by a Contractor-hired inspector holding current ACI Post-Installed Anchor Inspector Certification credentials.

Anchors and dowels installed in this Contract shall be subject to field proof load testing by an independent third-party testing agency, as noted on the plans.

The characteristic bond strength of the adhesive bonding material shall meet or exceed the design characteristic bond stress value specified on the plans.

For complete requirements, see Section 6.10 "Drilling Holes and Bonding Anchors and Dowels" in the General section of the special provisions.

NOTICE TO CONTRACTOR - ENVIRONMENTAL INVESTIGATIONS

Environmental site investigations have been conducted that involved the sampling and laboratory analysis of soil, sediment, surface water and groundwater collected from various locations and depths within the project limits. The results of these investigations indicated the presence of detectable concentrations of extractable total petroleum hydrocarbons (ETPH), volatile organic compounds (VOC), polynuclear aromatic hydrocarbons (PAH) and RCRA 8 metals in the soils within proposed construction areas. The DEEP groundwater classification beneath the site is GB. Based on these findings, two (2) AOEC's exist(s) within the proposed project limits. In addition, "Low Level" AOEC's exist within the proposed project limits, where the compounds detected at concentrations below the numeric criteria.

The proposed remediation methodology for the AOECs/LL-AOECs is controlled handling, management and disposal and/or re-use of material excavated. Excavated material from the AOECs shall be transported to and stockpiled at a Waste Stockpile Area (WSA) for characterization prior to disposal and/or re-use.

Materials generated from LLAOECs do not require special handling procedures and may be reused within the project limits assuming: (1) such soil is deemed to be structurally suitable for use as fill by the Engineer; (2) such soil is not placed below the water table; 3) the CTDEEP groundwater classification of the area where the soil is to be reused as fill does not preclude said reuse; and (4) such soil is not placed in an area subject to erosion.

Material from the LL-AOECs, which cannot be re-used within the project limits, shall be transported to the WSA for characterization and off-site disposal.

All controlled materials shall be sampled and characterized for disposal and/or re-use in accordance with the contract specifications and RSRs. Construction dewatering fluids will also require controlled handling and management compliant to the CTDEEP General Permit requirements. Surface waters are not considered a controlled material and pumping and diverting of surface waters shall be handled in accordance with the approved permits for the project.

Based on the proposed construction activities, it is anticipated that an area of approximately 6,000 square feet (ft²) will be required for the construction of a WSA. The WSA will be located on a parcel located on Center Street adjacent to the project limits (see contract plans).

The Contractor is hereby notified that controlled materials requiring special management or disposal procedures will be encountered during various construction activities conducted within the project limits. Therefore, the Contractor will be required to implement appropriate health and safety measures for all construction activities to be performed within the AOEC(s). These measures shall include, but are not limited to, air monitoring, engineering controls, personal protective equipment and decontamination, equipment decontamination and personnel training.

WORKER HEALTH AND SAFETY PROTOCOLS WHICH ADDRESS POTENTIAL AND/OR ACTUAL RISK OF EXPOSURE TO SITE SPECIFIC HAZARDS IS SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.

The City of Meriden, as Generator, will provide an authorized representative to sign all manifests and waste profile documentation required by disposal facilities for disposal of contaminated sediments, water, and controlled materials.

The Sections which shall be reviewed by the Contractor include, but are not limited to, the following:

- Item No. 0101000A - Environmental Health and Safety
- Item No. 0101128A - Securing, Construction and Dismantling of a Waste Stockpile and Treatment Area
- Item No. 0101130A – Environmental Work – Solidification
- Item No. 0101117A - Controlled Materials Handling
- Item No. 0202315A - Disposal of Controlled Materials
- Item No. 0202318A - Management of Reusable Controlled Material
- Item No. 0204213A – Handling Contaminated Groundwater

The Contractor is alerted to the fact that a Department environmental consultant will be on site for excavation and dewatering activities within the AOEC(s), to collect soil and groundwater samples (if necessary), and to observe site conditions for the State. **The WSA on the plans is to be used exclusively for temporary stockpiling of excavated materials from within project AOEC(s) for determination of disposal classification.**

Information pertaining to the results of the environmental investigations discussed can be found in the documents listed below. The results contained in the environmental investigation reports listed below show levels of various contaminants that the Contractor may encounter during construction. Actual levels found during construction may vary and such variations will not be considered a change in condition provided the material can still be disposed as non-hazardous at one or more of the disposal facilities listed in Item No. 0202315A - Disposal of Controlled Materials. These documents shall be available for review at the City of Meriden Town Hall Engineering Department, 142 East Main Street, Meriden, Connecticut.

Task 210: Subsurface Site Investigation – Replacement of Center Street Bridge over Harbor Brook Meriden Connecticut.

Rev. Date 09/05/19

Task 310: Subsurface Site Investigation – Replacement of Center Street Bridge over Harbor Brook Meriden Connecticut.

NOTICE TO CONTRACTOR

UTILITY COORDINATION

The contractor is required to maintain access to all temporary and permanent utility structures including but is not limited to poles, manholes junction boxes etc. Emergency cell phone contact numbers for the primary Contractor and all subcontractors must be provided to all utility owners prior to the commencement of any work.

UTILITY WORK SCHEDULE

CTDOT Project Number:	79-212	Town:	Meriden
Project Description:	Bridge Replacement...Center St. Bridge over Harbor Brook, Meriden		
CTDOT Utilities Engineer:	Xiuyun Cai		
Phone:	860-594-3329	Email:	Xiuyun.Cai@ct.gov

Utility Company:	Eversource Energy		
Prepared By:	Steve Wells	Date Prepared:	05/24/19/2019
Phone:	860-280-2417	Email:	steven.wells@eversource.com

Scope of Work

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

In order to accommodate CDOT and the City of Meriden's proposed replacement of the Center St. Bridge over Harbor Brook, 3 of the 4 existing Eversource medium voltage cable in the bridge must be temporarily relocated on 2 parallel pole lines east of the bridge construction area. The overhead medium voltage electric conductors that cross the bridge parallel to the western curb of Center St. must be relocated on to the eastern most of the 2 temporary pole lines mentioned above. The poles in this area are jointly owned by Eversource and Frontier Tel. Co. with Frontier being the custodian. Therefore, Frontier is responsible for the installation of permanent and temporary poles & guying in this area that will be jointly used by the 2 companies. Eversource needs 4 additional poles that will be solely used by Eversource. In addition, Eversource must enlarge 2 existing manhole structures north and south of the bridge and extend conduit to 4 temporary poles. Also, 2 additional manholes must be installed with conduit in an area where Eversource electrical distribution equipment exists on easemented property of 290 Pratt St. This is to accommodate the replacement and updating of the above mentioned electrical equipment. Following the placement of the 2 new culverts and the installation of permanent conduits across the new culverts, the installation of 4 med. voltage underground cable in the new conduit, will take place. Also, the overhead pole line along the western curb of Center St. will be restored including the installation of a pole and 3 polemounted transformers to feed an electric service on the property of 290 Pratt St. All temporary cable, poles and guying installed by Eversource will then be removed.

Special Considerations and Constraints

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

Due to the volume and complexity of this work, the time to perform is significant. Some of the cutovers to the affected circuits can not be done during the moratorium period of June 1st thru Sept. 1st. This proposal hinges on the ability to install temp. poles & wires adjacent to the proposed construction area. In order to accommodate the poles with adequate clearance from the Harbor Brook retaining wall, it may be necessary to slightly encroach on the area that is supposed to be kept clear of overhead wires. Currently it is impossible to precisely spot poles and anchors for this job due to the heavy vegetation growth in the area. Once all the clearing and grubbing of vegetation takes place, we will find the best location for the temp. poles in order to safely support all the aerial utilities and to try and keep the area as clear as possible for construction.

UTILITY WORK SCHEDULE

CTDOT Project Number:	79-212	
Utility Company:	Eversource Energy, Electrical Distribution	
Prepared By:	Steve Wells	Total Working Days: 117

Schedule

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

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (working days)
2+27 , 18' Lt. & 4+59 , 19' Lt.	Frontier to install 2 poles & 8 anchors along west side of Center street	Notice to proceed from State. Clearing & Grubbing of Trees by State. Shutdown of Center St. for Construction	1
3+03 - 68' Rt., 4+22 , 62' Rt.	Frontier to install 2 poles & 4 anchors on town & private property east of Center St.	Notice to proceed from State. Clearing & Grubbing of Trees. Shutdown of Road	1
3+07 - 59' Rt. To 4+02 , 104' Rt.	Eversource Elec. (ESE) to clear trees east of construction area on private property @ 290 Pratt St.	Notification to proceed from State. Concurrent w/ other pole setting	2
3+07 - 59' Rt. & 3+52 , 122' Rt.	ESE to install 2 poles & 4 Anchors on town & private property east of Center St.	Installation of Frontier Poles & Anchors	1
4+02 - 104' Rt. & 4+13 , 60' Rt.	ESE to install 2 poles & 4 Anchors on private property east of Harbor Brook.	Installation of Frontier Poles & Anchors	1
Various	Install guying , 4 pole tops, 3 transformrs & 4 spans of overhead 3 phse wire to by-pass construction. area.	Installation of ESE & Frontier Poles & Anchors	5

Various	Install 3 spans of aerial cable across Harbor Brook on temp. poles & 2 short spans of bare neutral.	Installation of ESE Poles & Anchors	1
2+27 , 18' Lt. to 4+59 , 19' Lt.	Energize overhead pri. by-pass of construction area and cutover 290 Pratt St. svc to new 3 phase bank.	Installation of ESE & Frontier Poles & Anchors	0.5
2+27 , 18' Lt. to 4+59 , 19' Lt.	Remove 2 spans of overhead wire, pole top, 3 phase transformer bank, secondary wire & st. light, along the western curb of Center St.	Overhead by-pass energized	0.5
2+73 , 8' Lt.	Eversource Elec. civil contractor, Charter Oak Utility Constructors, (COU) , to enlarge MH-80	Shutdown of Road. Eversource Gas to relocate 2" steel gas svc. to 200 Pratt St.	15
2+73 , 8' Lt., 3+07 , 59' Rt.	COU to install 2 concrete encased conduits from MH-80 to ESE Pole	Enlargement of MH-80, Install of ESE poles.	1
2+73 , 8' Lt., 3+03 , 68' Rt.	COU to install 2 encased conduits from MH-80 to Frontier Pole	Enlargement of MH-80, Install of Frontier poles.	1
4+54 , 8' Lt.	Eversource Elec. civil contractor, Charter Oak Utility Constructors, (COU) , to enlarge MH-82	Possible removal of un-used section of 8" san. sewer to be abandoned.	12
4+04 , 32' Rt.	COU to install cast in place MH-1077 on Eversource easement property for new switch gear.	Shutdown of road.	10
4+54 ,8' Lt. to 4+04, 32' Rt. & 4+22,32' Rt.	COU to install 4 encased ducts from MH-82 to MH-1077 & stub 4 ducts : MH-82 to future MH-1078.	Installation of MH-80 & MH-1077	2
3+80 , 35' Rt. & 4+22 , 62' Rt.	COU to install 2 encased conduits from MH-12 to Frontier Pole	Installation of Frontier Poles & Guying	0.5

3+80 , 35' Rt. & 4+13 , 60' Rt.	COU to install 2 encased conduits from MH-12 to ESE Pole	Installation of ESE Poles & Guying	0.5
Various	ESE to install swgr on MH-1077, instl. 6 perm. cbls., 7 temp. cbls., & perform cutovers.	Installation of all manholes & conduit.	15
4+22 , 32' Rt.	COU to install cast in place MH-1078 on Eversource easement property for new switch gear.	Cutovers involving swgr. on MH-1077	10
Various	ESE to install swgr. on MH-1078, instl. 4 perm. cbls., 4 temp. cbls., & perform cutovers.	Installation of MH-1078, Removal of existing swgr. in easement area	10
2+73 , 8' Lt. to 4+54 , 8' Lt.	COU to install 12-5" & 1-2" duct bank of steel @ culverts & enc. pvc in approaches. MH-80 to MH-82	Installation of 2 new culverts.	4
2+73 , 8' Lt. to 4+54 , 8' Lt.	ESE to install 4 permanent cables in new ducts across culverts, MH-80 to MH-82, & do cutovers.	Installation of new duct bank...MH-80 to MH-82.	15
2+27 , 18' Lt. & 4+59 , 19' Lt.	Reinstall overhead 3 phase wire on Center St. & instl. new pole 1065, 3 transformers and service to feed 290 Pratt St. env. station.	Completion of culvert installation.	3
Various	Remove 11 temp. cables installed to feed temp. conductors over Harbor Brook	Cutover of all 4 new cables over culverts. Rmvl of temp OH wires bypass.	2
Various	Remove all overhead conductors temporarily installed over Harbor Brook	Cutover of all 4 new cables over culverts. Rmvl of temp OH wires bypass.	1
Various	Remove all temp. poles and anchors installed by ESE.	Removal of all temp. conductors.	2

UTILITY WORK SCHEDULE Rev 08 02 2016

CTDOT Project Number:	SHP 79-212	Town:	Meriden
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Project Description:	Center St bridge over Harbor Brook
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CTDOT Utilities Engineer:	Xiuyun Cai
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Phone:	860-594-3269	Email:	Xiuyun.Cai@ct.gov
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Utility Company:	Frontier Communications
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Prepared By:	Marino Limauro	Date Prepared:	8/16/2019
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Phone:	203-771-3110	Email:	marino.a.limauro@ftr.com
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Scope of Work

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

This project involves the relocation of Frontier Communication's outside plant facilities on Center Street in Meriden, CT. This relocation will be completed in two phases. In the temporary phase, Frontier will set four poles. Poles P1064 and P1066 as well as temporary poles P1 and P3. Frontier will also remove the existing pole P1065. Frontier will temporarily feed all existing cables to the temporary poles set on the east side of Center St. The temporary aerial cables will be placed on the east side of the road and the existing aerial cables will be removed. The permanent phase of relocation will occur once the contractor has completed construction on the bridge. Poles P1065 will be relocated back to the east side of Center St by Eversource. The permanent aerial cables will again be placed on the east side of the Center Street and the temporary cables will be removed. Services to all existing Frontier customers will remain intact throughout the duration of this project. Prior to setting any new poles, the elevation must be within 6 inches of final grade and the face of curb and rear of sidewalk must be clearly marked.

Special Considerations and Constraints

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

All work on this time line is dependant on weather, storms, work load and customer high speed data circuit turndowns. All calendar days and work days are approximate. Regarding high speed special circuits to our customers, this part of Frontier's work is dependent on getting permission and a schedule from our customers for these turndowns and may take up to three months to change over. Overtime and afterhours service may be required to complete high speed data service cut-overs. Also, if there are any natural or unnatural disasters that happen within Frontier serving area, crews will be expected to help restore services in the affected area and will return once all services are restored.

UTILITY WORK SCHEDULE Rev 3/2015

CTDOT Project Number: SHP 79-212

Utility Company: Frontier Communications - Temporary relocation

Prepared By: Marino Limauro

Total Working Days: 19

Schedule

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

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (working days)
1+00 to 5+00	Place (4) poles on east side of Center St	Upon receipt of Notice to Proceed.	5
1+00 to 5+00	Place Anchors and guying for new poles		4
1+00 to 5+00	Place temporary aerial cables	Other utilities must be complete.	2
1+00 to 5+00	Splice temporary cables.		5
1+00 to 5+00	Remove old aerial cables and guying.		2
1+00 to 5+00	Remove existing P1065		1

UTILITY WORK SCHEDULE Rev 08 02 2016

CTDOT Project Number:	SHP 79-212	Town:	Meriden
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Project Description:	Center St bridge over Harbor Brook
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CTDOT Utilities Engineer:	Xiuyun Cai
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Phone:	860-594-3269	Email:	Xiuyun.Cai@ct.gov
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Utility Company:	Frontier Communications
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Prepared By:	Ian Birtwistle	Date Prepared:	8/16/2019
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Phone:	203-238-5144	Email:	ian.birtwistle@ftr.com
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Scope of Work

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

This project involves the relocation of Frontier Communication's outside plant facilities on Center Street in Meriden, CT. This relocation will be completed in two phases. The existing 4 conduits and cables over the existing culvert will temporarily be removed in the area of construction. The conduits connecting to FTR's manholes will be capped underground. Once the culvert is in place, the 4 new conduits will be built into the proposed sidewalk. FTR's contractor and the state contractor will coordinate rebuilding our structure within the proposed sidewalk. Once FTR's conduits are placed, the sidewalk can be poured. When outside of the sidewalk, FTR's structure will be reconnected with the existing structure and concrete encased.

Special Considerations and Constraints

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

All work on this time line is dependant on weather, storms, work load and customer high speed data circuit turndowns. All calendar days and work days are approximate. Regarding high speed special circuits to our customers, this part of Frontier's work is dependent on getting permission and a schedule from our customers for these turndowns and may take up to three months to change over. Overtime and afterhours service may be required to complete high speed data service cut-overs. Also, if there are any natural or unnatural disasters that happen within Frontier serving area, crews will be expected to help restore services in the affected area and will return once all services are restored.

UTILITY WORK SCHEDULE Rev 3/2015

CTDOT Project Number:	pro.79-212	Town:	Meriden
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Project Description:	Eversource temp line relocating		
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CTDOT Utilities Engineer:	Xiuyun Cai		
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Phone:	860-594-3269	Email:	xiuyun.cai@ct.gov
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Utility Company:	Cox Communications		
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Prepared By:	Jose Ceden	Date Prepared:	8/15/2019
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Phone:	860-250-3445	Email:	jose.cedeno@cox.com
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Scope of Work

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

Once the temporary poles are installed, Cox will temporarily attach overhead utilities to new poles and then move them back to original poles. Would need to extend coax feeder to 255 Center st off pole#1066, move lines from pole#1065 and pole#1063, email states pole#1064 but Cox prints and actual pole is #1063. Please advice when this work is scheduled to begin. Thanks.

Special Considerations and Constraints

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

This cutover would have to be scheduled during night shift, will create outage to customers. We can prep during day.

UTILITY WORK SCHEDULE Rev 3/2015

CTDOT Project Number:	79-212	Town:	MERIDEN
Project Description:	CENTER ST BRIDGE OVER HARBOR BROOK		
CTDOT Utilities Engineer:	XIUYUN CAI		
Phone:	(860)594-3269	Email:	Xiuyun.Cai@ct.gov

Utility Company:	CROWN CASTLE FIBER		
Prepared By:	TERENCE J SHEA	Date Prepared:	8/9/2019
Phone:	(203)649-3905	Email:	terence.shea@crowncastle.com

Scope of Work

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

Crown Castle Fiber's work will consist of moving slack to project area, run new strand on temporary pole line, shift cable to new strand and remove old strand for temporary move. For move to permanent poles at project completion, run new strand to permanent poles, shift cable, create backlash with slack and remove temporary strand.

Special Considerations and Constraints

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

PLEASE NOTE THAT ANY TIME FRAME GIVEN AS A START TIME OR DURATION OF WORK CAN BE AFFECTED BY MANY FACTORS INCLUDING, BUT NOT LIMITED TO, MAKE READY WORK, OTHER UTILITIES, PERMIT APPLICATIONS, CHANGES IN SCOPE, INCLEMENT WEATHER, HOLIDAYS AND EMERGENCY SITUATIONS.

UTILITY WORK SCHEDULE Rev 08 02 2016

CTDOT Project Number: 079-212	Town: Meriden
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Project Description: Replacement of Center St Bridge over Harbor Brook Roadway Plan

CTDOT Utilities Engineer:

Phone: 860-665-2471	Email: nicole.karinchak@eversource.com
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Utility Company: Eversource Gas

Prepared By: Nicole Karinchak	Date Prepared: 08/07/2019
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Phone:	Email:
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Scope of Work

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

Eversource Gas has two gas mains in the scope of this project. One 6" LP main and one 6" IP main. Each of these mains currently run in the deck of the bridge. These two mains will need to be relocated to facilitate the replacement of the bridge. A temporary bridge will need to be provided by the DOT/CITY/TOWN for ESG to run the main, this bridge will need to be approved prior ESG relocating the main. Please note ESG requires as much planning time as possible, minimum of three months notice. ESG will require onsite walk through. Eversource Gas abandons all main in place, removal of abandoned pipe will need to be facilitated by contractor.

Special Considerations and Constraints

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

Please note the working days estimates are based on the drawings provided. Actual working days will be based on test pits, weather and site conditions (utility crossings/ledge). Also note, the relocation plan, under the culvert or on the side of the bridge will govern the location of this main. ES Gas will not be responsible for permanent restoration.

UTILITY WORK SCHEDULE Rev 3/2015

CTDOT Project Number: 079-212

Utility Company: Eversource Gas

Prepared By: Nicole Karinchak

Total Working Days: 30

Schedule

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

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (working days)
2+00 - 4+00	Relocate 6" LP gas main to facilitate the cities new bridge construction. The relocated gas main will	Notice to proceed, Temp Bridge Approval, Site Visit, Test Pits to determine if scope	15
VN for ESG to run its n	temporary bridge to be constructed for support, this design will be approved by ES Gas prior to installing	needs to be revised	
	main - Approximately ~350 ft 4" Diameter (min) gas main		
2+00 - 4+00	Relocate 6" IP gas main to facilitate the cities new bridge construction. The relocated gas main will	Notice to proceed, Temp Bridge Approval, Site Visit, Test Pits to determine if scope	15
	temporary bridge to be constructed for support, this design will be approved by ES Gas prior to installing	needs to be revised	
	main - Approximately ~350 ft 4" Diameter (min) gas main		
****	Please note the working days estimates are based on the drawings provided. Actual working days will be		
	based on test pits, weather and site conditions (utility crossings/ledge). Also note, the relocation plan, under		
	the culvert or on the side of the bridge will govern the location of this main.		

UTILITY WORK SCHEDULE Rev 3/2015

CTDOT Project Number: 079-212

Utility Company: Eversource Gas

Prepared By: Nicole Karinchak

Total Working Days: 30

Schedule

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

Location (Station to Station)	Description of Utility Work Activity	Predecessor Activity	Duration (working days)
2+00 - 4+00	Reconnect 6" LP gas main to facilitate the cities new bridge construction. The relocated gas main will	Notice to proceed, Temp Bridge Approval, Site Visit, Test Pits to determine if scope	15
VN for ESG to run its n	temporary bridge to be constructed for support, this design will be approved by ES Gas prior to installing	needs to be revised	
	main - Approximately ~200 ft 6" Diameter (min) gas main		
2+00 - 4+00	Reconnect 6" IP gas main to facilitate the cities new bridge construction. The relocated gas main will	Notice to proceed, Temp Bridge Approval, Site Visit, Test Pits to determine if scope	15
	temporary bridge to be constructed for support, this design will be approved by ES Gas prior to installing	needs to be revised	
	main - Approximately ~200 ft 6" Diameter (min) gas main		
****	Please note the working days estimates are based on the drawings provided. Actual working days will be		
	based on test pits, weather and site conditions (utility crossings/ledge). Also note, the relocation plan, under		
	the culvert or on the side of the bridge will govern the location of this main.		

NOTICE TO CONTRACTOR – UTILITY GENERATED SCHEDULE

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

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

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

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

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

NOTICE TO CONTRACTOR – ADVANCED NOTIFICATION

The contractor shall notify CR Parkside Limited Partnership at least 30 days prior to the start any on-site work; as they would be using the City's vacant parking lot during construction.

Contact Info:

Norman Isko, Esq.

CR Parkside Limited Partnership

200 Pratt Street

Meriden CT. 06450

Tel. [\(203\) 639-5121](tel:2036395121)

NOTICE TO CONTRACTOR – MAINTAINING ACCESS TO CR LIMITED PARTNERSHIP

The contractor shall maintain access to the heating oil refilling station for the CR Parkside Limited Partnership property located within the project limits. The contractor will also be required to relocate the dumpster unit on the CR Parkside property to a location on the property which is accessible to both the property owner and trash service pick up company.

**NOTICE TO CONTRACTOR - INCREASED REQUIREMENTS FOR
CONSTRUCTION FIELD OFFICE**

This Notice is to alert the Contractor of the increased size and other requirements for the Contract item “Construction Field Office, (Size)” due to Covid-19 and other considerations.

The revisions to special provisions:

ITEM #0969060A - CONSTRUCTION FIELD OFFICE, SMALL

ITEM #0969062A - CONSTRUCTION FIELD OFFICE, MEDIUM

ITEM #0969064A - CONSTRUCTION FIELD OFFICE, LARGE

ITEM #0969066A - CONSTRUCTION FIELD OFFICE, EXTRA LARGE

include but not limited to, increased field office size, increased ventilation requirements, increase cleaning requirements, and additional field office supply requirements.

All costs for these requirements shall be included in the Construction Field Office item included in the Contract.

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:

Mr. Augusto Grazuna
District 1 Electrical Supervisor
Department of Transportation
Hartford, Connecticut
(860) 566-3156/3157

Mr. Richard Russo
District 2 Electrical Supervisor
Department of Transportation
Colchester, Connecticut
(860) 537-8942/8943

Mr. Arnold Ozols
District 3 Electrical Supervisor
Department of Transportation
Milford, Connecticut
(203) 878-1869

Mr. Mark Russo
District 4 Electrical Supervisor
Department of Transportation
Southbury, Connecticut 06488
(203) 264-9590

Mr.
Cablevision of Connecticut

Mr.
Eversource

, CT 06
(203)

, CT 06
(860)

Mr.
Frontier Communications

Mr.
United Illuminating

, CT 06
(860)

, CT 06
(203)

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

Mr. Michael LeBlanc
Property & Facilities
Department of Transportation
Newington, CT 06111
DOT.BUILDINGCODEINSP@CT.GOV
860-594-2238
Cell 860-983-5114

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

the WR Number. For State-owned traffic signals in UI territory, contact the Department's Traffic Electrical Unit to obtain a Request for Metered Service to provide to UI to obtain the Work Order Number. The street address is required for release to local power companies (Groton Utilities or Wallingford Electric).

SECTION 1.08 - PROSECUTION AND PROGRESS

Article 1.08.04 - 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:

Center Street

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

The Contractor will be allowed to close Center Street and detour traffic as shown on the plans for the duration of the project, 58 weeks.

The Contractor shall notify the Engineer at least 14 days in advance of the start of the closure.

All Other Roadways

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

Night Work

The contractor will not be allowed to perform any work between 7:00 p.m. and 7:00 a.m. on all roadways, on weekdays, unless the Contractor obtains approval from the City. The Contractor must submit a request in advance of the implementation of a night work period.

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, old 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 river banks or in deep pools.

All construction activities taking place within the Project limits will need to be coordinated with the Engineer. At least 10 days prior to the commencement of any construction activities, the Contractor shall, through the Engineer, arrange for an environmental inspector to meet and discuss proper protocol for maintaining environmental commitments made for the protection of this species and habitat. The Engineer will provide oversight to ensure that the following protocols are followed and maintained during the course of 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 Municipality will require the following precautionary measures to protect the wood turtle and wood turtle habitat:

- i. Exclusionary fencing will be required to prevent any turtle access into construction areas. These measures shall be installed at the limits of disturbance around the work area prior to construction.
- ii. Exclusionary fencing shall be at least 20 inches tall and be secured to and remain in contact with the ground. Silt fencing installed for erosion control may serve this like purpose; however avoid the use of plastic or netted silt fence.
- iii. Exclusionary fencing shall be regularly inspected and maintained (at least bi-weekly and after major weather events) to secure any gaps or openings at ground level that may allow turtles to pass through.

- iv. In areas where silt fencing is used for exclusion, it shall be removed as soon as soils are stable to allow for reptile and amphibian passage to resume.
- v. All construction personnel and work crews working within the turtle habitat shall be apprised of the species description and possible presence, and shall also be advised that any turtles found inside the work areas shall be relocated or to notify the appropriate authorities to relocate them.
- vi. The contractor, a consulting herpetologist, or a qualified professional familiar with the turtle habitat requirements and behavior shall conduct a search for any turtles within the work site area each morning prior to the start of any work activities. Any turtles that are discovered shall be carefully moved, unharmed, to an area immediately outside of the fenced area in the same direction that it was walking. If a turtle is found within the work site an inspection of the site to identify and remove the access point shall be completed.
- vii. Any turtles encountered within the immediate work area shall be carefully moved to an adjacent area outside of the excluded area and fencing should be inspected to identify and remove the access point.
- viii. Any confirmed sightings of box, wood, or spotted turtles shall be reported and documented with the NDDDB at nddbrequestdep@ct.gov using the special animal form found at http://www.ct.gov/deep/cwp/view.asp?a=2702&q=323460&depNav_GID=1641.
- ix. No heavy machinery or vehicles shall be parked in any turtle habitat.
- x. If felling trees adjacent to brooks and streams, they shall be cut to fall away from the waterway, not dragged across waterway, and not have their stumps removed from the banks

#

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

This species is protected by State laws, which prohibit killing, harming, taking, or keeping them in your possession. Photographs and the laws protecting wood turtles shall be posted in the Contractor's and engineer's field office (species ID sheets will be provided by the Engineer).

SECTION 6.10 - DRILLING HOLES AND BONDING ANCHORS AND DOWELS

6.10.01 - Description: Work under this item consists of drilling holes in concrete and bonding anchors or dowels into the holes with adhesive bonding material as shown on the plans, in accordance with the manufacturer's recommendations, and as directed by the Engineer.

Adhesive bonded anchors are composed of adhesive bonding material and steel anchors, either fully threaded rods or deformed reinforcing bars, with an embedment no greater than 20 times the diameter of the anchor.

Adhesive bonded dowels are composed of adhesive bonding material and deformed steel reinforcing bars embedded no less than the tension development length of the bar calculated using its full yield strength and no greater than 60 times the diameter of the reinforcing bar.

6.10.02 - Materials: For adhesive bonded anchors, the adhesive bonding material shall meet the assessment requirements of ACI 355.4 latest edition and of ICC Evaluation Service (ICC-ES) AC308 *Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements*, including use under sustained tension loads and installation in holes drilled horizontally. The characteristic bond strength of the adhesive bonding material shall meet or exceed the design characteristic bond stress value specified on the plans.

Steel anchors shall meet the requirements specified on the plans.

For adhesive bonded dowels, the adhesive bonding material shall meet the assessment requirements of ACI 355.4 latest edition and of ICC-ES AC308 *Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements* including use under sustained tension loads, installation in holes drilled horizontally, and for use with reinforcing bars embedded the code-required tension development length of the bar. The characteristic bond strength of the adhesive bonding material shall meet or exceed the design characteristic bond stress value specified on the plans.

Dowels shall meet the requirements specified on the plans.

6.10.03 - Construction Methods: The Contractor shall select adhesive bonding material based on, and compatible with, the Site conditions, the requirements shown on the plans, the material's ICC-ES Evaluation Service Report, and the manufacturer's printed installation instructions (MPII).

A. Submittals: Prior to drilling holes for the anchors and dowels, 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 ICC-ES Evaluation Service Report for the adhesive bonding material. The ICC-ES Evaluation Service Report shall have been issued or reissued no more than 2 years prior to its submission and be valid at the time of installation.
2. A copy of the adhesive bonding material manufacturer's printed installation instructions (MPII)
3. type of drill and diameter of bit
4. method of cleaning holes
5. method of placement of the adhesive bonding material

B. Installation Requirements: The drilling of the holes for the anchors and dowels shall proceed only after the Contractor's Product Data submittal has been reviewed, stamped, and returned to the Contractor and copies have been delivered to the Engineer.

The Contractor shall resubmit the Product Data should the Evaluation Service Report become invalid before the installation of the anchors and dowels as determined by the Engineer.

The installation, including the drilling of the holes, of the anchors and dowels with adhesive bonding material shall be performed by qualified installers. Personnel instructed and trained on the installation of the adhesive bonded anchors and dowels in accordance with the MPII by the adhesive bonding material manufacturer shall be considered qualified installers. The Contractor shall arrange for a manufacturer's representative to provide onsite installation instruction and training for the Contractor's installation personnel and the Engineer.

Installers of horizontally oriented anchors and dowels subject to sustained tension loads as shown on the plans, shall hold current ACI Adhesive Anchor Installer Certification credentials.

The installation of all anchors and dowels with adhesive bonding material shall be inspected by an inspector, provided by the Contractor, holding current ACI Post-Installed Anchor Inspector Certification credentials. The installation of any horizontally oriented anchors and dowels subject to sustained tension load shall be continuously inspected during installation by the inspector provided by the Contractor, holding current ACI Post-Installed Anchor Inspector Certification credentials.

Prior to drilling holes for the anchors and dowels, the Contractor shall provide the following installer and inspector information to the Engineer:

1. documentation confirming that all the installers are qualified and have been trained by the adhesive bonding material manufacturer
2. a copy of each installer's ACI Adhesive Anchor Installer Certification card, as applicable
3. a copy of the inspector's ACI Post-Installed Anchor Inspector Certification card

The installation, including drilling of holes, of the anchors and dowels with adhesive bonding material shall be in accordance with the adhesive bonding material MPII. The methods and equipment used to drill and clean the holes, weather conditions at the time of installation, temperature of the concrete, anchor and dowel, and the condition of the hole at time of installation shall also be in accordance with the MPII. The use of tools, such as drill bits and cleaning brushes, from a manufacturer different from the manufacturer of the adhesive bonding material is not permitted unless noted otherwise in the adhesive bonding material MPII. In case of conflict between these specifications and the MPII, the requirements of the MPII shall govern.

The anchors and dowels shall be installed in clean, dry holes (no water present) drilled into structurally sound concrete and bonded with adhesive bonding material. Structurally sound concrete is solid when sounded with a hammer, uncracked, greater than 21 days old, and has a compressive strength no less than its design strength when it was originally placed. If the hole is filled with water, partially filled with water, or water entered the hole during drilling, the Contractor shall blow out the water using compressed air and allow a minimum of 24 hours before cleaning the hole and installing the anchors or dowels. The Contractor shall not install anchors or dowels in saturated, surface dry holes (holes with damp surfaces, but no standing water).

Holes for the anchors and dowels shall be located and drilled to a depth no less than the anchor embedment depth shown on the plans. A pachometer shall be used to locate existing reinforcing steel. If existing reinforcing is encountered during the drilling operation, the holes shall be relocated as noted on the plans. Core drilling through the reinforcing bars may be allowed if noted on the plans. Drilled holes that are abandoned shall be completely filled with adhesive bonding material or non-shrink grout and finished flush with the adjacent concrete surface.

C. Field Testing: After the adhesive bonding material has fully cured in accordance the MPII, the anchors and dowels shall be field tested to verify the installation procedures and installed adhesive anchor strength. Field testing shall be performed by an independent third-party testing agency, hired by the Contractor.

The Contractor shall provide the testing agent with a copy of the plans and these provisions and instruct the testing agent to perform the following:

1. Verify the adhesive bonding material used
2. Check that the anchorage size and type match the requirements of the Contract
3. Perform all field testing in accordance with the Contract
4. Record all test results on a field proof load test report form (sample form included herein)
5. Sign and date the test form

The Contractor shall submit the completed, and signed test report form to the Engineer.

The adhesive bonded anchors and dowels to be field tested at each location shall be randomly selected by the Engineer based on the tabulated number to be tested shown on the plans. A confined static tension test shall be performed in accordance with ACI 355.4 and ASTM E488 for the proof test load shown on the plans, in the presence of the Engineer. The test equipment shall be capable of measuring displacement of the anchor or dowel. The proof test load shall be maintained for a minimum of 10 seconds. In order to pass the field test, the tested anchors and dowels shall have no visible damaged during or after the proof load, no indications of displacement at the proof test load and no cracking of concrete in the vicinity of the anchor or dowels. An additional anchor or dowel shall be tested for each anchor or dowel that does not pass the field test.

All anchors and dowels that do not pass the field test shall be removed without any damage to surrounding concrete. The Contractor shall reinstall new anchors and dowels in accordance with the requirements described herein. Holes can be re-drilled to remove the adhesive bonding material residue prior to new anchor or dowel installation. The anchors and dowels at the failed locations shall not be reused.

D. Repairs: The Contractor, as directed by the Engineer, shall take adequate precautions to prevent any materials from dropping to the area below, which may result in damage to any existing construction or to adjoining property. Should any damage occur to the structure as a result of the Contractor's operations, the Contractor shall make repairs at their expense. The repair work shall be approved in advance and shall be of a quality acceptable to the Engineer.

6.10.4 - Method of Measurement: This work will be measured for payment by the actual number of drilled holes in which anchors and dowels are embedded and accepted.

6.10.5 - Basis of Payment: This work will be paid for at the Contract unit price each for "Drilling Holes and Bonding Anchors" or "Drilling Holes and Bonding Dowels," which price shall include drilling and preparing holes, furnishing, and installing adhesive bonding material, furnishing anchors and dowels, providing an ACI Certified inspector, testing of the installed anchors and dowels, and all material, equipment, tools, and labor incidental thereto.

Pay Item	Pay Unit
Drilling Holes and Bonding Anchors	ea.
Drilling Holes and Bonding Dowels	ea.

Name, address and contact information for testing firm

Field Proof Load Test Report -				Page of				
CTDOT Project:		Date:						
Contractor:		Weather:						
Contractor Rep.:		Temperature: AM		PM				
		Technician:						
		Arrival Time:						
		Departure Time:						
General Location of Work: Include Town, Description of crossing, Bridge number, as applicable								
Item Details								
Item Tested	Size	Grade	Embed Depth					
Equipment Information								
Hydraulic Ram Number	Hydraulic Ram Capacity	Dial Gauge Number	Dial Gauge Capacity					
Test Application Method:								
Required Load (lbs):			Required Dial Reading (psi):					
Test Results								
Test #	Location	Dial Reading (psi)	Maximum Load (lbs)	Failure Type				Pass/Fail
				None	Bond	Concrete	Component	
Comments								
<p>Describe location, total number of anchors/dowels. Provide sketch of anchor/dowels and test locations</p> <p>Adhesive bonding material product name</p> <p>Describe equipment used to measure displacement and provide displacement measurements/results</p> <p>List names and affiliations of engineers witnessing testing</p> <p>Use additional sheets, similar to this sheet, if required</p>								
Signature:						Date:		

SECTION 8.22 - TEMPORARY TRAFFIC BARRIER

Section 8.22 is hereby replaced with the following:

8.22.01—Description: Work under this item shall consist of furnishing, installing, relocating and removing temporary traffic barrier.

8.22.02—Materials: The precast concrete materials for temporary traffic barrier shall meet the requirements of Article 8.21.02 except that reinforcing steel does not need to be galvanized.

Any temporary precast concrete barrier curb that was fabricated after December 31, 2019 that does not, at a minimum, meet AASHTO MASH (TL-3) is not allowed to be used as temporary traffic barrier. The condition of all precast concrete temporary traffic barrier must meet the “acceptable” or “marginal” definitions in the ATSSA “Quality Guidelines for Temporary Traffic Control Devices and Features.”

An alternate to the temporary traffic barrier shown on the plans may be requested. The alternate temporary traffic barrier must be documented to meet the minimum crash performance for MASH (TL-3) and its dynamic deflection distance must not exceed the values indicated on the plans for the type of temporary traffic barrier proposed.

The delineator shall be fabricated of aluminum, steel, plastic, or of a material approved by the Engineer. The retroreflective sheeting shall be Type IV, Type V, or Type IX as specified in Article M.18.09. Delineator fastening hardware or adhesive shall be suitable for the purpose intended.

The connection rod and anchors shall be manufactured in accordance with AASHTO M 314, Grade 55. Threads shall be UNC Series as specified in ANSI B1.1 and shall have Class 2A threaded tolerances before galvanizing.

Plain steel washers shall be manufactured in accordance with ANSI B18.22.

Heavy hex nuts shall be Grade A, manufactured in accordance with AASHTO M 291.

Connection loop bars shall be bent from smooth bars that meet the requirements of ASTM A36.

Steel tube for the connection key shall meet the requirements of ASTM A500, Grade B or C.

Steel plate shall be AASHTO M270 Grade 36 or 50.

Adhesive bonding material shall meet the requirements of Article 6.10.02.

Non-shrink, non-staining grout shall meet the requirements of Article M.03.05.

Membrane waterproofing (cold liquid elastomeric) shall be selected from the Qualified Products List and shall be able to be applied by brush.

8.22.03—Construction Methods:

1. Submittals:

- a. When used temporary traffic barrier is furnished, the Contractor shall provide documentation stating where the material originated, the Department project for which it was produced, the casting dates, and certification that the barrier meets the Contract requirements.
- b. When an alternative temporary traffic barrier is requested, the Contractor shall submit to the Engineer a Materials Certificate, in accordance with Article 1.06.07, and a copy of the Federal-aid eligibility letter issued to the manufacturer documenting that the device complies with the minimum requirements of MASH (TL-3).

- c. Submit Materials Certificates for the steel plate, connection rods, anchors and non-shrink, non-staining grout.
 - d. A Materials Certificate for the membrane waterproofing (cold liquid elastomeric) shall be submitted to the Engineer, in accordance with Article 1.06.07, along with the manufacturer's written installation instructions for application of the membrane when repair of deck membrane is required after removal of anchors.
 - e. Submit Product Data for the selected adhesive bonding material, in accordance with Article 6.10.03-A.
2. **Precast Unit:** Concrete temporary traffic barrier units shall be precast in accordance with the pertinent requirements of Article 8.21.03, except the penetrating sealer protective compound need not be applied to the precast unit.
3. **Installation & Removal:** Temporary traffic barrier units shall be placed as shown on the plans or as directed by the Engineer, on a firm even surface to produce a smooth continuous length of barrier.

Any damaged material shall be removed and replaced by the Contractor at their expense. The Contractor shall maintain the condition and alignment of the temporary traffic barrier during all stages of construction.

The Contractor shall relocate the temporary traffic barrier and its appurtenances to locations within the Project limits when shown on the plans or as ordered by the Engineer. When the temporary traffic barrier is no longer required, it shall be removed completely from the Project and shall remain the property of the Contractor.

Any holes in concrete decks created for anchoring shall be filled with non-shrink, non-staining grout up to the concrete surface after barrier removal. Anchors secured to the deck using adhesive bonding material shall be cut flush with the concrete surface when no longer needed. If the temporary traffic barrier is set on a bituminous wearing surface on top of the concrete deck and the existing membrane is to remain, a six-inch diameter pavement core shall be drilled around each anchor to the top of deck to remove the wearing surface and to provide access to cut off the anchor or fill the hole in the deck. All loose or poorly adhering membrane and other materials that could adversely affect the bond of the membrane to the deck shall be removed from the concrete surface. Cold liquid elastomeric membrane shall be brush-applied to the exposed concrete surface in accordance with the accepted installation instructions submitted by the manufacturer. The minimum thickness of membrane shall be 80 mils which shall be measured using a wet film gage. After the membrane is cured in accordance with the manufacturer's written recommendations, the core hole shall be filled using a bituminous concrete mixture at a minimum temperature of 240°F containing the same or smaller nominal maximum aggregate size and compacted with a hand compactor or other mechanical means to the maximum compaction possible. The bituminous concrete shall be compacted to 1/8 inch above the finished pavement.

4. **Delineator:** The delineator shall be installed in the center on top of all barriers on the roadway and those installed within 8 feet from the edge of road, and at the locations designated on the plans. They shall be fastened by adhesive or hardware and must be maintained in good condition at all times. The color of the delineator shall match the color of the adjacent pavement marking edge line.

DE-7 (One Way White) delineators shall be used when the barriers are on the right side of traffic or dividing traffic in the same direction.

DE-7A (One Way Yellow) delineators shall be used when the barriers are on the left side of traffic.

DE-7B (Two Way Yellow) delineators shall be used when the barriers divide opposing traffic lanes.

DE-7D (Two Way White) delineators shall be used when the barriers are installed in an alternating one-way traffic operation.

Spacing of delineators on temporary traffic barriers shall be as specified on Traffic Standard Sheet TR-1205_01.

5. **Connection:** Nuts for the connection rod pin and loop connection shall be turned until the washer is drawn up against the connection loop. The connection loops must not be bent in the tightening process. For ease in removing the nuts, the threads may be waxed. Connection keys shall be installed as shown on the Plans
6. **Anchoring:** Anchoring temporary traffic barrier shall be with adhesive bonding material, thru-bolting, or pinning as shown on the plans, except only threaded inserts shall be used on new prestressed concrete members and shall be cast into the deck in locations that accommodate the stage construction. Shop drawings for the new prestressed concrete members shall reflect the use of inserts. Drilling into prestressed concrete members is not permitted. Installation of anchors with adhesive bonding material shall be in accordance with Article 6.10.03.

The terminal units of temporary barrier curb shall be 20 feet in length and shall be anchored with pins on both sides as shown on the plans.

Method of Measurement: This work will be measured for payment along the centerline of the top of the temporary traffic barrier and will be the actual number of linear feet of temporary traffic barrier furnished, installed and accepted.

Relocated temporary traffic barrier will be measured along the centerline of the top of the barrier each time the barrier has been satisfactorily relocated as directed by the Engineer, including to and from the storage area. Storage of barrier will not be measured for payment. Relocation of temporary traffic barrier for access to the work area, or for the convenience of the Contractor, shall be considered incidental to Maintenance and Protection of Traffic and will not be measured for payment.

The terminal units will not be measured separately. Their length will be included in the length of temporary traffic barrier installed.

Delineators will not be measured for payment.

Anchoring materials, filling of holes, cutting off adhesive bonded anchors, coring, furnishing and applying waterproofing membrane and filling in core holes with bituminous concrete will not be measured for payment.

Basis of Payment: This work will be paid for at the Contract unit price per linear foot for "Temporary Traffic Barrier" or "Temporary Traffic Barrier (Type)," complete in place, which price shall include all furnishing, transportation, initial installation, final removal, storage, materials, reinforcing steel, connecting rods, anchoring materials, equipment, tools and labor incidental thereto. Each temporary traffic barrier will be paid for once regardless of the number of times it is used on the Project. Any temporary traffic barrier that become lost, damaged or defaced shall be replaced by the Contractor at no cost to the State.

The relocation of the temporary traffic barrier will be paid for at the Contract unit price per linear foot for "Relocated Temporary Traffic Barrier" or "Relocated Temporary Traffic Barrier (Type)," which price shall include all transportation, installation, removal, materials, equipment , tools, storage and labor incidental thereto.

Pay Item	Pay Unit
Temporary Traffic Barrier	l.f.
Temporary Traffic Barrier (Pinned)	l.f.
Temporary Traffic Barrier (Bolted)	l.f.
Relocated Temporary Traffic Barrier	l.f.
Relocated Temporary Traffic Barrier (Pinned)	l.f.
Relocated Temporary Traffic Barrier (Bolted)	l.f.

ITEM #0020763A - DISPOSAL OF SEDIMENTS

Description:

Work under this item shall consist of the loading, transportation and final off-site disposal of sediments. These sediments are contaminated at non-hazardous levels as documented in the reports listed in the “Notice to Contractor – Environmental Investigations.” The controlled sediments are designated for off-site disposal at an upland facility and, after characterization by the Engineer, shall be taken from the WSA, loaded, transported, and disposed of at a DOT-approved upland disposal facility listed herein.

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

Waste Management – Chicopee Landfill Attn: Thomas Murray 161 New Lombard Road Chicopee, MA 01020 Phone: (413) 534-8741 Fax: (413) 493-1547	Southbridge Recycling and Disposal Park Attn: Scott Sampson 165 Barefoot Road Southbridge, MA 01550 Phone: (603) 235-3597 Fax: (508) 765-6812
Cranston Sanitary Landfill Attn: Paul Mahoney 1690 Pontiac Avenue Cranston, RI 02920 Phone: (413) 552-3688 and 978-463-6813 Cell: 508-265-3386	ESMI of New York Attn: Peter Hansen 304 Towpath Road Fort Edward, New York 12828 Phone: (518) 747-5500 Fax: (518) 747-1181

* Note: each bin will require an additional 10 days (or more) for PADEP to review analytical data and approve material for disposal prior to facility acceptance of material. This is in addition to all other restrictions and wait periods defined below.

The above list contains treatment/recycle/disposal facilities which can accept the waste stream generated by the project in quantities that may be limited by their permits and their operations restrictions. It is the responsibility of the contractor to verify that a facility will be available and capable of handling the volume as well as the chemical and physical characteristics of material generated by the project.

Construction Methods:

A. Material Disposal

After the sediment has adequately dewatered and any necessary solidification material has been added, the Engineer will sample materials stored at the WSA at a frequency established by the

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

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

All manifests or bills of lading utilized to accompany the transportation of the material shall be prepared by the Contractor a minimum of 24 hours in advance and signed by an authorized Department representative, as Generator, for each truck load of material that leaves the site. The Contractor shall forward the appropriate original copies of all manifests or bills of lading to the Engineer the same day the material leaves the Project.

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

B. Material Transportation

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

- Transported controlled materials are to be covered sufficiently to preclude the loss of material during transport prior to leaving the site and are to remain covered until the arrival at the selected treatment/recycling/disposal facility.
- All vehicles departing the site are to be properly logged to show the vehicle identification, driver's name, time of departure, destination, and approximate volume, and contents of materials carried.

- No materials shall leave the site unless a treatment/recycling/disposal facility willing to accept all of the material being transported has agreed to accept the type and quantity of waste.
- Discharge openings on trucks used for the transportation of sediments must be securely closed during transportation. Trucks deemed unacceptable for use by the Engineer will not be used for the transportation of sediments.

C. Equipment Decontamination

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

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

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

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

Method of Measurement:

The work of "DISPOSAL OF SEDIMENTS" will be measured for payment as the actual net weight in tons of material delivered to the treatment/recycling/disposal facility. Such determinations shall be made by measuring each hauling vehicle on the certified permanent scales at the treatment/recycling/disposal facility. Total weight will be the summation of weight bills issued by the facility specific to this Project. Excess excavations made by the Contractor beyond the payment limits specified in Specification Sections 2.02, 2.03, 2.06, and 2.86, or the Contract Special Provisions (as appropriate) will not be measured for payment and the Contractor assumes responsibility for all costs associated with the appropriate handling, management and disposal of this material.

The disposal of excavated materials, originally anticipated to be controlled materials, but determined by characterization sampling not to contain concentrations of regulated chemicals

(non-polluted or “clean” materials) will not be measured for payment under this item but will be considered as surplus excavated materials and will be paid in accordance with Article 1.04.05.

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

Basis of Payment:

This work will be paid for at the Contract unit price, which shall include the loading and transportation of sediments from the WSA to the treatment/recycling/disposal facility; the treatment/recycling/disposal; the preparation of manifests and fees paid; and all equipment, materials, tools, and labor incidental to loading, transporting, and treating/recycling/disposal of materials. **This unit price will be applicable to all of the Contractor-selected disposal facilities for the duration of the Project.**

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

Solidification of sediments will be paid under other Contract items.

<u>Pay Item</u>	<u>Pay Unit</u>
Disposal of Sediments	Ton

ITEM NO. 0101000A - ENVIRONMENTAL HEALTH AND SAFETY

Description:

Under this item, the Contractor shall establish protocols and provide procedures to protect the health and safety of its employees and subcontractors as related to the proposed construction activities performed within the Project AOEC(s). Work under this Item consists of the development and implementation of a written HASP that addresses the relative risk of exposure to documented hazards present within Project limits. The HASP shall establish health and safety protocols that address the relative risk of exposure to regulated substances in accordance with 29 CFR 1910.120 and 29 CFR 1926.65. Such protocols shall only address those concerns directly related to site conditions.

Note: The Engineer will prepare a site-specific health and safety plan which is compatible with the Contractor's plan and will be responsible for the health and safety of all Project Inspectors, Department employees and consulting engineers.

Materials:

The Contractor must provide chemical protective clothing (CPC) and personal protective equipment (PPE) as stipulated in the Contractor's HASP during the performance of work in areas identified as potentially posing a risk to worker health and safety for workers employed by the Contractor and all subcontractors.

Construction Methods:

1-Existing Information: The Contractor shall utilize all available information and existing records and data pertaining to chemical and physical hazards associated with any of the regulated substances identified in the environmental site investigations to develop the HASP. A list of documents containing this data is found in "Notice to Contractor – Environmental Investigations".

2-General: The requirements set forth herein pertain to the provision of workers' health and safety as it relates to proposed Project activities when performed in the presence of hazardous or regulated materials or otherwise environmentally sensitive conditions. THE PROVISION OF WORKER HEALTH AND SAFETY PROTOCOLS WHICH ADDRESS POTENTIAL AND/OR ACTUAL RISK OF EXPOSURE TO SITE SPECIFIC HAZARDS POSED TO CONTRACTOR EMPLOYEES IS SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.

The Contractor shall be responsible for the development, implementation and oversight of the HASP throughout the performance of work within the limits of the AOEC(s), as identified in the Contract Documents, and in other areas identified by the Engineer or by the HASP where site conditions may pose a risk to worker health and safety and/or the environment. **No physical**

aspects of the work within the AOEC shall begin until the HASP is reviewed by the Engineer and is determined to meet the requirements of the specifications. However, the Contract time, in accordance with Article 1.03.08, will begin on the date stipulated in the Notice to Proceed.

3-Regulatory Requirements: All construction related activities performed by the Contractor within the limits of the AOEC(s) or in other areas where site conditions may pose a risk to worker health and safety and/or the environment shall be performed in conformance with 29 CFR 1926, Safety and Health Regulations for Construction and 29 CFR 1910, Safety and Health Regulations for General Industry. Conformance to 29 CFR 1910.120, Hazardous Waste Site Operations and Emergency Response (HAZWOPER) may also be required, where appropriate.

4-Submittals: Three copies of the HASP shall be submitted to the Engineer within four (4) weeks after the Award of Contract or four (4) weeks prior to the start of any work in the AOEC, whichever is first, but not before the Award of the Contract.

The HASP shall be developed by a qualified person designated by the Contractor. This qualified person shall be a Certified Industrial Hygienist (CIH), Certified Hazardous Material Manager (CHMM), or a Certified Safety Professional (CSP). He/she shall have review and approval authority over the HASP and be identified as the Health and Safety Manager (HSM). The HASP shall bear the signature of said HSM indicating that the HASP meets the minimum requirements of 29 CFR 1910.120 and 29 CFR 1926.65.

The Engineer will review the HASP(s) within four (4) weeks of submittal and provide written comments as to deficiencies in and/or exceptions to the plan(s), if any, to assure consistency with the specifications, applicable standards, policies and practices and appropriateness given potential or known site conditions. Items identified in the HASP which do not conform to the specifications will be brought to the attention of the Contractor, and the Contractor shall revise the HASP to correct the deficiencies and resubmit it to the Engineer for determination of compliance with this item. The Contractor shall not be allowed to commence work activities in the AOEC(s), as shown on the Plans, or where site conditions exist which may pose a risk to worker health and safety and/or the environment, until the HASP has been reviewed and accepted by the Engineer. No claim for delay in the progress of work will be considered for the Contractor's failure to submit a HASP that conforms to the requirements of the Contract.

5-HASP Provisions:

(a) General Requirements: The Contractor shall prepare a HASP covering all Project site work regulated by 29 CFR 1910.120(b)/ 1926.65(b) to be performed by the Contractor and all subcontractors under this Contract. The HASP shall establish in detail, the protocols necessary for the recognition, evaluation, and control of all hazards associated with each task performed under this Contract. The HASP shall address site-specific safety and health hazards of each phase of site operation and include the requirements and procedures for employee protection. The level of detail provided in the HASP shall be tailored to the type of work, complexity of operations to be performed, and hazards

anticipated. Details about some activities may not be available when the initial HASP is prepared and submitted. Therefore, the HASP shall address, in as much detail as possible, all anticipated tasks, their related hazards and anticipated control measures.

The HASP shall interface with the Contractor's Safety and Health Program. Any portions of the Safety and Health Program that are referenced in the HASP shall be included as appendices to the HASP. All topics regulated by the 29 CFR 1910.120(b)(4) and those listed below shall be addressed in the HASP. Where the use of a specific topic is not applicable to the Project, the HASP shall include a statement to justify its omission or reduced level of detail and establish that adequate consideration was given the topic.

(b) Elements:

(i) Site Description and Contamination Characterization: The Contractor shall provide a site description and contaminant characterization in the HASP that meets the requirements of 29 CFR 1910.120/1926.65.

(ii) Safety and Health Risk Analysis/Activity Hazard Analysis: The HASP shall address the safety and health hazards on this site for every operation to be performed. The Contractor shall review existing records and data to identify potential chemical and physical hazards associated with the site and shall evaluate their impact on field operations. Sources, concentrations (if known), potential exposure pathways, and other factors as noted in CFR 1910.120/126.65, paragraph (c)(7) employed to assess risk shall be described. The Contractor shall develop and justify action levels for implementation of engineering controls and personal protective equipment upgrades and downgrades for controlling worker exposure to the identified hazards. If there is no permissible exposure limit (PEL) or published exposure level for an identified hazard, available information from other published studies may be used as guidance. Any modification of an established PEL must be fully documented.

The HASP shall include a comprehensive section that discusses the tasks and objectives of the site operations and logistics and resources required to complete each task. The hazards associated with each task shall be identified. Hazard prevention techniques, procedures and/or equipment shall be identified to mitigate each of the hazards identified.

(iii) Staff Organization, Qualifications and Responsibilities: The HASP shall include a list of personnel expected to be engaged in site activities and certify that said personnel have completed the educational requirements stipulated in 29 CFR 1910.120 and 29 CFR 1926.65, are currently monitored under a medical surveillance program in compliance with those regulations, and that they are fit for work under "level C" conditions.

The Contractor shall assign responsibilities for safety activities and procedures. An outline or flow chart of the safety chain of command shall be provided in the HASP. Qualifications, including education, experience, certifications, and training in safety and health for all personnel engaged in safety and health functions shall be documented in the

HASP. Specific duties of each on-site team member should be identified. Typical team members include but are not limited to Team Leader, Scientific Advisor, Site Safety Officer, Public Information Officer, Security Officer, Record Keeper, Financial Officer, Field Team Leader, and Field Team members.

The HASP shall also include the name and qualifications of the individual proposed to serve as Health and Safety Officer (HSO). The HSO shall have full authority to carry out and ensure compliance with the HASP. The Contractor shall provide a competent HSO on-site who is capable of identifying existing and potential hazards in the surroundings or working conditions which are unsanitary, hazardous or dangerous to employees and who has authorization to take prompt corrective measures to eliminate or control them. The qualifications of the HSO shall include completion of OSHA 40-hour HAZWOPER training and 8-hour HAZWOPER supervisory training; a minimum of one year of working experience with the regulated compounds that have been documented to exist within Project limits; a working knowledge of Federal and State safety regulations; specialized training or documented experience (one year minimum) in personal and respiratory protective equipment program implementation; the proper use of air monitoring instruments, air sampling methods and procedures; and certification training in first aid and CPR by a recognized, approved organization such as the American Red Cross.

The primary duties of the HSO shall be those associated with worker health and safety. The Contractor's HSO responsibilities shall be detailed in the written HASP and shall include, but not be limited to the following:

- (A) Directing and implementing the HASP.
- (B) Ensuring that all Project personnel have been adequately trained in the recognition and avoidance of unsafe conditions and the regulations applicable to the work environment to control or eliminate any hazards or other exposure to illness or injury (29 CFR 1926.21). All personnel shall be adequately trained in procedures outlined in the Contractor's written HASP.
- (C) Authorizing Stop Work Orders, which shall be executed upon the determination of an imminent health and safety concern.
- (D) Contacting the Contractor's HSM and the Engineer immediately upon the issuance of a Stop Work order when the HSO has made the determination of an imminent health and safety concern.
- (E) Authorizing work to resume, upon approval from the Contractor's HSM.
- (F) Directing activities, as defined in the Contractor's written HASP, during emergency situations; and

(G) Providing personal monitoring where applicable, and as identified in the HASP.

(iv) Employee Training Assignments: The Contractor shall develop a training program to inform employees, supplier's representatives, and official visitors of the special hazards and procedures (including PPE, its uses and inspections) to control these hazards during field operations. Official visitors include but are not limited to Federal Agency Representatives, State Agency Representatives, Municipal Agency Representatives, Contractors, subcontractors, etc. This program shall be consistent with the requirements of 29 CFR 1910.120 and 29 CFR 1926.65.

(v) Personal Protective Equipment: The plan shall include the requirements and procedures for employee protection and should include a detailed section on respiratory protection. The Contractor shall describe in detail and provide appropriate personal protective equipment (PPE) to insure that workers are not exposed to levels greater than the action level for identified hazards for each operation stated for each work zone. The level of protection shall be specific for each operation and shall be in compliance with all requirements of 29 CFR 1910 and 29 CFR 1926. The Contractor shall provide, maintain, and properly dispose of all PPE.

(vi) Medical Surveillance Program: All on-site Contractor personnel engaged in 29 CFR 1910.120/1926.65 operations shall have medical examinations meeting the requirements of 29 CFR 1910.120(f) prior to commencement of work.

The HASP shall include certification of medical evaluation and clearance by the physician for each employee engaged in 29 CFR 1910.120/1926.65 operations at the site.

(vii) Exposure Monitoring/Air Sampling Program: The Contractor shall submit an Air Monitoring Plan as part of the HASP which is consistent with 29 CFR 1910.120, paragraphs (b)(4)(ii)(E), (c)(6), and (h). The Contractor shall identify specific air sampling equipment, locations, and frequencies in the air-monitoring plan. Air and exposure monitoring requirements shall be specified in the Contractor's HASP. The Contractor's CIH shall specify exposure monitoring/air sampling requirements after a careful review of the contaminants of concern and planned site activities.

(viii) Site Layout and Control: The HASP shall include a map, work zone delineation (support, contamination, reduction and exclusion), on/off-site communications, site access controls, and security (physical and procedural).

(ix) Communications: Written procedures for routine and emergency communications procedures shall be included in the Contractor's HASP.

(x) Personal Hygiene, Personal Decontamination and Equipment Decontamination: Decontamination facilities and procedures for personnel protective equipment, sampling equipment, and heavy equipment shall be discussed in detail in the HASP.

(xi) Emergency Equipment and First Aid Requirements: The Contractor shall provide appropriate emergency first aid kits and equipment suitable to treat exposure to the hazards identified, including chemical agents. The Contractor will provide personnel that have certified first aid/CPR training on-site at all times during site operations.

(xii) Emergency Response Plan and Spill Containment Program: The Contractor shall establish procedures in order to take emergency action in the event of immediate hazards (i.e., a chemical agent leak or spill, fire or personal injury). Personnel and facilities supplying support in emergency procedures will be identified. The emergency equipment to be present on-site and the Emergency Response Plan procedures, as required 29 CFR 1910.120, paragraph (1)(1)(ii) shall be specified in the Emergency Response Plan. The Emergency Response Plan shall be included as part of the HASP. This Emergency Response Plan shall include written directions to the closest hospital as well as a map showing the route to the hospital.

(xiii) Logs, Reports and Record Keeping: The Contractor shall maintain safety inspections, logs, and reports, accident/incident reports, medical certifications, training logs, monitoring results, etc. All exposure and medical monitoring records are to be maintained according to 29 CFR 1910 and 29 CFR 1926. The format of these logs and reports shall be developed by the Contractor to include training logs, daily logs, weekly reports, safety meetings, medical surveillance records, and a phase-out report. These logs, records, and reports shall be maintained by the Contractor and be made available to the Engineer.

The Contractor shall immediately notify the Engineer of any accident/ incident. Within two working days of any reportable accident, the Contractor shall complete and submit to the Engineer an accident report.

(xiv) Confined space entry procedures: Confined space entry procedures, both permit required and non permit required, shall be discussed in detail.

(xv) Pre-entry briefings: The HASP shall provide for pre-entry briefings to be held prior to initiating any site activity and at such other times as necessary to ensure that employees are apprised of the HASP and that this plan is being followed.

(xvi) Inspections/audits: The HSM or HSO shall conduct inspections or audits to determine the effectiveness of the HASP. The Contractor shall correct any deficiencies in the effectiveness of the HASP.

6-HASP Implementation: The Contractor shall implement and maintain the HASP throughout the performance of work. In areas identified as having a potential risk to worker health and safety, and in any other areas deemed appropriate by the HSO, the Contractor shall be prepared to immediately implement the appropriate health and safety measures, including but not limited to the use of personal protective equipment (PPE), and engineering and administrative controls.

If the Engineer observes deficiencies in the Contractor's operations with respect to the HASP, they shall be assembled in a written field directive and given to the Contractor. The Contractor shall immediately correct the deficiencies and respond, in writing, as to how each was corrected. Failure to bring the work area(s) and implementation procedures into compliance will result in a Stop Work Order and a written directive to discuss an appropriate resolution(s) to the matter. When the Contractor demonstrates compliance, the Engineer shall remove the Stop Work Order. If a Stop Work Order has been issued for cause, no delay claims on the part of the Contractor will be honored.

Disposable CPC/PPE, i.e. disposable coveralls, gloves, etc., which come in direct contact with hazardous or potentially hazardous material shall be placed into 55 gallon USDOT 17-H drums and disposed of in accordance with Federal, State, and local regulations. The drums shall be temporarily staged and secured within the WSA until the material is appropriately disposed.

7-HASP Revisions: The HASP shall be maintained on-site by the Contractor and shall be kept current with construction activities and site conditions under this Contract. The HASP shall be recognized as a flexible document which shall be subject to revisions and amendments, as required, in response to actual site conditions, changes in work methods and/or alterations in the relative risk present. All changes and modifications shall be signed by the Contractor's HSM and shall require the review and acceptance by the Engineer prior to the implementation of such changes.

Should any unforeseen hazard become evident during the performance of the work, the HSO shall bring such hazard to the attention of the Contractor and the Engineer as soon as possible. In the interim, the Contractor shall take action, including Stop Work Orders and/or upgrading PPE as necessary to re-establish and maintain safe working conditions and to safeguard on-site personnel, visitors, the public and the environment. The HASP shall then be revised/amended to reflect the changed condition.

Method of Measurement:

1-Within thirty (30) calendar days of the award of the Contract, the Contractor shall submit to the Engineer for acceptance a breakdown of its lump sum bid price for this item detailing:

- (a) The development costs associated with preparing the HASP in accordance with these Specifications.
- (b) The cost per month for the duration of the Project to implement the HASP and provide the services of the HSM and the HSO.

2-If the lump sum bid price breakdown is unacceptable to the Engineer; substantiation showing that the submitted costs are reasonable shall be required.

3-Upon acceptance of the payment schedule by the Engineer, payments for work performed will be made as follows:

- (a) The lump sum development cost will be certified for payment.
- (b) The Contractor shall demonstrate to the Engineer monthly that the HASP has been kept current and is being implemented and the monthly cost will be certified for payment.
- (c) Any month where the HASP is found not to be current or is not being implemented, the monthly payment for the Environmental Health and Safety Item shall be deferred to the next monthly payment estimate. If the HASP is not current or being implemented for more than thirty calendar days, there will be no monthly payment.
- (d) Failure of the Contractor to implement the HASP in accordance with this Specification shall result in the withholding of all Contract payments.

Basis of Payment:

This work will be paid for at the Contract lump sum price for “Environmental Health and Safety” which price shall include all materials, tools, equipment and labor incidental to the completion of this item for the duration of the Project to maintain, revise, monitor and implement the HASP. Such costs include providing the services of the HSM and HSO, Contractor employee training, chemical protective clothing (CPC), personal protective equipment (PPE), disposal of PPE and CPC, medical surveillance, decontamination facilities, engineering controls, monitoring and all other HASP protocols and procedures established to protect the Health and Safety for all on-site workers.

Pay Item	Pay Unit
Environmental Health and Safety	L.S.

ITEM #0101117A - CONTROLLED MATERIALS HANDLING

Description:

Work under this Item is intended to provide specific procedural requirements to be followed by the Contractor during the excavation of Controlled Materials from within any AOEC, as shown on the Project Plans. This supplements Specification Sections 2.02, 2.03, 2.06, and 2.86, and Contract Special Provisions for excavation wherever contaminated materials are encountered. Work under this item shall include transporting and stockpiling materials at the WSA; and covering, securing, and maintaining the stockpiled materials throughout the duration of the Project. All materials, excluding the existing pavement structure (asphalt and subbase), rock, ledge, and concrete, excavated within AOEC(s) are to be considered Controlled Materials.

Controlled Materials consisting of non-hazardous levels of regulated substances have been documented to exist within the Project. Such contamination is documented in the reports listed in the “Notice to Contractor – Environmental Investigations.” Where contaminated soils are excavated, such soil will not be reusable as backfill, unless authorized by the Engineer in writing, and will require special handling, disposal and documentation procedures.

Materials:

The required materials are detailed on the Project Plans. All materials shall conform to the requirements of the Contract.

Plastic Sheet: Polyethylene plastic sheeting for underlayment shall be at least 30 mil thick. Polyethylene plastic sheeting for covering excavated material shall be a thickness of 10 mil. Both shall be at least 10 feet wide.

Covers for roll-off/storage containers shall be made of polyethylene plastic, or similar water-tight material, that is of sufficient size to completely cover top opening and can be securely fastened to the container.

Sand Bags: Sandbags used to secure polyethylene covers shall be at least 30 pounds.

Sorbent Boom: Shall be 8 inches in diameter and 10 feet long and possess petrophilic and hydrophobic properties. Sorbent booms shall also have devices (i.e. clips, clasps, etc.) for connection to additional lengths of boom.

Construction Methods:

A. General

When Controlled Materials are encountered during the course of the work, health and safety provisions shall conform to the appropriate sections of the Contract. Provisions may include

implementation of engineering controls, air and personal monitoring, the use of chemical protective clothing (CPC), personal protective equipment (PPE), implementation of engineering controls, air and personal monitoring, and decontamination procedures.

Unless otherwise directed by the Engineer, materials removed from any excavation within an AOEC shall be transported directly from their point of origin on the Project to the WSA. The stockpiles of excavated Controlled Materials shall be maintained as shown on the Project Plans. The Contractor shall plan excavation activities within AOEC(s) in consideration of the capacity of WSA, and the material testing and disposal requirements of the applicable Contract item. **No claims for delay shall be considered based on the Contractor's failure to coordinate excavation activities as specified herein.**

The Engineer will sample the stockpiled Controlled Materials at a frequency and for the constituents to meet the acceptance criteria of the treatment/recycling/disposal facilities submitted by the Contractor. The Contractor is hereby notified that laboratory turnaround time is expected to be fifteen (15) working days. Turnaround time is the period of time beginning when the Contractor notifies the Engineer which facility it intends to use and that the stockpile is ready for sampling and ending with the Contractor's receipt of the laboratory analytical results. Any change of intended treatment/recycling/disposal facility may prompt the need to resample and will therefore restart the time required for laboratory turnaround. The laboratory will furnish such results to the Engineer. Upon receipt, the Engineer will make available to the Contractor the results of the final waste characterization determinations. **No delay claim will be considered based upon the Contractor's failure to accommodate the laboratory turnaround time as identified above.**

B. Transportation and Stockpiling

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

- Transported Controlled Materials are to be covered prior to leaving the point of generation and are to remain covered until the arrival at the WSA;
- All vehicles departing the site are properly logged to show the vehicle identification, driver's name, time of departure, destination, and approximate volume and content of materials carried;
- All vehicles shall have secure, watertight containers free of defects for material transportation;
- No material shall leave the site until there is adequate lay down area prepared in the WSA; and,

- Documentation must be maintained indicating that all applicable laws have been satisfied and that the materials have been successfully transported and received at the WSA.

Construction of the WSA shall be completed prior to the initiation of construction activities generating Controlled Materials. Plastic polyethylene sheeting shall underlay all excavated Controlled Materials. Measures shall be implemented to divert rainfall away from the WSA.

No Controlled Materials shall be excavated or transported to the WSA until registration under the “General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer)” has been obtained by ConnDOT.

Placement of sorbent boom along the perimeter of the WSA shall be conducted when soil is saturated with petroleum product.

Excavated materials shall be staged as shown on the Project Plans or as directed by the Engineer.

C. WSA Maintenance

The Contractor shall provide all necessary materials, equipment, tools and labor for anticipated activities within the WSA. Such activities include, but are not limited to, handling and management of stockpiles and drummed CPC/PPE; uncovering and recovering stockpiles; maintenance of WSA; replacement of damaged components (i.e. sand bags, plastic polyethylene sheeting, etc.); and waste inventory record management. The Contractor shall manage all materials in the WSA in such a way as to minimize tracking of potential contaminated materials across the site and off-site, and minimize dust generation.

Each stockpile shall be securely covered when not in active use with a cover of sufficient size to prevent generation of dust and infiltration of precipitation. The cover shall be to prevent wind erosion.

The staged stockpiles shall be inspected at least daily by the Contractor to ensure that the cover and containment have not been damaged and that there is no apparent leakage from the pile. If the cover has been damaged, or there is evidence of leakage from the piles, the Contractor shall immediately replace the cover or containment as needed to prevent the release of materials to the environment from the piles.

An inventory of stockpiled materials and drummed CPC/PPE shall be conducted on a daily basis. Inventory records shall indicate the approximate volume of material/drums stockpiled per day; the approximate volume of material/drums stockpiled to date; material/drums loaded and transported off-site for disposal; any materials loaded and transported for on-site reuse; and identification of stockpiles relative to their points of generation.

Following the removal of all stockpiled Controlled Materials, residuals shall be removed from surfaces of the WSA as directed by the Engineer. This operation shall be accomplished using

dry methods such as shovels, brooms, mechanical sweepers or a combination thereof. Residuals shall be disposed of as Controlled Materials.

D. Dewatering

Dewatering activities shall conform to Items in pertinent articles of the Contract.

E. Decontamination

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

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

Dry decontamination procedures are recommended. Residuals from dry decontamination activities shall be collected and managed as Controlled Materials. If dry methods are unsatisfactory as determined by the Engineer, the Contractor shall modify decontamination procedures as required subject to the Engineer's approval.

F. Dust Control

The Contractor shall implement a fugitive dust suppression program in accordance with the Contract to prevent the off-site migration of particulate matter and/or dust resulting from excavation, loading and operations associated with Controlled Materials. It shall be the Contractor's responsibility to supervise fugitive dust control measures and to monitor airborne particulate matter. The Contractor shall:

1. Employ reasonable fugitive dust suppression techniques.
2. Visually observe the amounts of particulate and/or fugitive dust generated during the handling of Controlled Materials. If the apparent amount of fugitive dust and/or particulate matter is not acceptable to the Engineer, the Engineer may direct the Contractor to implement corrective measures at his discretion, including, but not limited to, the following:
 - (a) apply water to pavement surfaces
 - (b) apply water to equipment and excavation faces; and
 - (c) apply water during excavation, loading and dumping.

G. Permit Compliance

The Contractor shall comply with the terms and conditions of the CTDEEP “General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer),” including the General Operating Conditions and the Specific Operating Conditions, except that the Engineer will conduct all soil/sediment characterization and perform all record keeping. In particular, the Contractor shall:

1. Operate, maintain and repair the WSA in conformance with the requirements of the General Permit.
2. Maintain a communications system capable of summoning fire, police, and/or other emergency service personnel.
3. Prevent unauthorized entry onto the stockpiles by the use of fences, gates, or other natural or artificial barriers.
4. Separate incidental excavation waste to the satisfaction of the receiving facility or to an extent that renders the contaminated soil and/or sediment suitable for its intended reuse.
5. Isolate and temporarily store incidental waste in a safe manner prior to off-site transport to a facility lawfully authorized to accept such waste.
6. Not store more than 100 cubic yards of incidental waste at any one time.
7. Sort, separate and isolate all hazardous waste from contaminated soil and/or sediment.
8. Prevent or minimize the transfer or infiltration of contaminants from the stockpiles to the ground as detailed in “B. Transportation and Stockpiling” above.
9. Securely cover each stockpile of soil as detailed in “C. WSA Maintenance” above.
10. Minimize wind erosion and dust transport as detailed in “F. Dust Control” above.
11. Use anti-tracking measures at the WSA to ensure the vehicles do not track soil from the WSA onto a public roadway at any time.
12. Instruct the transporters of contaminated soil and/or sediment of best management practices for the transportation of such soil (properly covered loads, removing loose material from dump body, etc.).
13. Control all traffic related to the operation of the facility in such a way as to mitigate the queuing of vehicles off-site and excessive or unsafe traffic impact in the area where the facility is located.
14. Ensure that except as allowed in section 22a-174-18(b)(3)(C) of the Regulations of Connecticut State Agencies, trucks are not left idling for more than three (3) consecutive minutes.

Method of Measurement:

The work of Controlled Material Handling will be measured for payment by the number of cubic yards of controlled material excavated within the AOEC(s) and taken to the WSA. This measurement shall be in accordance with and in addition to the quantity measured for payment of the applicable excavation item in Specification Sections 2.02, 2.03, 2.06, and 2.86, or the Contract Special Provisions, as applicable. Excess excavations made by the Contractor beyond the payment limits specified in the Contract will not be measured for payment and the Contractor

assumes all costs associated with the appropriate handling, management and disposal of this material.

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

Basis of Payment:

This work shall be paid for at the Contract unit price, which shall include all transportation from the excavation site to the final WSA, including any intermediate handling steps; stockpiling Controlled Materials at the WSA; covering, securing, and maintaining the individual stockpiles within the WSA throughout the duration of the Project; and all tools, equipment, material and labor incidental to this work.

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

All materials, labor and equipment associated with compliance with the General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer) will not be measured separately, but will be considered incidental to the item "Controlled Materials Handling."

Securing, construction and dismantling of the WSA shall be paid for under Item 101128A. Handling and disposal of contaminated groundwater will be paid for under Item 0204210A. Payment for dust control activities shall be made under the appropriate Contract items.

Pay Item

Pay Unit

Controlled Materials Handling

CY

**ITEM NO. 101128A - SECURING, CONSTRUCTION AND DISMANTLING
OF A WASTE STOCKPILE AND TREATMENT AREA**

Description:

Work under this Item shall consist of the securing, construction and dismantling of the temporary Waste Stockpile Area at the location designated on the Project Plans and in accordance with the Contract. All controlled and hazardous materials excavated during construction activities shall be stockpiled in the WSA. The WSA shown on the Plans is to be used exclusively for temporary stockpiling of excavated materials from within Project AOEC(s) and Hazardous AOEC(s) for determination of disposal classification.

Materials:

The required materials are detailed on the Project Plans. All materials shall conform to the requirements of the Contract.

Construction blocks shall be solid precast rectangular concrete six feet in length, three in height, and two feet in depth.

Polyethylene plastic sheeting for underlayment shall be a thickness of 30 mil and minimum width of ten feet.

Sand bags used to secure polyethylene sheeting soil covers shall have a minimum weight of thirty pounds.

Bedding sand shall conform to Section 6.51.02 of the Specifications.

Processed Aggregate Base shall conform to Section 3.04 of the Specifications.

Hay bales shall conform to the requirements of Section 2.18 of the Specifications.

Bituminous Concrete shall conform to Section 4.06 of the Specifications.

Roll-off/Storage Containers shall be of watertight, steel-body construction, of the size specified and able to handle the storage and subsequent transportation of material to the disposal facility.

Precast Concrete Barrier Curb shall conform to Section 8.22 of the Specifications.

Construction Methods:

The WSA shall be constructed in accordance with the Contract at the location shown on the Project Plans.

Construction of the WSA shall be completed prior to the initiation of construction activities generating Controlled or Hazardous Materials. The Contractor is responsible for the maintenance and protection of all utilities potentially affected during WSA construction. The Contractor shall locate and mark all existing utilities potentially affected prior to initiating WSA construction.

The proposed location of the WSA shall be cleared of any debris and vegetation as directed by the Engineer. Any objectionable materials, which may result in damage to the polyethylene sheeting underlayment, shall be removed prior to stockpiling excavated controlled or hazardous materials.

The Contractor shall comply with the terms and conditions of the DEP "General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer)", including the General Operating Conditions and the Specific Operating Conditions, except that the Engineer will conduct all soil/sediment characterization and perform all record keeping. In particular, the Contractor shall:

1. Construct and repair the WSA in conformance with the requirements of the General Permit.
2. Prevent unauthorized entry onto the stockpiles by the use of fences, gates, or other natural or artificial barriers.
3. Install anti-tracking measures at the WSA to ensure the vehicles do not track soil from the WSA onto a public roadway at any time.
4. Post and maintain a sign that is visible from a distance of at least 25' at the WSA identifying the name of the permittee (State of CT, Department of Transportation), the DOT field office phone number, the hours of operation for the WSA, and the phrase, "Temporary Soil Staging Area". Lettering shall be at least one inch (1") high with a minimum overall sign dimension of four (4) feet wide by two (2) feet high. Such sign is only required if the capacity of the WSA is equal to or greater than 1,000 cubic yards. If initially the WSA capacity is less than 1,000 c.y. and the WSA capacity is subsequently increased, the Contractor shall post and maintain the required sign at no additional cost to the State, prior to stockpiling the additional material.

Following the removal of all stockpiled material, the Contractor shall use dry decontamination procedures for all surfaces of the WSA as directed by the Engineer. Residual materials shall be disposed of as Controlled or Hazardous Materials. If the results from dry methods are unsatisfactory to the Engineer, the Contractor shall modify decontamination procedures as required.

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

Upon completion of the Project and following removal of all residual Controlled or Hazardous Materials, the Contractor shall dismantle the WSA and return the area to original condition. During dismantling, the Contractor shall remove all materials such as polyethylene sheeting and sand bags. Materials shall be disposed of by the Contractor as solid waste in accordance with the Contract and all Federal, State and local regulations.

Operation and maintenance of the WSA shall be included under Item 101117A "Controlled Material Handling" and/or Item 101109A "Hazardous Materials Excavation".

Method of Measurement:

This work will be measured for payment at the Lump Sum cost for securing, construction, and dismantling of a WSA.

Basis of Payment:

This work will be paid for at the Contract Lump Sum, which shall include all materials, tools, labor, equipment, permits, and work needed to secure, construct, decontaminate and dismantle the WSA, including all clearing, grubbing, grading, clean up, site restoration and seeding.

All materials, labor and equipment associated with compliance with the General Permit for Contaminated Soil and/or Sediment Management (Staging and Transfer) will not be measured separately, but will be considered incidental to the item "Securing, Construction and Dismantling of a Waste Stockpile and Treatment Area".

Pay Item	Pay Unit
Securing, Construction and Dismantling Of a Waste Stockpile and Treatment Area	L.S.

ITEM #0101130A - ENVIRONMENTAL WORK - SOLIDIFICATION

Description:

Under this item, the Contractor shall be responsible for the solidification of controlled and hazardous materials containing free draining liquids, as may be necessary during the performance of work operations prior to off-site disposal. Materials shall be dewatered prior to the addition of solidification material.

The Contractor shall submit within seven (7) days of the Notice to Proceed, for the Engineer's review, a detailed methodology and plan of operation for the solidification of materials.

Materials:

The materials used for solidification shall be a naturally occurring material such as diatomaceous earth or other material as approved by the Engineer. Said material shall be in a dry state prior to use in solidification operations. No polymers or other synthetic materials shall be allowed.

Construction Methods:

Submittals:

The Contractor shall submit for the Engineer's review, a plan showing the location of solidification material storage and proposed mixing location as well as a detailed narrative describing the equipment, materials and methodology to be used. The Contractor shall also include its planned methods to remove or drain away free water prior to the addition of any solidification materials to controlled or hazardous materials. The methodology shall completely describe the Contractor's proposed plan for removal of free liquids (as determined by ASTM) from the excavated materials. Should solidification fail to eliminate free liquids as proposed, the Contractor will be required to revise the solidification plan at no additional cost to the State.

Upon visual examination, if controlled or hazardous materials have free liquids present, the Contractor may, with concurrence of the Engineer, add dry materials to absorb free-standing liquids, utilizing a methodology accepted by the Engineer. The Contractor shall dewater controlled and hazardous materials prior to the addition of solidification materials to the satisfaction of the Engineer. All dewatering fluids shall be handled in accordance with the Contract. Solidification procedures shall be subject to monitoring by the Engineer.

The maximum quantity of solidification material that may be used by the Contractor shall be limited to twenty (20) percent, by volume, of the material being solidified. Should this procedure be demonstrated as not effective in the elimination of the presence of free-standing liquids, the Contractor shall submit methods for the removal of free-standing water. The Contractor shall also submit the additional costs of the proposed alternative to the Engineer for review. No alternative methods of solidification shall be initiated until reviewed and accepted by the Engineer.

Method of Measurement:

This work will be measured for payment as the actual weight of solidification material used by the Contractor. The Contractor shall demonstrate the amount of solidification material used by the original weight tickets from a certified scale. The weight tickets shall show the weight of the material brought to the site and subsequently used in solidification operations.

If no certified scale is available, the Engineer may allow for the calculation of the weight by a summation of sealed, pre-measured bags.

Basis of Payment:

This work will be paid for at the Contract unit price for solidification material used and accepted by the Engineer. Such price shall include all labor, materials, tools, and equipment incidental to the work including transportation of the materials to the Project and the addition of solidification material to excavated materials.

Pay Item	Pay Unit
Environmental Work - Solidification	Ton

ITEM #0201199A – REMOVE AND RESET FENCE

Description: Work under these items shall consist of removal of existing fencing in locations as indicated on the plans or as directed by the Engineer, storage and care of existing fencing (as necessary) and resetting the existing fence in locations as shown on the plans or as ordered by the Engineer and in conformity with these specifications.

Materials: No material is required for this work. If existing fence is damaged or cannot be removed without damage such that it cannot be reset, these pieces shall be replaced in-kind to match the existing fence. If damaged by the contractor, there shall be no additional payment for this material replacement, otherwise this material replacement shall be negotiated and paid as an extra work item.

Construction Methods: All work shall proceed as directed by and to the satisfaction of the Engineer and in accordance with the details shown on the plans.

Removal of Existing Fence: The existing fence shall be removed and properly stored and protected for future re-installation. Any holes left after the removal of the existing posts shall be backfilled & compacted so as to give a neat appearing job, and the hole areas seeded as appropriate.

Resetting Fence: The posts shall be set in holes excavated to the depths and dimensions as required to match existing fence sections and materials. The posts shall be set plumb, spaced as required to match existing fence sections and materials. Post shall be set to a minimum depth of 36 inches, or as required to match existing post lengths and topography at the proposed fence location. The holes shall then be backfilled and thoroughly compacted using mechanical tampers such that the posts are set firmly in place with no settlement or rotation.

Method of Measurement: This work shall be measured for payment by the number of feet of fence reset, complete and accepted, as measured from outside to outside of end posts.

Basis of Payment: This work shall be paid for at the contract unit price per linear foot for “Remove and “Reset Fence”, complete in place which price shall include all materials, equipment, tools, labor and work incidental thereto, including removal of existing fence (whether reset or not), storage and protection of existing fence until such time as it is reset, excavation, backfilling, compaction, and disposal of existing material and surplus material.

If existing rails, posts, fabric or hardware that need to be replaced are the result of damage or carelessness by the contractor, there shall be no additional payment for this material replacement, otherwise this material replacement shall be negotiated and paid as an extra work item
No additional compensation will be made for augering as necessary to place posts.

Pay Item
Remove and Reset Fence

Pay Unit
LF

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

Description: This work shall consist of excavating existing channel bottom 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 or cofferdam installation. This item shall also include the stockpiling and protecting of the excavated material on the Site, subsequent placement of the stockpiled material in the channel, and the removal and proper disposal of all unused and unacceptable material.

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 ledge (bedrock) formations or broken from larger boulders will not be accepted. Broken concrete will not be accepted.

Construction Methods: 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 excavated channel bottom material to and from the stockpile are minimized during the placement of material. The Contractor shall prepare the area approved by the Engineer, suitable in size and location for stockpiling the existing channel bottom material.

The stockpile shall be located where it can remain undisturbed for the duration of the stream channel construction and shall be protected using sedimentation control measures. The stockpile area shall be cleared and cleaned adequately to prevent mixing with underlying soil or other materials, including the use of a separation barrier such as: structural fabric, polyethylene sheeting, or similar. The stockpile area shall be adequately covered to protect the excavated channel bottom material from erosion by rain or other forces.

After clearing and grubbing, the Engineer will identify the limits of the exposed channel bottom material to be excavated under this item. The Engineer will identify the bottom limit of excavation, an amount up to but not exceeding 24 inches in depth, based upon visual inspection of the channel bottom material, unless otherwise specified in the Contract. After the limits of excavation have been determined, the Contractor shall excavate the channel bottom material, separate from any other roadway, structure, channel or unsuitable material excavation in the area. After the channel bottom material, and approved supplemental streambed channel material if needed, has been placed in the stockpile area, no other excavated or off-Site material shall be placed in the stockpile.

The stockpiled channel bottom material shall be placed at the designated location(s) to the required thickness as shown on the plans, denoted on the permit application, or as directed by the Engineer. Equipment and placement techniques shall prevent integration with the surrounding material and shall keep the channel bottom material relatively homogenous. Channel material

shall be placed in a manner that replicates the original condition of the channel prior to excavation.

The Contractor shall perform all containment, diversion, or other separation of the channel flow when placing the channel bottom material to minimize sediment transport downstream.

The disposal of any surplus or unsuitable material shall be in accordance with Section 2.02. Restore the stockpile area as directed by the Engineer.

If it is agreed by the Engineer that there is an insufficient quantity of excavated channel bottom material within the Project limits, the Contractor shall obtain Supplemental Streambed Channel Material as specified under that item.

Method of Measurement: This work will be measured for payment by the number of cubic yards of channel bottom material excavated, stockpiled, maintained, and accepted, including disposal of unacceptable and surplus materials.

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 channel bottom 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 items.

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, tools and labor incidental to the preparation of the stockpile area, excavation of channel bottom, hauling of the material to the stockpile, and separation of any rock ledge or concrete debris, storing, and protecting (including but not limited to sedimentation controls and covering of 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 unused and unacceptable material will be in accordance with Article 1.09.04 – Extra and Cost-Plus Work.

Payment for supplemental streambed channel material will be included in the item "Supplemental Streambed Channel Material." If no item appears in the proposal, 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 from the excavation of channel bottom material will be included in the item "Cofferdam and Dewatering" or special provision for "Handling Water."

Excavation of material not identified by the Engineer for stockpiling and reuse in accordance with this specification will be paid in accordance with Section 2.02.

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

ITEM #0202217A – SUPPLEMENTAL STREAMBED CHANNEL MATERIAL

Description: This work shall consist of procuring, transporting and placing supplemental streambed channel material meeting the visual inspection requirements herein, along stream bank/channel improvement locations as shown on the plans or denoted on the Project's permit applications. This work shall also include any necessary temporary protection and stockpiling of the supplemental streambed channel material on the Site and removal and proper disposal of all unused material.

Materials: When a sufficient quantity of material is not available from the existing streambed channel within the permitted footprint of the Site, the Contractor shall furnish visually inspected and accepted supplemental streambed channel material from an off-Site source.

The supplemental streambed channel material for this item shall be consistent with the existing naturally-formed cobbles and rocks, gravel, and clean natural sediments found within the existing channel. Rock excavated from ledge (bedrock) formations, broken from larger boulders, broken concrete or angular material will not be accepted. Rock larger than 12 inches in diameter will not be accepted. Silts and clays will not be accepted.

The visual inspection of the supplemental streambed channel material shall be performed by the Engineer at the off-Site source prior to delivery of material to the Site. The Contractor shall notify the Engineer at least 10 working days in advance of the need for inspection of proposed off-Site material.

Construction Methods: At the start of construction, the Contractor shall prepare an area, approved by the Engineer, suitable in size and location for stockpiling the supplemental streambed channel bottom material. The Contractor shall select an upland location where disruption to the stream channel or impact to wetland areas caused by moving the supplemental streambed channel bottom material to and from the stockpile are minimized during the placement of material. The stockpile shall be located where it can remain undisturbed for the duration of the stream channel construction and shall be protected using sedimentation control measures.

The stockpile area shall be cleared and cleaned adequately to prevent mixing with underlying soil or other materials, including the use of structural fabric if required. The stockpile area shall be adequately covered to protect the supplemental streambed channel material from erosion by rain or other forces. After the supplemental streambed channel material and the excavated channel bottom material to be reused have been placed in the stockpile areas, no other excavated or off-Site material shall be placed in the stockpiles.

The reused and supplemental streambed channel material shall be placed at the designated location(s) to the required thickness as shown on the plans or denoted on the permit application, or as directed by the Engineer. Equipment and placement techniques shall prevent integration with the surrounding material and shall keep the channel bottom material relatively homogenous. Reused and supplemental streambed channel material shall be placed in a manner that replicates the original condition of the channel prior to excavation.

The Contractor shall perform all containment, diversion, or other separation of the channel flow when placing the reused and supplemental streambed channel material to minimize sediment transport downstream.

The disposal of any surplus or unsuitable material shall be in accordance with Section 2.02. Restore the stockpile area as directed by the Engineer.

Method of Measurement: Work under this item shall be measured for payment as provided under Article 1.09.04 – Extra and Cost-Plus Work.

The sum of money shown on the estimate and in the itemized proposal as “Estimated Cost” for this work will be considered the price bid even though payment will be made only for actual work performed. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded and the original price will be used to determine the total amount bid for the Contract.

Basis of Payment: This work will be paid for under Article 1.09.04 – Extra and Cost-Plus Work.

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

Payment for excavation and reuse of existing channel bottom material will be included in the item “Excavation and Reuse of Existing Channel Bottom Material.”

Payment for all containment, diversion or other separation of stream flow from the excavation of channel bottom material will be included in the item “Cofferdam and Dewatering” or special provision for "Handling Water."

Pay Item	Pay Unit
Supplemental Streambed Channel Material	est.

ITEM #0202315A - DISPOSAL OF CONTROLLED MATERIALS

Description:

Work under this item shall consist of the loading, transportation and final off-site disposal/recycling/treatment of controlled materials (excluding dewatering fluids) that have been generated from various excavations within the AOEC(s), brought to the WSA and determined to be contaminated with regulated substances at non-hazardous levels. This contamination is documented in the reports listed in the “Notice to Contractor – Environmental Investigations.” The results contained in the environmental investigation reports listed in the “Notice to Contractor – Environmental Investigations” show levels of various contaminants that the Contractor may encounter during construction. Actual levels found during construction may vary and such variations will not be considered a change in condition provided the material can still be disposed as non-hazardous at one or more of the disposal facilities listed herein. The controlled materials, after proper characterization by the Engineer, shall be taken from the WSA, loaded, transported to and treated/recycled/disposed of at a permitted treatment/recycle/disposal facility listed herein.

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

Phoenix Soil, LLC 58 North Washington Street Plainville, CT 06062 (860) 747-8888: Sandra Zac	ESMI of New Hampshire 67 International Drive Loudon, NH 03307 (603) 783-0228: Steve Bennitt
ESMI of New York 304 Towpath Road Fort Edward, New York 12828 (800) 511-3764: Peter Hanson	Allied Waste Niagara Fall Landfill, LLC 5600 Niagra Falls Blvd. Niagara, NY 14304 (716) 285-3344: David Hanson
Ted Ondrick Company, LLC 58 Industrial Road Chicopee, MA 01020 (413) 592-2566: David Costanzo	Clean Earth of Carteret 24 Middlesex Avenue Carteret, NJ 07008 (732) 541-8909: Cheryl Coffee
Clean Earth of Philadelphia 3201 S. 61 Street Philadelphia, PA 19153 (215) 724-5520: Mike Kelly	Cumberland County Landfill 135 Vaughn Road Shippensburg, PA 17257 (717) 729-2060: Don Demkovitz

The Southbridge Recycling and Disposal Park 165 Barefoot Road Southbridge, MA 01550 (603) 235-3597: Scott Sampson	Hazelton Creek Properties, LLC * 280 South Church Street Hazelton, PA 18201 (570) 501-5050: Allen Swantek
Colonie Landfill 1319 Loudon Road Cohoes, NY 12047 (518) 951-0794: Eric Morales	

* Note: each bin will require an additional 10 days (or more) for PADEP to review analytical data and approve material for disposal prior to facility acceptance of material. This is in addition to all other restrictions and wait periods defined below.

The above list contains treatment/recycle/disposal facilities which can accept the waste stream generated by the project in quantities that may be limited by their permits and their operations restrictions. It is the responsibility of the contractor to verify that a facility will be available and capable of handling the volume as well as the chemical and physical characteristics of material generated by the project.

Construction Methods:

A. Material Disposal

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

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

based on the failure of the Contractor's selected disposal facility(s) to meet the Contractor's production rate or for the Contractor's failure to select sufficient facilities to meet its production rate.

Any material processing (including but not limited to the removal of woody debris, scrap metal, pressure-treated and untreated wood timber, large stone, concrete, polyethylene sheeting or similar material) required by the Contractor's selected facility will be completed by the Contractor prior to the material leaving the site. It is solely the Contractor's responsibility to meet any such requirements of its facility. Any materials removed shall be disposed of or recycled in a manner acceptable to the Engineer at no additional cost. If creosote treated timbers are removed, they will be disposed of under the item "Disposal of Contaminated Timber Piles", "Disposal of Contaminated Railroad Ties" or in accordance with Article 1.04.05 in the absence of such items.

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

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

B. Material Transportation

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

- Transported controlled materials are to be covered sufficiently to preclude the loss of material during transport prior to leaving the site and are to remain covered until the arrival at the selected treatment/recycling/disposal facility.
- All vehicles departing the site are to be properly logged to show the vehicle identification, driver's name, time of departure, destination, and approximate volume, and contents of materials carried.
- No materials shall leave the site unless a treatment/recycling/disposal facility willing to accept all of the material being transported has agreed to accept the type and quantity of waste.

C. Equipment Decontamination

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

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

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

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

Method of Measurement:

The work of "DISPOSAL OF CONTROLLED MATERIALS" will be measured for payment as the actual net weight in tons of material delivered to the treatment/recycling/disposal facility. Such determinations shall be made by measuring each hauling vehicle on the certified permanent scales at the treatment/recycling/disposal facility. Total weight will be the summation of weight bills issued by the facility specific to this Project. Excess excavations made by the Contractor beyond the payment limits specified in Specification Sections 2.02, 2.03, 2.06, and 2.86, or the Contract Special Provisions (as appropriate) will not be measured for payment and the Contractor assumes responsibility for all costs associated with the appropriate handling, management and disposal of this material.

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

Any materials stored in the WSAs, and which are reused within Project limits, will not be measured for payment under this item. This material will be paid for under Item 0202318A – Management of Reusable Controlled Material or in accordance with Article 1.04.05 in the item's absence.

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

Any material processing required by the Contractor-selected disposal facility, including the proper disposal of all removed materials other than creosote treated wood, will not be measured for payment.

Basis of Payment:

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

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

Pay Item

Pay Unit

Disposal of Controlled Materials

Ton

ITEM NO. 0202318A MANAGEMENT OF REUSABLE CONTROLLED MATERIAL

Description:

Work under this item shall include all materials, equipment, tools and labor required to load, transport from the WSA, place, and compact reusable controlled materials in fill areas located within the Project limits. "Reusable controlled material" is soil that contains contaminant concentrations above analytical detection limits, but below the applicable regulatory criteria.

Construction Methods:

Controlled material stored within the WSA which is determined to be reusable following analytical testing shall be loaded, transported, placed and compacted at fill areas located within the Project limits in accordance with the following conditions: (1) such soil is deemed to be structurally suitable for use as fill by the Engineer; (2) such soil is not placed below the water table; 3) the DEP groundwater classification of the area where the soil is to be reused as fill does not preclude said reuse; and (4) such soil is not placed in an area subject to erosion.

Method of Measurement:

"Management of Reusable Controlled Material" will be measured for payment by the number of cubic yards of material loaded and transported from the WSA and placed at fill areas located within the Project limits in accordance with the Contract.

Basis of Payment:

"Management of Reusable Controlled Material" will be paid for at the Contract unit price, which shall include all materials, equipment, tools and labor necessary to load and transport reusable controlled materials from the WSA to fill areas located within the Project limits and to place and compact the reusable material. This price shall include any decontamination of soil handling equipment, and the treatment/recycling/disposal of wastes generated in conjunction with such decontamination.

No separate payment will be made for consolidating previously tested individual stockpiles that have been deemed reusable, but shall be considered incidental to the work.

The disposal of any reusable controlled material that fails to meet material testing requirements for the intended use in accordance with the Contract requirements, as well as any excess reusable material, will be paid under Item 202315A, "Disposal of Controlled Material".

Pay Item	Pay Unit
Management of Reusable Controlled Materials	C.Y.

ITEM #0204151A - HANDLING WATER

Description: Work under this item shall consist of designing, furnishing, installing, maintaining, removing and disposing of a temporary water handling system. This may include water-handling-cofferdams (temporary barriers), bypass pipes, bypass pumps/hoses, temporary energy dissipation, sumps, drainage channels, and equipment and work necessary for dewatering.

A temporary water handling system redirects surface 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 working drawings, 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 and water elevations 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 be compatible with the stage construction and Maintenance and Protection of Traffic, as indicated in the Contract, and shall conform to Section 1.10.

The Contractor shall be responsible for maintenance of the water handling system. If the system becomes damaged or displaced during construction, the system shall be corrected as required.

Unless otherwise provided or directed, all temporary water handling system components shall be removed and disposed of in an acceptable manner when no longer required.

Pumped water shall be in accordance with Article 2.04.03-2.

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” complete and accepted, which price shall include designing (including submittals and working drawings), furnishing, installing, maintaining, removing, and disposing 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 #0204213A - HANDLING CONTAMINATED GROUNDWATER

Description:

Under this Item, the Contractor shall collect, manage, treat, and dispose of contaminated groundwater generated during dewatering operations within the designated Groundwater Areas of Environmental Concern (GW AOECs) within the project limits.

Contaminated groundwater is defined as “groundwater which has been generated from excavations within the designated GW AOECs containing substances at concentrations that exceed the effluent limits for the DEP General Permit for the Discharge of Groundwater Remediation Wastewater Directly to Surface Water”. The presence of contaminants removable through control of settleable solids does not constitute contaminated groundwater. Groundwater contamination caused by the Contractor’s activities or work practices is also not considered contaminated groundwater.

The contamination and groundwater depth at the time of the investigation is documented in the reports listed in the “Notice to Contractor – Environmental Investigations”. Contaminants and depth to groundwater is provided for the Contractor’s information and may be influenced by factors such as seasonal groundwater table changes, tidal changes, drought or flooding conditions, local withdrawals from the aquifer, local construction, etc. Additional information with regard to soil descriptions and groundwater observations may also be available if geotechnical investigations were conducted for the project. The Contractor shall contain contaminated groundwater and 1) treat it on-site prior to discharge to sanitary sewer; 2) treat it on-site prior to discharge to surface water; or 3) transport water to an off-site treatment/disposal facility.

This Item does not apply to the possible diversion of existing storm water flow around the construction site during Project activities. Diversion of existing storm water or surface flows shall be completed in accordance with the Contract and all applicable permits. This item also does not include process water or wastewater generated by the Contractor’s work activities.

Construction Methods:

A. General

It is the Contractor’s responsibility to determine the expected groundwater generation rate from construction activities, select the appropriate groundwater management method, and size its system capacity to meet those dewatering needs.

All equipment required as a part of this Item shall be installed in a location and manner acceptable to the Engineer and in accordance with the manufacturer’s recommendations. Equipment shall be decontaminated prior to arrival at the Project, decontaminated prior to

being moved to another area of the project, and then decontaminated before it leaves the Project, at no additional cost to the State. Solids (soil or sediment) generated by on-site dewatering activities shall be brought to the Waste Stockpile Area (WSA) for testing and characterization by the Engineer.

The Contractor is responsible for operating and maintaining the equipment at all times when dewatering in the GW AOEC(s) occurs. This includes providing appropriate supervision during evenings, weekends, and holidays. If the system is intended to operate unattended, a remote alarm system acceptable to the Engineer shall be installed to monitor critical system operating parameters and the Contractor shall be responsible for providing rapid emergency response during non-working hours in the event a system malfunction occurs. A list of names and phone numbers shall be displayed in the immediate vicinity of the system for emergency contacts.

The Contractor shall report releases from the groundwater treatment system due to overfilling or equipment/piping failure to the DEP Spill Response Unit in accordance with RCSA 22a-450 and provide the Engineer with all information, including the DEP case number. All costs related to spill response associated with the Contractor's on-site containment or treatment system will be the responsibility of the Contractor.

The Contractor shall collect all samples related to permit compliance in the presence of the Engineer. The Contractor shall provide informational copies of all groundwater analytical results and discharge monitoring reports to the Engineer as they are generated.

The Contractor shall operate the dewatering equipment at a rate that removes the groundwater that naturally infiltrates the excavation. The Contractor shall not cause a hydraulic gradient that draws groundwater into the excavation at an excessive rate. Additional treatment required due to the mobilization of off-site contaminants caused by the Contractor dewatering at an excessive rate will be the responsibility of the Contractor.

Additional treatment related to the Contractor's work activities (i.e. treatment or increased charges due to changes in pH or introduction of different contaminants into the groundwater) and management and disposal of excess water related to the Contractor's process water or waste water will not be included under this item but will be considered a part of the Contractor's cost for the item under which the work is being performed.

B. Groundwater Management Methods

The Contractor shall use one or more of the following methods for the management and disposal of contaminated groundwater. Based on project specifics and site constraints, the Contractor may choose to use more than one of the following methods on a single project. All methods may not be possible at the site due to sanitary sewer or permitting restrictions.

1. On-Site Treatment System with Discharge to Sanitary Sewer

a. Contractor Submittals

At least 14 days prior to any submittal to the Publicly Owned Treatment Works (POTW) or DEP, the Contractor shall submit the treatment system design, which has been sealed by a Professional Engineer licensed in the State of Connecticut to the Engineer for review and comment. Equipment shall prevent sediments and solids, as well as contaminants in excess of the permit allowable effluent concentrations, from entering the sanitary sewer. This submittal shall include a schematic or diagram that shows all treatment system equipment, well point locations, pump set-ups in excavations, sedimentation control methods, system location, method of conveyance, flow rates, pipe sizes, valve locations, sampling ports, discharge locations, electrical power connection, etc.

The Contractor shall submit the manufacturer's data sheets, assembly details and performance data on all treatment equipment. If dewatering equipment is to remain on site between October 15 and April 15, the Contractor shall include its method to prevent the treatment system equipment from freezing (heat tape, immersion heaters, etc.).

The Contractor shall detail its method to collect and contain water in its excavations. The Contractor shall also describe in detail its methods for limiting the quantity of water entering the excavation, including shoring, location of well points, limiting excavation size, preventing entry of surface water into the excavation, etc. The Contractor shall also include its assumptions and flow rate calculations related to the sizing of the system.

It is the Contractor's responsibility to design and properly size the system to accommodate the anticipated contaminants and dewatering rates based on its construction activities, POTW limitations, and permit requirements. The Contractor is alerted that construction activities may be limited based on permit restrictions or POTW limitations.

No claim for delay or request for additional time will be considered based upon the Contractor's failure to accommodate the review process.

b. Permits

Groundwater generated by construction activities within a GW AOEC shall be appropriately treated and discharged to the sanitary sewer system within Project limits. Management and discharge of contaminated groundwater shall be accomplished in accordance with a DEP General Permit and POTW requirements. The Contractor shall be responsible for registering under the General Permit, any other necessary State or local permits, and all associated fees.

The DEP General Permit for the Discharge of Groundwater Remediation Wastewater to Sanitary Sewer is available at www.ct.gov/dep. The Contractor shall submit the most current permit registration form to the DEP. A minimum lead-time of six (6) weeks can

be expected to process and submit the registration, in addition to coordination time with the POTW. **No claim for delay or request for additional time will be considered based upon the Contractor's failure to accommodate the permitting process.** The Contractor shall not submit the permit registration to the DEP prior to the Engineer's review of and comment on the treatment system.

The Contractor shall submit a copy of the DEP permit certificate of registration to the Engineer prior to initiating any discharge.

All testing required by the general permit shall be conducted by a laboratory certified by the Connecticut Department of Public Health (DPH) for the method specified in the permit. The Contractor shall submit copies of the analytical results to the all parties specified in the permit terms and conditions and to the Engineer.

No claim for delay or request for additional time will be considered based upon the Contractor's failure to design a system to meet this performance specification. It is the Contractor's responsibility to properly size the treatment system and temporary containment tanks based on its anticipated flow rates from construction activities and to determine the level of treatment required to meet permit discharge limits.

c. Treatment System Operation

The Contractor shall ensure that all personnel involved in the groundwater treatment operations understand the terms of the General Permit. In the event of a conflict between the requirements of the Contract and the permit, the more stringent will apply.

The Contractor shall not commence work activities within any GW AOEC until such time as:

- i. the temporary groundwater treatment system design is reviewed by the Engineer and comments are adequately addressed,
- ii. the system is installed in accordance with the accepted design and is completely operational, and
- iii. a copy of the Contractor's permit certificate of registration has been submitted to the Engineer.

The Contractor shall make any sanitary sewer tie-in modifications necessary to accommodate the treatment unit only after obtaining approval from the Engineer and the POTW.

The Contractor shall take all meter readings required by the permit and forward them to the appropriate parties.

The Contractor shall collect all samples related to permit compliance in the presence of the Engineer and shall submit copies of the analytical results and discharge monitoring reports to the appropriate agency(ies) as required by the General Permit terms and conditions. The Contractor shall provide informational copies of all analytical results and discharge monitoring reports to the Engineer as they are generated. In the event of an exceedance, the Contractor shall immediately comply with the “*Duty to Correct, Record, and Report Violations*” section of the General Permit. The Contractor shall provide the Engineer a copy of the required DEP reporting and then document its review of the treatment system and all actions taken to correct the exceedance in writing to the Engineer within 48 hours of receiving laboratory data documenting the exceedance.

If the discharge must be suspended due to an effluent violation, the Contractor shall only restart the discharge after obtaining all necessary approvals from the DEP/POTW and in full compliance with the General Permit and any amendments imposed thereto.

No claim for delay, request for additional time, or request for additional design/redesign costs for the system will be considered based upon the Contractor’s failure to design/redesign a system to meet this performance specification.

2. On-Site Treatment System with Discharge to Surface Water

a. Contractor Submittals

At least 14 days prior to any submittal to the DEP, the Contractor shall submit the treatment system design, which has been sealed by a Professional Engineer licensed in the State of Connecticut, to the Engineer for review and comment. Equipment shall prevent sediments and solids, as well as contaminants in excess of the permit allowable effluent concentrations, from discharging. This submittal shall include a schematic or diagram that shows all treatment system equipment, well point locations, pump set-ups in excavations, sedimentation control methods, system location, method of conveyance, flow rates, pipe sizes, valve locations, sampling ports, discharge locations, electrical power connection, etc.

The Contractor shall submit the manufacturer’s data sheets, assembly details and performance data on all treatment equipment. If dewatering equipment is to remain on site between October 15 and April 15, the Contractor shall include its method to prevent the treatment system equipment from freezing (heat tape, immersion heaters, etc.).

The Contractor shall detail its method to collect and contain water in its excavations. The Contractor shall also describe in detail its methods for limiting the quantity of water entering the excavation, including shoring, location of well points, limiting excavation size, preventing entry of surface water into the excavation, etc. The Contractor shall also include its assumptions and flow rate calculations related to the sizing of the system.

It is the Contractor's responsibility to design and properly size the system to accommodate the anticipated contaminants and dewatering rates based on its construction activities and permit requirements. The Contractor is alerted that construction activities may be limited based on permit restrictions.

No claim for delay or request for additional time will be considered based upon the Contractor's failure to accommodate the review process.

b. Permits

Groundwater generated by construction activities within a GW AOEC shall be appropriately treated and discharged to surface water within Project limits. Management and discharge of contaminated groundwater shall be accomplished in accordance with a DEP General Permit. The Contractor shall be responsible for registering under the General Permit and all associated fees.

The DEP General Permit for the Discharge of Groundwater Remediation Wastewater Directly to Surface Water is available at www.ct.gov/dep. The Contractor shall submit the most current permit registration form to the DEP. A minimum lead-time of six (6) weeks can be expected to process and submit the registration. **No claim for delay or request for additional time will be considered based upon the Contractor's failure to accommodate the permitting process.** The Contractor shall not submit the permit registration to the DEP prior to review of and comment on the treatment system by the Engineer.

The Contractor shall submit a copy of the DEP permit certificate of registration to the Engineer prior to initiating any discharge.

All testing required by the General Permit shall be conducted by a laboratory certified by the Connecticut Department of Public Health (DPH) for the method specified in the permit. The Contractor shall submit copies of the analytical results to the all parties specified in the permit terms and conditions and to the Engineer.

No claim for delay or request for additional time will be considered based upon the Contractor's failure to design a system to meet this performance specification. It is the Contractor's responsibility to properly size the treatment system and temporary containment tanks based on its anticipated flow rates from construction activities and to determine the level of treatment required to meet permit discharge limits.

For sites where the receiving water body does not qualify the site for registration under the DEP General Permit for the Discharge of Groundwater Remediation Wastewater Directly to Surface Water and the discharge is anticipated to continue for 30 days or less, the Contractor may qualify for a DEP Temporary Authorization (TA) to discharge to surface water. The Contractor will be bound to the terms and conditions of the TA the same as if it were a permit. If the Contractor applies for, and receives, a TA from the

DEP, all other requirements of this specification will apply, except that where the specification refers to a permit, the TA will be substituted.

c. Treatment System Operation

The Contractor shall ensure that all personnel involved in the groundwater treatment operations understand the terms of the General Permit. In the event of a conflict between the requirements of this Item and the permit, the more stringent will apply.

The Contractor shall not commence work activities within any GW AOEC until such time as:

- i. the temporary groundwater treatment system design is reviewed by the Engineer and comments are adequately addressed,
- ii. the system is installed in accordance with the accepted design and is completely operational, and
- iii. a copy of the Contractor's permit certificate of registration has been submitted to the Engineer.

The Contractor shall take all meter readings required by the permit and forward them to the appropriate parties.

The Contractor shall submit copies of the analytical results and discharge monitoring reports to the appropriate agency(ies) as required by the General Permit terms and conditions. The Contractor shall provide informational copies of all analytical results and discharge monitoring reports to the Engineer as they are generated. In the event of an exceedance, the Contractor shall immediately comply with the "***Duty to Correct, Record, and Report Violations***" section of the General Permit. The Contractor shall provide the Engineer a copy of the required DEP reporting and then document its review of the treatment system and all actions taken to correct the exceedance in writing to the Engineer within 48 hours of receiving laboratory data documenting the exceedance.

If the discharge must be suspended due to an effluent violation, the Contractor shall only restart the discharge after obtaining all necessary approvals from the DEP and in full compliance with the General Permit and any amendments imposed thereto.

No claim for delay, request for additional time, or request for additional design/redesign costs for the system will be considered based upon the Contractor's failure to design/redesign a system to meet this performance specification.

3. Off-Site Treatment and Disposal

At least 14 days prior to any work involving the dewatering of contaminated groundwater, the Contractor shall submit for the Engineer's review and comment its proposed system to collect and contain the contaminated groundwater. This submittal shall include schematics of proposed pump set-ups in excavations; sedimentation control measures; probable location of temporary containment tanks; schematics of proposed method to transfer liquids from temporary containment tanks to transport vehicles; schematic of proposed method to off-load liquids at the off-site permitted treatment/disposal facility; documentation that transport vehicles hold a "Waste Transportation Permit" for contaminated liquids per CGS 22a-454; and the name of the disposal facility from the following list of Department-approved and DEP-permitted treatment facilities for State-regulated liquid disposal:

Clean Harbors of CT
51 Broderick Rd.
Bristol, CT 06010
(860)224-7600

United Oil Recycling
Gracey Ave.
Meriden, CT 06450
(203)238-6754

Bridgeport United Recycling
50 Cross St.
Bridgeport, CT 06610
(203)238-6754

All testing required to meet facility acceptance parameters shall be conducted by the Contractor in the presence of the Engineer. The Contractor is hereby notified that laboratory turnaround time is expected to be fifteen (15) working days. The Contractor shall provide informational copies of the laboratory results to the Engineer. **No delay claim will be considered based upon the Contractor's failure to accommodate the laboratory turnaround time as identified above or to design its system with sufficient holding capacity to accommodate this requirement.**

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

The Contractor will be responsible for disposal of the entire shipment as the Hazardous Waste Generator for water that undergoes a change in waste classification due to the Contractor's work activities or processes (i.e. contaminated groundwater being classified characteristically hazardous for pH due to grouting operations).

Method of Measurement:

Within fourteen (14) calendar days after addressing the Engineer's comments on the proposed system(s) for Handling Contaminated Groundwater, the Contractor shall submit to the Engineer for approval a cost breakdown of its lump sum bid price. The submission must include substantiation showing that the cost breakdown submitted is reasonable based on the Contractor's lump sum bid. The cost breakdown shall be in accordance with the following payment schedule:

- a. The cost to prepare the design for proposed system(s) for Handling Contaminated Groundwater, including preparation and submittal of all permit registration applications, in accordance with these specifications. Design costs shall not exceed 10% of the total cost of the item.
- b. The procurement and installation cost for the proposed system(s) for Handling Contaminated Groundwater in accordance with these specifications. Procurement and installation costs shall not exceed 20% of the total cost of the item.
- c. Equipment decontamination and demobilization and restoration of site. Decontamination and demobilization costs shall not exceed 10% of the total cost of the item.
- d. The remaining costs for operation, monitoring, permit compliance, sampling and analysis, disposal costs, and maintenance of the proposed system(s), including cleaning of the temporary containment tanks of settled solids, transporting of solids to the WSA, and transportation of the contaminated dewatering wastewater to an off-site permitted treatment/disposal facility in accordance with these specifications shall be divided evenly throughout the duration of the project work involving contaminated groundwater at the discretion of the Engineer.

Increased costs directly related to the Contractor's operation (i.e. treatment or increased charges due to changes in pH or additional contaminants, treatment and disposal of excess water related to process or waste water, etc.) will not be paid under this item but will be considered a part of the Contractor's cost for the item under which the work is being performed.

Basis of Payment:

This work will be paid for at the Contract lump sum price for "Handling Contaminated Groundwater" which price shall include: all work and materials involved with handling contaminated groundwater from within GW AOECs and shall include all equipment, materials, tools and labor incidental to removal of the contaminated groundwater from the excavation; conveying contaminated groundwater from the dewatering point to the temporary containment tanks and groundwater treatment facility; treatment; conveying discharge of contaminated wastewater to a sanitary sewer, surface water or off-site disposal at a permitted treatment/disposal facility (including transportation); disposal or recycling of used treatment media (i.e. bag filters and spent carbon); permit applications; disposal and permit fees; POTW fees; electrical costs; sampling and documentation costs; laboratory costs; design and

monitoring; mobilization, operation, and maintenance of the system; site work; all required equipment decontamination; transportation of solids to the WSA; and equipment demobilization.

Sedimentation control associated with work under this Item will be paid under the appropriate items of the Contract.

Pay Item	Pay Unit
Handling Contaminated Groundwater	Lump Sum

ITEM #0205005A TRENCH EXCAVATION 0'-15' DEEP

ITEM #0205006A ROCK IN TRENCH EXCAVATION 0'-15' DEEP

2.05.01 - Description: Trench excavation shall consist of the removal and satisfactory disposal of all materials, the removal of which is necessary for the proper completion of the work, to the dimensions shown on the plans or as ordered, and backfilling, all in accordance with these specifications for the following:

- 1) The construction of sanitary sewer manholes, sanitary sewer pipes, and water main pipes.
- 2) The removal of sanitary sewer manholes, sanitary sewer pipes and appurtenances beyond the limits of the roadway and structure excavation.
- 3) The removal of miscellaneous items such as abandoned underground tanks, pipelines, etc.

Classification:

- 1) **Trench excavation** will be allowed only for the construction of the structures and the removals definitely specified above; and no compensation will be made for any other class of excavation, as specified elsewhere herein, that may be necessary for construction or removal.
- 2) **Rock in Trench:** Rock, insofar as it applies to trench excavation, shall be defined as rock in definite ledge formation, boulders, or portions of boulders, cement masonry structures, concrete structures, reinforced concrete pipe, Portland cement concrete pavement or base, of 1/2 c.y. or more in volume, removed as indicated or directed from within the payment lines for trench excavation.

2.05.02 - Materials: No materials required for this work.

2.05.03 - Construction Methods: Trench excavation shall be made in accordance with the requirements of the plans or as ordered. The Contractor shall furnish and employ such shores, braces, pumps, etc., as may be necessary for the protection of property, proper completion of the work and the safety of the public and employees of the Contractor and the City. All bracing, etc., shall be removed when no longer required for the construction or safety of the work.

When a structure is to be eliminated, it shall be completely removed and all pipes plugged with cement masonry or removed completely.

Where the plans or Contract show that a drainage structure is to be abandoned, the structure shall be removed to a depth 2 ft below the subgrade or to the depth shown on the plan. The floor of the structure shall be broken and all pipes shall be plugged with cement masonry.

Wherever portions of existing concrete pavement that would otherwise remain in place must be removed in conjunction with trench excavation, such removals shall be made to neat lines. The

areas in which such concrete pavements are to be removed will be delineated by the Engineer before such work is done. Where no break or joint exists in the concrete pavement at the line of delineation, a full depth cut shall be made in the concrete with a concrete cutting saw approved by the Engineer. The concrete shall then be removed from within the delineated area, exercising extreme care to avoid “breakbacks” beyond the sawcut or joint. Concrete pavement remaining in place shall have vertical edges.

Wherever the concrete pavement to be removed has been overlaid with bituminous concrete and the adjacent bituminous concrete pavement is to remain in place, the bituminous pavement shall be removed to a neat line that is 1 ft beyond the neat line for the concrete pavement removal.

Wherever portions of existing full-depth bituminous concrete pavement are to be removed in conjunction with trench excavation, they shall be removed to neat lines. Where the limits of the areas in which such bituminous pavement is to be removed are adjacent to existing bituminous concrete pavement that is to remain in place, the limits shall be cut by a method approved by the Engineer.

After the excavation is completed, the Contractor shall notify the Engineer; and no masonry, pipe or other material shall be placed in the excavated area until the Engineer has approved the depth of excavation and the character of the foundation material.

When backfilling is required, the material used shall be of a quality satisfactory to the Engineer and shall be free from large or frozen lumps, wood and other extraneous material. All backfill shall be placed in layers of not more than 6 in deep after compaction and shall be thoroughly compacted by means of mechanical rammers or vibrators or by pneumatic tampers. Hand tampers shall be used only upon written permission of the Engineer. Unless otherwise ordered by the Engineer, the backfill shall be brought to the surface of the surrounding ground and neatly graded.

All suitable material removed in making the excavation shall be used for backfill if required. All surplus or unsuitable material shall be removed and disposed of as directed. Should additional material be required for backfilling, it may be obtained from the Project excavation or from borrow pits, gravel pits, or elsewhere as the Engineer may direct.

Each layer of backfill shall be compacted to optimum moisture content. No subsequent layer shall be placed until the specified compaction is obtained for the previous layer.

Fill placed around pipes shall be deposited on both sides to approximately the same elevation at the same time. Rock fill or stones larger than 2 in shall not be placed closer than 2 ft from the pipes on the sides and the top.

No backfill shall be placed against any structure until permission has been given by the Engineer.

2.05.04 - Methods of Measurement: Except as noted below, the depth of trench excavation will be measured in its original position by taking the difference between the ground surface at the

time the trench is excavated and that after the excavations are complete. Before starting any excavation, the Contractor shall notify the Engineer so that elevations and measurements of the work may be obtained. Any work done prior to such notification will not be paid for.

Trench excavation in roadway cuts will include only that portion outside of the limits of roadway excavation and will not include open ditches.

Payment limits will be as described hereinafter.

There will be no measurement for payment for the cost of plugging existing pipes.

Horizontal Payment Limits: Payment lines will be vertical for sanitary sewer pipes, and water main pipes, and will be the width to which the material is actually removed, except that in no case, even though the actual excavation is wider, will the width between payment lines be more than the following:

- a) 2 ft greater than the nominal inside diameter of circular pipe, or nominal inside span of elliptical pipe or pipe-arch for such diameters or spans of less than 30 in.
- b) 3 ft greater than the nominal inside diameter of circular pipe or the nominal inside span of elliptical pipe or pipe-arch for such diameters or spans that are 30 in or greater.

For sanitary sewer manhole structures, payment lines will be vertical and 2 ft outside of the neat lines of the foundations in each direction horizontally.

In case it is necessary to excavate to a greater width than that specified above due to of the removal of existing structures, such additional excavation will be considered as trench excavation and will be measured and paid for as such.

For the removal of underground obstructions such as sanitary sewer manholes, sanitary sewer pipes, etc., payment lines shall be vertical and 2 ft outside of the underground item measured horizontally in each direction.

If rock is encountered, the Contractor shall strip it of sufficient overlying material to allow for proper measurement and shall then notify the Engineer that the rock surface is ready for measurement. If the Contractor shall fail to give such notice, the Engineer will presume that the measurements taken at the time the Engineer first saw the material in question will give the true quantity of excavation.

Vertical Payment Limits: Where pipe bedding is used, the lower vertical payment limit will be as shown on the plans. There will be no direct payment for the excavation necessitated by the shaping of the bedding, but the cost shall be included in the cost per linear foot for the pipe specified.

The upper vertical payment limit will be that prescribed below; except, when in the opinion of the Engineer, roadway excavation cannot be made prior to or simultaneously with the trench

excavation, then the upper vertical payment limit will be the surface existing at the time the trench excavation is made.

Vertical Payment Limits Other Than in Fills: Payment lines will extend vertically from the bottom of the trench to the bottom of the roadway excavation.

If trench excavation is not located within the limits of roadway excavation, payment lines will extend vertically from the bottom of the trench to the existing ground surface.

Vertical Payment Limits in Fills: For the various installations, the vertical payment lines will extend from the bottom of the completed and accepted trench to the lowest of the following upper limits:

- a) Bottom of subbase.
- b) In the case of culverts, 1 ft above the top of the pipe.
- c) In the case of structures other than pipes, 1 ft above the top of the uppermost pipe placed in the structure.
- d) In the case of pipe installations transverse to the roadway extending down fill slopes, the vertical payment limit will be the depth below bottom of loam or embankment surface, as the case may be, and measured perpendicular to the bottom of the trench.

Vertical payment limits will be as described above except that in no case will the depth measurement used for payment be greater than that actually excavated.

If gravel fill or borrow are used for trench backfill, they will be measured in place within the payment limits described herein.

Basis of Payment:

This work will be paid for at the Contract unit price per cubic yard for “Trench Excavation 0 feet - 15 feet Deep”.

When rock, meeting the description given under this specification is encountered within the payment lines for trench excavation, its removal will be classified and paid for at the Contract unit price per cubic yard for “Rock in Trench Excavation 0 feet - 15 feet Deep”.

Those portions of trench excavation classified and paid for as “Rock in Trench Excavation” of the various depths will be the actual volumes of rock excavated within the payment lines at the applicable bottom depth. Those portions of trench excavation above the rock will be the actual volume of earth excavated within the payment lines at the applicable bottom depth for rock in trench.

When payment is made for trench excavation in fill, no such excavation will be classified as “Rock in Trench.”

Excavation necessary for the removal of pipe , or other installations, described herein, will be paid for as trench excavation at the applying depth.

The above prices shall include all materials, tools, equipment and labor necessary to complete the excavation in accordance with the plans or as ordered. The prices shall also include backfilling where required and the disposal of surplus material. No additional payment will be made for shoring, bracing, pumping, bailing or for material or equipment necessary for the satisfactory completion of the work. When it becomes necessary, in the opinion of the Engineer, to install sheet piling for the support of existing facilities, pavement, utilities, or for other constraints, the sheeting items will be paid in accordance with Section 7.16.

If gravel fill or borrow are used for trench backfill, payment will be made at their respective Contract unit prices, or in the absence of such items in the Contract, as extra work.

There will be no direct payment for the plugging of existing pipes, removal and disposal of pipes or for the breaking up of floors in structures being abandoned. The cost shall be included in the Contract unit prices of the excavation items.

Pay Item

Trench Excavation 0'-15' Deep
Rock in Trench Excavation 0'-15' Deep

Pay Unit

C.Y.
C.Y.

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

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 the manufacturer’s Material Certificate for compliance to ASTM D6690 Type II requirements for each batch or lot of material utilized on the Contract.
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.

The Contractor must submit to the Engineer all Material Safety Data Sheet documents from the material manufacturer(s) prior to the commencement of work. During work progress, the Contractor must submit to the Engineer the manufacturer’s Material Certificate for compliance to applicable specifications for each batch or lot of material utilized on the Contract.

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 40°F 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 $\frac{1}{8}$ inch up to 1.5 inches wide shall be prepared and sealed as stated below. Cracks that are between $\frac{1}{8}$ inch and 1.5 inches wide, but eventually taper in width below the minimum $\frac{1}{8}$ inch, shall also be prepared and sealed as stated below. Only cracks that are less than $\frac{1}{8}$ 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 $\frac{1}{2}$ inch in depth at the joint's deepest point. The minimum width of a raveled joint must be $\frac{1}{2}$ 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 $\frac{3}{4}$ inch for cracks between $\frac{1}{8}$ inch and $\frac{3}{4}$ inch wide, and to a depth of 1.25 inches for cracks between $\frac{3}{4}$ 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 presented to the Engineer for their written acceptance 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 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 # 0601088A - CONCRETE FORM LINERS

Description: Work under this item shall include construction of textured, colored formed concrete surfaces using simulated stone form liners, a color stain system designed to closely duplicate the appearance of natural stone. This item shall include the following:

- 1) Furnishing, installing, and removing a concrete form liner that will be used to produce a simulated stone facing on exposed surfaces and to the limits shown on the contract documents or requested by the engineer.
- 2) Grouting, patching and hand or tool finishing work after the forms are removed as necessary to remove lines and irregularities on the finished facing that are not in keeping with the intended “look” of the simulated stone facing.
- 3) Color staining of the concrete surfaces as may be required by the style of simulated stone facing used, including test panels to establish colors and patterns of staining before initiating this portion of the work.
- 4) Preparation, submittal and approval of pattern layout drawings, maximizing re-use and minimizing cutting of form liners, for each surface shown on the plans, or other surface where form liners are to be used.

Materials: Acceptable concrete form liner manufacturers and form liner patterns are:

- Custom Rock Formliners, as manufactured by Custom Rock International, Inc., St. Paul, MN 55116, (800) 637-2447. Pattern: No. 2209 – New England Drystack
- Fitzgerald Formliners, as manufactured by Fitzgerald Formliners, 1500 East Chestnut Street, Santa Ana CA 92701, (800) 547-7760. Pattern: No. 17033 – Sierra Drystack
- Spec Formliners as manufactured by Spec Formliners, Inc., 1038 E 4th Street, Santa Ana, CA 92701, (888) 429-9550. Pattern: No. 1587 – California Dry Stack
- An equal form liner approved by the Engineer, which conforms to the parameters and is of similar appearance to the patterns of the above.

Form Liners - The form liners shall be reusable, made of high strength urethane and not compress more than ¼” when concrete is placed at a rate of 10 vertical feet per hour. Form liners shall be removable without causing deterioration of surface or underlying concrete.

Release Agent - The release agent shall be compatible with the form liners, simulated stone masonry and with the color stain system, as recommended by the manufacturer.

Form Ties - The form ties shall be designed to separate at least one inch back from the finished surface, leaving only a neat hole that can be plugged with patching material.

Color Stain - Special penetrating stain mix as provided by the manufacturer, shall achieve color variations present in the natural stone being simulated by the pattern selected for the project. The Engineer/Town shall select a color pattern from photos of completed projects. 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 6.25 lb/cf and shall meet requirements for; weathering resistance - 2000 hours accelerated exposure in accordance with the 3-bulb test of ASTM G152, scrub test - 100 revolutions, abrasion resistance (Tabor CF-10) - 500 cycles, adhesion – 0.04” cross cuts on glass pass 3 or higher on a scale of 1 to 5 in accordance with ASTM D3359, chemical resistance - ASTM D1308.

Construction Methods: 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 color 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 and to coordinate the work. Included for attendance shall be the manufacturer’s authorized representatives, the contractor, the subcontractor (installer), the Engineer and the Town.

The Contractor shall submit the following for approval by the Engineer/Town prior to beginning the form 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, weephole locations, drainage and other protrusions, 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 5 square yards, or larger if needed to adequately illustrate the pattern selected.
2. The test panel shall contain an area demonstrating simulated stone masonry butt joint, the continuation of the pattern through an expansion joint and an outside corner.
3. The test panel shall include staining as may be required for the selected pattern.
4. The test panel shall be removed when it is no longer needed, to the satisfaction of the Engineer.

The test panel requirement may be waived, if in the opinion of the engineer, all parties involved adequately understand the requirements and the intended look of the final finished surfaces.

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/Town. 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 bush 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 with 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 may be 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 brushes with stiff bristles may be used on stubborn areas. Mild acid washes may also be used. **Solvents shall not be used**. If necessary, patching of holes shall be performed with 100% clear silicone caulk. Form liners shall be stored inside or under a protective, non-transparent cover, in a vertical 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 larger than 3/8" in greatest principal dimension shall be filled with concrete patching material from the approved product list, as approved by the Engineer. All honeycombed areas shall be filled and textured to match surrounding areas. Seam lines and other unnatural protrusions shall be ground down to match adjacent areas with a hand-held power grinder using discs made for concrete. Grinding of seams shall be performed immediately after removal of the form liners. Perform final bush hammering to blend defects and ground areas into the final rock texture. In particular, the process of wall patching and preparation shall be subject to approval of the manufacturer and Engineer.

Color Staining: All color staining shall be performed by the manufacturer, or their 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 latent, dirt, oil and other objectionable materials. After the wall has dried, the color staining process shall be applied using colors approved by the Engineer/Town. Color staining shall be applied in such a way that the stones shall have individual colorations from one to the other. Water-based stains shall be used in air temperatures ranging from 50 degrees F to 100 degrees F. 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 F and falling.

All staining work shall be scheduled after backfilling is completed to avoid contaminating or damaging of the surfaces. After staining is complete and approved, topsoil and rip rap shall be placed in a way that does not damage the finished surfaces.

Method of Measurement:

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, will be measured for payment by the actual number of square feet of concrete patterned on cast-in-place concrete surfaces, within the pay limits shown on the drawings or as approved by the Engineer.

Basis of Payment:

This work will be paid for at the contract unit price per square foot for "Concrete Form Liners", complete in place, which price shall include all work and materials incidental thereto, including

form liners, release agents, form ties, color stains or additives, pattern drawings, test panels, scaffolding, patching, preparation, cleaning, staining and all other work, materials, tools, and labor incidental thereto.

Pay Item

Concrete Form Liners

Pay Unit

S.F.

ITEM #0601541A - (24' X 11') PRECAST CONCRETE BOX CULVERT

ITEM #0601542A - (12' X 10') PRECAST CONCRETE BOX CULVERT

Description: Work under this item consists of furnishing and installing a precast concrete box culvert(s) as shown on the plans and as ordered by the Engineer. This item also includes all hardware, inserts, dowels for connections, reinforcing steel and joint materials as shown on the plans.

Materials:

- The concrete mix design shall meet the requirements of M.03.02, Class PCC05562, and shall be submitted to the Engineer.
- All reinforcing steel, including dowel bar mechanical connectors, shall be galvanized and shall meet the requirements of M.06.01.
- All threaded concrete inserts, lifting fixtures, and miscellaneous hardware cast into precast concrete components shall be galvanized in accordance with ASTM A153 or ASTM B695 Grade 50. All portions of the lifting and seating devices shall be recessed from the finished concrete surface.
- Non-shrink grout shall meet the requirements of M.03.05 and be suitable for submerged applications.
- Gaskets shall meet the requirements of ASTM D1056, C1677 or C990.
- Geotextiles shall be the "Separation (High Survivability)" type and shall be selected from the Department's Qualified Product List.
- Galvanized steel connection plates shall conform to the requirements of M.06, and shall be galvanized per ASTM A153.
- Butyl tape used to seal the culvert joints shall conform to ASTM C877 and shall not be stored at temperatures below 40 degrees Fahrenheit.
- Steel cover plates and steel structural ribs shall be Grade 50 steel and shall conform to the requirements of M.06 and article M.07.02.
- Bolts for attaching the steel cover plates to the ends of the pre-cast concrete culvert shall be 3/4" diameter A325 heavy hex bolts.

Construction Methods:

1. Submittals: All submittals shall include a title sheet with the following:

- Project number, town and crossing.
 - Bridge number, when shown on the plans.
 - Design code, as applicable.
 - Contact information for fabricator – contact information shall include name and address of the fabricator and the name of contact person with phone number and email address.
- (a) Shop Drawings - Precast Concrete Components:** Prior to fabrication, the Contractor shall submit an individually packaged set of shop drawings for the precast concrete components for each precast box culvert location to the Engineer for review, in accordance with the plans and 1.05.02. Each shop drawing package shall include details necessary for fabrication of each unique component, handling and installation of the precast concrete

components, supporting documents for all materials incorporated into the precast concrete components and for other materials provided by the fabricator.

- (b) Working Drawings - Lifting and Seating Devices :** Prior to fabrication, the Contractor shall submit working drawings and supporting computations for the embedded lifting and seating devices required for the handling and installation of the precast concrete components at each box culvert location to the Engineer for review in accordance with 1.05.02. Prior to applying load to the embedded devices, the concrete shall attain the minimum concrete compressive strength associated with the safe working load of the device.
- (c) Working Drawings - Installation of Precast Concrete Components:** Prior to installation of the precast concrete components, the Contractor shall submit working drawings and supporting computations for the lifting and placement of the precast concrete components, to the Engineer for review in accordance with 1.05.02. Cranes shall be operated in accordance with the Connecticut Department of Public Safety regulations. The Contractor shall be responsible for verifying the weight of each lift. The working drawing submittal shall include, but not be limited to the following:
- Plan of the work area showing all structures, roads, railroad tracks, Federal and State regulated areas as depicted on the plans, overhead and subsurface utilities, property lines, or any other information relative to erection. No picks shall be allowed over vehicular, pedestrian, railway or vessel traffic.
 - A detailed narrative describing the lifting and installation sequence.
 - Manufacture's data sheet for the crane(s) including the load/capacity chart. The capacity of the crane shall be adequate for the total lift/pick load including rigging, spreaders and other materials. In the area of railroads and navigable waterways, the capacity shall be as required by the regulatory authorities.
 - Manufacturer's data sheets and product data sheets for all rigging (slings, spreader bars, blocks, etc.), lifting devices, and other connecting equipment and hardware listing the number, type, size, arrangement and capacity of each.
 - Location of each crane for each pick.
 - Crane support measures, including any support beneath the outriggers such as bearing pads, crane mats, planking or special decking, or other means to transfer the crane's total weight (including the lifted load) into the earth or structure beneath it.
 - Delivery location of each component.
 - Boom length and the lift and setting radius for each pick (or maximum lift radius).
 - Pick point location(s) on each component.
 - Lifting weight of each component including rigging (clamps, spreader beams, etc.)
- (d) Product Data – Field Installed Materials:** Prior to installation of the precast concrete components, the Contractor shall submit product data for field installed materials, such as non-shrink grout, geotextile, etc., not addressed in other submissions to the Engineer for review in accordance with 1.05.02.

- 2. Fabrication and Manufacture:** The fabrication and manufacture of the precast concrete components shall meet the requirements of M.08.02-4 as supplemented by the following:

- (a) **Reinforcing Steel:** Reinforcing steel shall be fabricated and installed in accordance with Articles 6.02.03-2 through 6.02.03-5. The welding of reinforcement is not permitted.
- (b) **Test Cylinders:** During the casting of the components, the Contractor shall cast a minimum of four 4 inch × 6 inch test cylinders in accordance with AASHTO T23 during each production run. Cylinders shall be cured under the requirements of ASTM C31 and shall be used to confirm that the concrete meets the requirements of M.03.02.
- (c) **Placing Concrete:** Concrete shall not be deposited in the forms until the Contractor has inspected the reinforcing steel, including all other embedded components, and has documented such inspection.

Concrete shall not be deposited into the forms when the ambient temperature is below 40°F or above 100°F, unless adequate heating or cooling procedures have been previously approved by the Engineer. The concrete temperature shall be 60°F to 90°F at the time of placement.

Truck-mixed or transit-mixed concrete will not be allowed.

Production during the winter season, from November 15 to March 15 inclusive, will be permitted only on beds located in a completely enclosed structure of suitable size and dimension that provides a controlled atmosphere for the protection of the casting operation and the product.

Outside concreting operations will not be permitted during rainfall unless the operation is completely under cover.

The concrete shall be vibrated internally, or externally, or both, as needed to provide adequate flow and consolidation of the concrete. The vibration shall be provided in such a manner as to avoid displacement of reinforcing steel, forms, or other components. There shall be no interruption in the placement of concrete. Concrete shall be placed and vibrated sufficiently to produce a surface free from imperfections such as honeycombing, segregation, cracking, or checking.

Any deficiencies noted in the components may be cause for rejection.

- (d) **Finishing:** All fins, runs, or mortar shall be removed from the concrete surfaces which will remain exposed. Form marks on exposed surfaces shall be smoothed by grinding. All exposed, outside concrete surfaces shall be given a grout clean-down finish in accordance with 6.01.03-10.
- (e) **Handling and Storage:** Any precast concrete components damaged during storage, transportation or handling shall be repaired or replaced by the Contractor, at its own expense, as directed by the Engineer.
- (f) **Repairs:** The Contractor shall submit to the Engineer, for review, any proposed methods or materials to be used in the repair of precast concrete components or defective surfaces. Precast concrete components with defective area greater than 10% as determined by the Engineer will be rejected.

- 3. Fabrication Tolerances:** Tolerances of forming precast concrete box sections shall be as follows:
- (a) **Internal Dimensions:** The internal dimensions shall be within 1% of the design dimensions or within 1 1/2 inches, whichever is less.
 - (b) **Roof, Floor and Wall Thickness:** The roof, floor and wall thickness shall be within 1/4 inch of the thicknesses shown in the design.
 - (c) **Laying Length of Opposite Surfaces:** Variations in laying lengths of two opposite surfaces of the box section shall be less than 1/8 inch/foot of internal span up to 3/4 inch maximum.
 - (d) **Length of Section:** The length of a section shall not vary from the designed length by more than 1/2 inch in any box section.
- 4. Pre-assembly of Box Sections:** Box sections shall conform to all dimensions within tolerances specified herein. Adjacent sections shall be assembled without a gasket at the manufacturing plant to ensure that all tolerances are met prior to shipping. All sections that will be joined with mechanical connectors shall be pre-assembled, complete with fasteners, to confirm alignment. The Department shall be given at least 2 working days' notice to inspect and evaluate the sections prior to shipping.
- 5. Installation:** The installation of the precast concrete box sections and components shall be in accordance with the plans and the following:
- (a) The installation of the precast concrete box sections shall proceed as required by the sequence of construction, stage construction plans, and the special provisions entitled "Prosecution and Progress" and "Maintenance and Protection of Traffic."
 - (b) Prior to installing the inlet and outlet end box culvert sections, a bed of non-shrink grout shall be placed on the cut-off walls. The end box culvert sections shall be connected to the cut-off wall using galvanized dowels installed in cast or drilled holes and bonded with non-shrink grout.
 - (c) All box culvert lap joints shall be sealed with rubber gaskets and must provide a silt-tight fit. A positive means, through the use of seating devices, shall be used for pulling each section against the adjacent section to assure a silt-tight joint. The gasket shall be uniformly compressed to a minimum of 1/2 of its uncompressed width. The joint opening between adjacent seated sections on all interior surfaces of the culvert shall be uniform and match the width shown on the plans. The interior surfaces on either side of the lap joints of the adjacent seated sections shall form a smooth and continuous plane, free from irregularities.

Both inside and outside of the joints between the culverts shall be sealed with butyl tape. The locations where the butyl tape will be used shall not be blast cleaned to ensure that the tape will adhere to the concrete surface.

- (d) After its installation, any box section, as determined by the Engineer, not acceptable in vertical or horizontal alignment for any reason, including but not limited to settlement, displacement, excess camber or misfit, shall be removed by the Contractor and correctly installed, as directed by the Engineer and at the Contractor's expense.
- (e) The lap joints on the exterior of the roof and the interior of the floor and the lap joints on the interior and exterior of the walls (full height on each side) shall be filled with non-shrink grout after seating the sections. The exposed portions of the lap joints within the haunches or fillets on the interior of the culvert sections shall also be filled with non-shrink grout. The non-shrink grout shall be finished smooth and flush with the adjacent concrete surface.

All portions of the lifting and seating devices that extend to or beyond the finished concrete surface shall be removed. All fixtures or holes cast into the sections for lifting or seating shall be completely filled with non-shrink grout and finished smooth and flush with the adjacent concrete surface.

The surface preparation, mixing, placing, curing, and finishing of the non-shrink grout shall follow the written instructions provided by the manufacturer of the grout. The Contractor shall furnish the Engineer with copies of the instructions.

Prior to the passage of flowing water over the with non-shrink grout, the non-shrink grout shall attain a minimum compressive strength of 3,000 psi.

- (f) Geotextile shall be placed on the exterior surface of the roof and walls of the culvert over the lap joints between the culvert sections. The geotextile shall extend 12 inches to each side of the joint and shall be attached to the culvert with silicone caulk.

6. Erection Tolerances: The Contractor shall be responsible for ensuring the overall length of the box culvert meets the layout requirements on the plans within all acceptable tolerances as specified in the contract.

Method of Measurement: The work for the precast concrete box culvert will not be measured for payment but will be paid for by the linear foot of precast concrete box culvert as dimensioned on the plans along each completed (upper and lower) box culvert cell, completed and accepted.

Basis of Payment: The work for the precast concrete box culvert will be paid for at the Contract unit price per linear foot for for "24' X 11' Precast Concrete Box Culvert" and "12' X 10' Precast Concrete Box Culvert," completed in place and accepted, which price shall include all equipment, materials, tools and labor incidental to the manufacture, shipping, repair and installation of the precast concrete box culvert of the specified size(s) at the locations shown on the plans.

Pay Item	Pay Unit
24' X 11' Precast Concrete Box Culvert	l.f.
12' X 10' Precast Concrete Box Culvert	l.f.

ITEM #0606906A REBUILD MASONRY WALL

Description: Work under this item shall consist of the removal and rebuilding of the existing stone wall(s) to the locations as shown on the plans or as directed by the Engineer.

Materials: In the event that the existing stones cannot be reused or are insufficient to rebuild the wall, the contractor shall supply new stones in like and kind to the existing stones or as directed by the Engineer. Materials for this work shall meet the requirements of M.11.02 for rubble masonry stone.

Construction Methods: All work shall proceed as directed by and to the satisfaction of the Engineer and in accordance with the details shown on the plans.

The existing stone wall shall be removed and properly stored and protected for future rebuilding. The contractor shall catalog and take care in removing individual stones to ensure they are properly installed during future rebuilding.

The earth at the location of the existing stone wall shall be leveled off so that the first or base course of stones is stably bedded. The stones shall be placed in a pattern that matches the adjoining existing stone wall pattern and provides a neat vertical end to match the proposed cast-in-place concrete wingwalls to the limits shown on the plans or as directed by the Engineer.

Methods of Measurement: The portion of work covered under this special provision and associated with the reconstruction of the existing masonry walls shall be measured for payment by the actual number of cubic yards of the stone masonry walls rebuilt, within the pay limits shown on the drawings or as approved by the Engineer.

Basis of Payment: This work shall be paid for at the contract unit price per cubic yard for “Rebuild Masonry Wall” complete in place, which price shall include all necessary materials, equipment, tools, labor and work incidental thereto; also all necessary excavation, stabilizing, stockpiling and backfilling. Any additional stone required for rebuilding the existing stone wall will be paid for under the item “Dry Rubble Masonry”

Pay Item
Rebuild Masonry Wall

Pay Unit
C.Y.

ITEM #0707001A – MEMBRANE WATERPROOFING (WOVEN GLASS FABRIC)

Description: Work under this item shall consist of furnishing and applying a waterproof membrane system to the surface of concrete decks, curbs, and buried structures, as shown on the plans and in accordance with the Manufacturer's recommendations.

Materials: Materials for this work shall be as follows:

Primer shall meet the requirements of ASTM D41.

Liquid asphalt shall meet the requirements of ASTM D449, Type III for above ground, and Type I for below ground.

Woven glass fabric shall be saturated with asphalt and shall meet the requirements of ASTM D1668, Type I.

Construction Methods: Prior to application of the primer, the concrete surfaces shall be prepared so that any projections or holes are rounded and are less than 1/4 inch in height or 1/2 inch in depth. Any nonconforming hole or projection shall be repaired prior to installation, to the satisfaction of the Engineer.

No materials shall be installed on a wet surface, in wet weather, or when the air or surface temperature is below 35°F without written authorization from the Engineer.

After the concrete surface is deemed acceptable by the Engineer, the surface shall be thoroughly cleaned of loose or foreign substances by blowing the area with clean, oil-free compressed air.

Primer shall be applied for a minimum distance of 2 inches up the face of the curb and onto a deck surface. The primer shall be applied with a sprayer, roller or squeegee without allowing the primer to pond. The primer shall be applied per the Manufacturer's recommendations. The primer shall be cured prior to being overlaid or disturbed.

Liquid asphalt shall be contained in double jacketed melters or tanker. Liquid asphalt shall be heated to produce a liquid asphalt that is lump free and free flowing at a temperature recommended by the Manufacturer, but not to exceed 400°F in a melter and 450°F in a tanker. If the Manufacturer recommends a higher delivery temperature, a request may be submitted with a Certified Test Report including the flash point of the material. Melters and tankers shall be equipped with thermometers. Melters shall be equipped with an agitator.

Liquid asphalt shall be applied over the areas on the concrete surfaces previously coated with the primer. The woven glass fabric shall extend a minimum of 2 inches up the face of the curb with the remaining width extending onto the deck, or as shown on the plans. Press the fabric into place to eliminate all air bubbles and to bond the fabric to the base coat of liquid asphalt while

the asphalt is still in liquid form. The strip of fabric must be firmly and uniformly pressed against the curb. Liquid asphalt must be applied over the strip of fabric to ensure a watertight joint along the curb line.

Each subsequent strip of full width fabric shall be “shingled” into a base coat of liquid asphalt so that there will be 2 layers of fabric at all points with longitudinal laps not less than 2 inches wide. All end laps shall be at least 12 inches. If so ordered by the Engineer, additional strips of woven glass fabric shall be placed over any other areas of the concrete surface that require special protection.

Liquid asphalt must be applied to the top of any fabric and allowed to saturate the entire fabric area. The top coat of liquid asphalt shall be of sufficient thickness to completely conceal the fabric weave to the satisfaction of the Engineer. All laps must be thoroughly sealed down.

Liquid asphalt must not flow into deck joints, weepholes or drainage structures.

The entire waterproofing membrane shall be free of wrinkles, air bubbles, or other defects. In the event bubbles or blisters form under the membrane, they shall be addressed to the satisfaction of the Engineer.

All damage or areas of poor installation shall be repaired with a patch. Patches, made of layers of hot liquid asphalt and fabric, shall extend at least 12 inches beyond the area to be repaired. A second patch shall extend over the first by at least 3 inches beyond the first on all sides.

Vehicular or pedestrian traffic shall not be allowed on the finished membrane waterproofing. The Contractor shall take every precaution necessary to prevent damage to the finished membrane. The Contractor shall repair, at its expense, any damage, to the satisfaction of the Engineer.

At least one course of hot mix asphalt overlay shall be placed as soon as practical in order to prevent damage to the installed membrane. In no case shall the membrane be left unprotected for a time period exceeding the recommendations of the membrane Manufacturer.

Method of Measurement: This work will be measured for payment by the actual number of square yards of waterproofed surface completed and accepted by the Engineer.

Basis of Payment: This work will be paid at the Contract unit price per square yard for “Membrane Waterproofing (Woven Glass Fabric)” which price shall include furnishing all materials, equipment, tools, labor and incidentals necessary to complete the work.

Pay Item	Pay Unit
Membrane Waterproofing (Woven Glass Fabric)	s.y.

ITEM #0716000A TEMPORARY EARTH RETAINING SYSTEM

7.16.01 - Description: *“Remove in its’ entirety and replace with the following”.*

The temporary earth retaining system shall be any type of adequately braced temporary retaining wall which the Contractor elects to build to satisfy the condition that existing or planned facilities be properly retained during excavation or placement of fill. The temporary earth retaining system shall be designed by the Contractor and constructed where shown on the plans. The Contractor shall remove this system upon completion of the permanent work, unless the Engineer allows some sections to remain in place. For the purposes of this specification, temporary earth retaining system shall be understood to mean a structure, the type of which the Contractor elects to build, which will support excavation and enable an area to be pumped dry to facilitate Construction.

Pay Item

Temporary Earth Retaining System

Pay Unit

s.f.

ITEM # 0728008A – 3/8” CRUSHED STONE

7.28.01 - Description: Work under this item shall consist of crushed stone, placed at the locations and dimensions as shown on the contract drawings or as directed by the Engineer in the field.

7.28.02 - Materials: The materials for this work shall be a singularly graded crushed stone, with 90% of the material by weight being retained on the sieve of the size specified. Stone shall be crusher run broken stone, meeting the coarse aggregate material requirements of Section M.05.01, except that it shall contain no asphalt cement or bituminous concrete material.

7.28.03 - Construction Methods: The area or trench bottom on which the crushed stone is to be placed shall be shaped to a reasonably true surface prior to placing the crushed stone. The stone shall be spread, by hand or machine as conditions allow and which will not crush the stone, and then shaped to a smooth uniform finished grade to the depth and dimensions as indicated on the plans or as directed in the field. The stone shall be compacted with a roller or a plate compactor (if conditions prohibit roller use) as required to fully seat and bind the stone and to ensure that settlement will not occur.

7.28.04 - Method of Measurement: The quantity of crushed stone measured for payment shall be the number of cubic yards, whose length, width and thickness shall be as accepted and measured in place after compaction.

7.28.05 - Basis of Payment: This work shall be paid for at the contract unit price per cubic yard for the size of crushed stone indicated, complete in place, which price shall include preparation and compaction of the area or trench bottom on which the crushed stone is to be placed, as well as all work, materials, labor and equipment incidental thereto.

Payment for crushed stone shall be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
3/8” Crushed Stone	CY.

ITEM #0817006 A – 6" X 10" GRANITE STONE CURBING FOR BRIDGES

8.17.01--Description: This curbing shall consist of approved granite stone, furnished in accordance with the dimensions and details shown on the plans, or as ordered, and installed to the lines and grades given and in conformity with these specifications.

8.17.02--Materials: The materials for this work shall conform to the requirements of Article M.12.08.

Mortar: The mortar for this work shall conform to Article M.11.04.

Metal Anchors: Metal anchors shall be steel conforming to the requirements of Article M.06.01-1, bar reinforcement, and shall be thoroughly galvanized by the hot-dip process after fabrication.

Where required and indicated on the plans, joint seal shall be placed in accordance with the provisions of Subarticle 4.01.03-B.6(f) insofar as it may apply.

8.17.03-Construction Methods: Granite stone curbing shall be constructed in the location and to the dimensions shown on the plans. The stone curbing shall be accurately set, straight and true to the line and grade as required. The stone curbing shall be set in a full mortar bed and full mortar end joints. As the stone curbing is being set, the anchors shall be grouted into the holes in the curbing by a method as approved by the Engineer. The concrete backing shall not be placed until the curbing and anchors have been properly placed. Care must be taken to prevent any movements of the stone curbing already in place while placing and compacting concrete backing. When required by the Engineer, the stone curbing shall be supported by such bracing and form work as may be necessary to prevent movement. Where vertical contraction joints or vertical expansion joints, or both, exist in the backing, the vertical joint of the curb shall coincide with the contraction or expansion joint.

All mortar joints shall be finished smooth and flush. These joints shall be carefully filled with cement mortar and shall be neatly pointed on the top and exposed front portions. After pointing, stone curbing shall be cleaned of all excess mortar to the satisfaction of the Engineer.

All fines shall be cleaned from the face of stones after all work on the parapets has been completed.

8.17.04--Method of Measurement: This work will be measured for payment by the actual number of linear feet of "6" x 10" Granite Stone Curbing for Bridges" installed and accepted. Measurement shall be made along the top arris line of the face of the curb.

8.17.05--Basis of Payment: Payment for this work will be made at the contract unit price per linear foot for "6" x 10" Granite Stone Curbing for Bridges" complete in place, which price shall include all materials including anchors, equipment, tools and labor incidental thereto.

The cost of drilling holes in stone curbing for anchors, beveling or rounding the ends of the stone curbing and pointing the joints with mortar, and sealing the longitudinal joint; shall be included in the cost of "6" x 10" Granite Stone Curbing for Bridges".

Pay Item

Pay Unit

6" x 10" Granite Stone Curbing for Bridges

L.F

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:

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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

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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 1.f.

ITEM #0969062A - CONSTRUCTION FIELD OFFICE, MEDIUM

Description: Under the item included in the bid document, 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 Municipal forces and others who may be engaged to augment Municipal 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	Med.
Minimum Sq. Ft. of floor space with a minimum ceiling height of 7 ft.	720
Minimum number of exterior entrances.	2
Minimum number of parking spaces.	7

Office Layout: The office shall have a 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:

- Each work area (or cubicle) shall be a minimum of 8 feet x 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).
- Only one user (workstation/desk) per work area.
- 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 Municipal 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 Municipality 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 Municipality's electrical inspector, must be contacted.

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 68°-80° 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 two (2) telephone lines: one (1) line for phone/voice service and one (1) line dedicated for the facsimile machine. For an Extra-Large field office this shall consist of four (4) telephone lines: three (3) lines for phone/voice service and one (1) line dedicated for facsimile machine. The Contractor shall pay all charges.

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
	Med.
	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.	3
Standard secretarial type desk and matching desk chair that has pneumatic seat height adjustment and dual wheel casters on the base.	-
Personal computer tables (4 ft. x 2.5 ft.).	3
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
Conference table, 3 ft. x 12 ft.	-
Table – 3 ft. x 6 ft.	-
Office Chairs.	4
Mail slot bin – legal size.	-
Non-fire-resistant cabinet.	-
Fire resistant cabinet (legal size/4 drawer), locking.	1
Storage racks to hold 3 ft. x 5 ft. display charts.	-
Vertical plan racks for 2 sets of 2 ft. x 3 ft. plans for each rack.	1
Double door supply cabinet with 4 shelves and a lock – 6 ft. x 4 ft.	-
Case of cardboard banker boxes (Min 10 boxes/case)	1
Open bookcase – 3 shelves – 3 ft. long.	-
White Dry-Erase Board, 36" x 48" min. with markers and eraser.	1

Interior partitions – 6 ft. x 6 ft., soundproof type, portable and freestanding.	-
Coat rack with 20 coat capacity.	-
Wastebaskets - 30 gal., including plastic waste bags.	1
Wastebaskets - 5 gal., including plastic waste bags.	3
Electric wall clock.	-
Electronic Level	1
Furnishing Description	Office Size
	Med.
	Quantity
Telephone.	2
Full size stapler 20 (sheet capacity, with staples)	2
Desktop tape dispensers (with Tape)	2
8 Outlet Power Strip with Surge Protection	4
Rain Gauge	1
Business telephone system for three lines with ten handsets, intercom capability, and one speaker phone for conference table.	-
Mini refrigerator - 3.2 c.f. min.	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
Microwave, 1.2 c.f. , 1000W min.	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.	2
Electronic office type printing calculators capable of addition, subtraction, multiplication and division with memory and a supply of printing paper.	1
Small Multi-Function Laser Printer/Copier/Scanner/Fax combination unit, network capable, as specified below under <u>Computer Related Hardware and Software</u> .	1
Large Multi-Function Laser Printer/Copier/Scanner/Fax combination unit, network capable, as specified below under <u>Computer Related Hardware and Software</u> .	
Field Office Wi-Fi Connection as specified below under <u>Computer Related Hardware and Software</u>	1
Wi-Fi Printer as specified below under Computer Related Hardware and Software.	1
Digital Camera as specified below under Computer Related Hardware and Software.	1

Video Projector as specified below under Computer Related Hardware and Software.	-
Smart Board as specified below under Computer Related Hardware and Software.	-
Conference Room Presentation Television as specified below under Computer Related Hardware and Software.	-
Infrared Thermometer, including annual third-party certified calibration, case, and cleaning wipes.	1
Concrete Curing Box as specified below under Concrete Testing Equipment.	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
Concrete Slump Cone and accessories as specified below under Concrete Testing Equipment.	1
First Aid Kit	1
Disinfecting wipes, sprays, and other supplies (** as specified below under Maintenance).	**
Hand sanitizer stations (***) maintain one full station at each entrance, restroom, and conference area).	***
Flip Phones as specified under <u>Computer Related Hardware and Software</u> .	-
Smart Phones as specified under <u>Computer Related Hardware and Software</u> .	-

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.

Computer Related Hardware and Software: The Municipality will supply by its own means the actual Personal Computers for the Municipal representatives. The Contractor shall supply the Field Office Wi-Fi Connection, Wi-Fi Printer, Digital Camera(s), Flip Phones, Smart Phones, Multifunction Laser Printer/Copier/Scanner/Fax, Video Projectors, and Smart Board(s), Conference Room Presentation Television, as well as 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 web site <http://www.ct.gov/dot/cwp/view.asp?a=1410&q=563904>

Within 10 calendar days after the signing of the Contract but before ordering/purchasing the Wi-Fi Printer (separate from the Multifunction Laser Printer/Copier/Scanner/Fax), Field Office Wi-Fi, Digital Camera(s), Flip Phones, Smart Phones, Multifunction Laser Printer/Copier/Scanner/Fax, Video Projector(s) and Smart Board(s) as well as associated hardware, the Contractor must submit a copy of their proposed order(s) with catalog cuts and specifications to the Municipality or their representatives for review and approval. The Wi-Fi Printer, Wi-Fi Router, Flip Phones, Smart Phones, digital cameras, Projector(s) and Smart Board(s) will be reviewed by Municipal personnel or

their representatives. The Multifunction Laser Printer/Copier/Scanner/Fax will be reviewed by the Municipality or their representatives. The Contractor shall not purchase the hardware, software, or services until the Municipality or their representatives 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 and setup of the field office Wi-Fi, Wi-Fi printer, and the configuration of the wireless router as directed by the Municipality or their representative. Installation will be coordinated with Municipal and Project personnel.

After the approval of the hardware and software, the Contractor shall contact the designated representatives of the Municipality, a minimum of 2 working days in advance of the proposed delivery or installation of the Field Office Wi-Fi Connection, Wi-Fi Printer, Digital Camera(s), Flip Phones, Smart Phones, Multifunction Laser Printer/Copier/Scanner/Fax, Video Projectors and Smart Board(s), as well as associated hardware, software, supplies, and support documentation.

The Contractor shall provide all supplies, paper, maintenance, service and repairs (including labor and parts) for the Wi-Fi printers, copiers, field office Wi-Fi, fax machines and other equipment and facilities required by this specification for the duration of the Contract. All repairs 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 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 levels 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 T119, Standard Test Method for Slump of Hydraulic-Cement Concrete.

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) in order to insure all Municipal-owned data equipment and supplies used in the office against all losses. The Contractor shall be named insured on that policy, and the Municipality shall be an additional named insured on the policy. These losses shall include, but not be limited to theft, fire, and physical damage. The Municipality will be responsible for all maintenance costs of Municipal owned computer hardware. In the event of loss, the Contractor shall provide replacement equipment in accordance with current Municipal equipment specifications, within seven days of notice of the loss. If the Contractor is unable to provide the required replacement equipment within seven days, the Municipality may provide replacement equipment and deduct the cost of the equipment from monies due or which may become due the Contractor under the Contract or under any other contract. The Contractor's financial liability under this paragraph shall be limited to the amount of the insurance coverage required by this paragraph. If the cost of equipment replacement required by this paragraph should exceed the required amount of the insurance coverage, the Municipality will reimburse the Contractor for replacement costs exceeding the amount of the required coverage.

Maintenance: During the occupancy by the Municipality or their representatives, 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, but not limited to, vacuuming carpet, washing & waxing floors, cleaning restrooms, removal of trash, general cleaning, etc. The general cleaning of the office shall be at least twice weekly. Restrooms, portable toilets and all other high touch areas shall be cleaned and disinfected at least every two days using CDC and Department of Health recommended and non-hazardous techniques. High touch areas to be cleaned include but are not be limited to (depending on the facilities supplied):

- A. Arms on chairs
- B. Table/Desktops
- C. Handrails
- D. Doorknobs and handles

- E. Countertops
- F. Elevator buttons
- G. Coffee pots
- H. Refrigerator / microwave / dishwasher / toaster handles
- I. Water dispensers
- J. Cabinet and file drawer knobs / handles
- K. Phones and keypads
- L. Copier / printer / fax control buttons
- M. Sinks and faucets
- N. Light switches

In addition, the Contractor shall supply appropriate (CDC and Department of Health recommended and non-hazardous), cleaning and disinfection supplies (wipes and sprays), and single use gloves for the use of the Municipal representatives, for disinfection of surfaces and equipment in between the 2 day interval noted above. The Contractor shall always maintain a minimum of 500 wipes and 100 pairs of disposable gloves in the field office.

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

Method of Measurement: The furnishing and maintenance of the construction field office will be measured for payment by the number of calendar months that the office is in place and in operation, 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 of this specified this specification.

<u>Pay Item</u>	<u>Pay Unit</u>
Construction Field Office, (Type)	Month

ITEM NO. 0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

Article 9.71.01 – Description is supplemented by the following:

The Contractor shall maintain and protect traffic as described by the following and as limited in the Special Provision "Prosecution and Progress":

Center Street

The contractor shall maintain and protect a minimum of one lane of traffic in each direction, each lane on a paved travel path not less than 11 feet in width.

The contractor shall be allowed to close Center Street to through traffic in each direction as shown on the Detour Plan contained in the contract plans.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall maintain and protect at least an alternating one-way traffic operation, on a paved travel path not less than 11 feet in width. The length of the alternating one-way traffic operation shall not exceed 300 feet and there shall be no more than one alternating one-way traffic operation within the project limits without prior approval of the Engineer.

All Other Roadways

The contractor shall maintain and protect a minimum of one lane of traffic in each direction, each lane on a paved travel path not less than 11 feet in width.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall maintain and protect at least an alternating one-way traffic operation, on a paved travel path not less than 11 feet in width. The length of the alternating one-way traffic operation shall not exceed 300 feet and there shall be no more than one alternating one-way traffic operation within the project limits without prior approval of the Engineer.

Commercial and Residential Driveways

The Contractor shall maintain access to and egress from all commercial and residential driveways throughout the project limits. The Contractor will be allowed to close said driveways to perform the required work during those periods when the businesses are closed, unless permission is granted from the business owner to close the driveway during business hours. If a temporary closure of a residential driveway is necessary, the Contractor shall coordinate with the owner to determine the time period of the closure.

Article 9.71.03 - Construction Method is supplemented as follows:

General

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

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

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

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

If applicable, when an existing sign is removed, it shall be either relocated or replaced by a new sign during the same working day.

The Contractor shall not store any material on-site which would present a safety hazard to motorists or pedestrians (e.g. fixed object or obstruct sight lines).

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

Existing Signing

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

Requirements for Winter

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

Signing Patterns

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

Pavement Markings -Non-Limited Access Multilane Roadways Secondary and Local Roadways

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

Interim Pavement Markings

The Contractor shall install painted pavement markings, which shall include centerlines, shoulder edge lines, lane lines (broken lines), 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 day/night. If the next course of bituminous concrete pavement will be placed within seven days, shoulder edge lines are not required. The painted pavement markings will be paid under the appropriate items.

If the Contractor will install another course of bituminous concrete pavement within 24 hours, the Contractor may install Temporary Plastic Pavement Marking Tape in place of the painted pavement markings by the end of the work day/night. These temporary pavement markings shall include centerlines, lane lines (broken lines) and stop bars; shoulder edge lines are not required. Centerlines shall consist of two 4 inch wide yellow markings, 2 feet in length, side by side, 4 to 6 inches apart, at 40-foot intervals. No passing zones should be posted with signs in those areas where the final centerlines have not been established on two-way roadways. Stop bars may consist of two 6 inch wide white markings or three 4 inch wide white markings placed side by side. The Contractor shall remove and dispose of the Temporary Plastic Pavement Marking Tape when another course of bituminous concrete pavement is installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

If an intermediate course of bituminous concrete pavement will be exposed throughout the winter, then Epoxy Resin Pavement Markings should be installed unless directed otherwise by the Engineer.

Final Pavement Markings

The Contractor should install painted pavement markings on the final course of bituminous concrete pavement by the end of the work day/night. If the painted pavement markings are not installed by the end of the work day/night, then Temporary Plastic Pavement Marking Tape shall be installed as described above and the painted pavement markings shall be installed by the end of the work day/night on Friday of that week.

If Temporary Plastic Pavement Marking Tape is installed, the Contractor shall remove and dispose of these markings when the painted pavement markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

The Contractor shall install permanent Epoxy Resin Pavement Markings in accordance with Section 12.10 entitled "Epoxy Resin Pavement Markings, Symbols, and Legends" after such time as determined by the Engineer.

TRAFFIC CONTROL DURING CONSTRUCTION OPERATIONS

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

TRAFFIC CONTROL PATTERNS

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

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

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

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

If a lane reduction taper is required to shift traffic, the entire length of the taper should be installed on a tangent section of roadway so that the entire taper area can be seen by the motorist.

Any existing signs that are in conflict with the traffic control patterns shall be removed, covered, or turned so that they are not readable by oncoming traffic.

When installing a traffic control pattern, a Buffer Area should be provided and this area shall be free of equipment, workers, materials and parked vehicles.

Typical traffic control plans 19 through 25 may be used for moving operations such as line striping, pot hole patching, mowing, or sweeping when it is necessary for equipment to occupy a travel lane.

Traffic control patterns will not be required when vehicles are on an emergency patrol type activity or when a short duration stop is made and the equipment can be contained within the shoulder. Flashing lights and appropriate trafficperson shall be used when required. Although each situation must be dealt with individually, conformity with the typical traffic control plans contained herein is required. In a situation not adequately covered by the typical traffic control plans, the Contractor must contact the Engineer for assistance prior to setting up a traffic control pattern.

PLACEMENT OF SIGNS

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

ALLOWABLE ADJUSTMENT OF SIGNS AND DEVICES SHOWN ON THE TRAFFIC CONTROL PLANS

The traffic control plans contained herein show the location and spacing of signs and devices under ideal conditions. Signs and devices should be installed as shown on these plans whenever possible.

The proper application of the traffic control plans and installation of traffic control devices depends on actual field conditions.

Adjustments to the traffic control plans shall be made only at the direction of the Engineer to improve the visibility of the signs and devices and to better control traffic operations. Adjustments to the traffic control plans shall be based on safety of work forces and motorists, abutting property requirements, driveways, side roads, and the vertical and horizontal curvature of the roadway.

The Engineer may require that the traffic control pattern be located significantly in advance of the work area to provide better sight line to the signing and safer traffic operations through the work zone.

Table I indicates the minimum taper length required for a lane closure based on the posted speed limit of the roadway. These taper lengths shall only be used when the recommended taper lengths shown on the traffic control plans cannot be achieved.

TABLE I – MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT MILES PER HOUR	MINIMUM TAPER LENGTH IN FEET FOR A SINGLE LANE CLOSURE
30 OR LESS	180
35	250
40	320
45	540
50	600
55	660
65	780

SECTION 1. WORK ZONE SAFETY MEETINGS

- 1.a) Prior to the commencement of work, a work zone safety meeting will be conducted with representatives of DOT Construction, Connecticut State Police (Local Barracks), Municipal Police, the Contractor (Project Superintendent) and the Traffic Control Subcontractor (if different than the prime Contractor) to review the traffic operations, lines of responsibility, and operating guidelines which will be used on the project. Other work zone safety meetings during the course of the project should be scheduled as needed.
- 1.b) A Work Zone Safety Meeting Agenda shall be developed and used at the meeting to outline the anticipated traffic control issues during the construction of this project. Any issues that can't be resolved at these meetings will be brought to the attention of the District Engineer and the Office of Construction. The agenda should include:
- Review Project scope of work and time
 - Review Section 1.08, Prosecution and Progress
 - Review Section 9.70, Trafficpersons
 - Review Section 9.71, Maintenance and Protection of Traffic
 - Review Contractor's schedule and method of operations.
 - Review areas of special concern: ramps, turning roadways, medians, lane drops, etc.
 - Open discussion of work zone questions and issues
 - Discussion of review and approval process for changes in contract requirements as they relate to work zone areas

SECTION 2. GENERAL

- 2.a) If the required minimum number of signs and equipment (i.e. one High Mounted Internally Illuminated Flashing Arrow for each lane closed, two TMAs, Changeable Message Sign, etc.) are not available; the traffic control pattern shall not be installed.
- 2.b) The Contractor shall have back-up equipment (TMAs, High Mounted Internally Illuminated Flashing Arrow, Changeable Message Sign, construction signs, cones/drums, etc.) available at all times in case of mechanical failures, etc. The only exception to this

is in the case of sudden equipment breakdowns in which the pattern may be installed but the Contractor must provide replacement equipment within 24 hours.

- 2.c) Failure of the Contractor to have the required minimum number of signs, personnel and equipment, which results in the pattern not being installed, shall not be a reason for a time extension or claim for loss time.
- 2.d) In cases of legitimate differences of opinion between the Contractor and the Inspection staff, the Inspection staff shall err on the side of safety. The matter shall be brought to the District Office for resolution immediately or, in the case of work after regular business hours, on the next business day.

SECTION 3. INSTALLING AND REMOVING TRAFFIC CONTROL PATTERNS

- 3.a) Lane Closures shall be installed beginning with the advanced warning signs and proceeding forward toward the work area.
- 3.b) Lane Closures shall be removed in the reverse order, beginning at the work area, or end of the traffic control pattern, and proceeding back toward the advanced warning signs.
- 3.c) Stopping traffic may be allowed:
 - As per the contract for such activities as blasting, steel erection, etc.
 - During paving, milling operations, etc. where, in the middle of the operation, it is necessary to flip the pattern to complete the operation on the other half of the roadway and traffic should not travel across the longitudinal joint or difference in roadway elevation.
 - To move slow moving equipment across live traffic lanes into the work area.
- 3.d) Under certain situations when the safety of the traveling public and/or that of the workers may be compromised due to conditions such as traffic volume, speed, roadside obstructions, or sight line deficiencies, as determined by the Engineer and/or State Police, traffic may be briefly impeded while installing and/or removing the advanced warning signs and the first ten traffic cones/drums only. Appropriate measures shall be taken to safely slow traffic. If required, traffic slowing techniques may be used and shall include the use of Truck Mounted Impact Attenuators (TMAs) as appropriate, for a minimum of one mile in advance of the pattern starting point. Once the advanced warning signs and the first ten traffic cones/drums are installed/removed, the TMAs and sign crew shall continue to install/remove the pattern as described in Section 5 and traffic shall be allowed to resume their normal travel.
- 3.e) The Contractor must adhere to using the proper signs, placing the signs correctly, and ensuring the proper spacing of signs.

- 3.f) Additional devices are required on entrance ramps, exit ramps, and intersecting roads to warn and/or move traffic into the proper travel path prior to merging/exiting with/from the main line traffic. This shall be completed before installing the mainline pattern past the ramp or intersecting roadway.
- 3.g) Prior to installing a pattern, any conflicting existing signs shall be covered with an opaque material. Once the pattern is removed, the existing signs shall be uncovered.
- 3.h) On limited access roadways, workers are prohibited from crossing the travel lanes to install and remove signs or other devices on the opposite side of the roadway. Any signs or devices on the opposite side of the roadway shall be installed and removed separately.

SECTION 4. USE OF HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

- 4.a) On limited access roadways, one Flashing Arrow shall be used for each lane that is closed. The Flashing Arrow shall be installed concurrently with the installation of the traffic control pattern and its placement shall be as shown on the traffic control plan. For multiple lane closures, one Flashing Arrow is required for each lane closed. If conditions warrant, additional Flashing Arrows should be employed (i.e.: curves, major ramps, etc.).
- 4.b) On non-limited access roadways, the use of a Flashing Arrow for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the Flashing Arrow.
- 4.c) The Flashing Arrow shall not be used on two lane, two-way roadways for temporary alternating one-way traffic operations.
- 4.d) The Flashing Arrow board display shall be in the “arrow” mode for lane closure tapers and in the “caution” mode (four corners) for shoulder work, blocking the shoulder, or roadside work near the shoulder. The Flashing Arrow shall be in the “caution” mode when it is positioned in the closed lane.
- 4.e) The Flashing Arrow shall not be used on a multi-lane roadway to laterally shift all lanes of traffic, because unnecessary lane changing may result.

SECTION 5. USE OF TRUCK MOUNTED IMPACT ATTENUATOR VEHICLES (TMAs)

- 5.a) For lane closures on limited access roadways, a minimum of two TMAs shall be used to install and remove traffic control patterns. If two TMAs are not available, the pattern shall not be installed.

- 5.b) On non-limited access roadways, the use of TMAs to install and remove patterns closing a lane(s) is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to utilize the TMAs.
- 5.c) Generally, to establish the advance and transition signing, one TMA shall be placed on the shoulder and the second TMA shall be approximately 1,000 feet ahead blocking the lane. The flashing arrow board mounted on the TMA should be in the “flashing arrow” mode when taking the lane. The sign truck and workers should be immediately ahead of the second TMA. In no case shall the TMA be used as the sign truck or a work truck. Once the transition is in place, the TMAs shall travel in the closed lane until all Changeable Message Signs, signs, Flashing Arrows, and cones/drums are installed. The flashing arrow board mounted on the TMA should be in the “caution” mode when traveling in the closed lane.
- 5.d) A TMA shall be placed prior to the first work area in the pattern. If there are multiple work areas within the same pattern, then additional TMAs shall be positioned at each additional work area as needed. The flashing arrow board mounted on the TMA should be in the “caution” mode when in the closed lane.
- 5.e) TMAs shall be positioned a sufficient distance prior to the workers or equipment being protected to allow for appropriate vehicle roll-ahead in the event that the TMA is hit, but not so far that an errant vehicle could travel around the TMA and into the work area. For additional placement and use details, refer to the specification entitled “Type ‘D’ Portable Impact Attenuation System”. Some operations, such as paving and concrete repairs, do not allow for placement of the TMA(s) within the specified distances. In these situations, the TMA(s) should be placed at the beginning of the work area and shall be advanced as the paving or concrete operations proceed.
- 5.f) TMAs should be paid in accordance with how the unit is utilized. When it is used as a TMA and is in the proper location as specified, and then it should be paid at the specified hourly rate for “Type ‘D’ Portable Impact Attenuation System”. When the TMA is used as a Flashing Arrow, it should be paid at the daily rate for “High Mounted Internally Illuminated Flashing Arrow”. If a TMA is used to install and remove a pattern and then is used as a Flashing Arrow, the unit should be paid as a “Type ‘D’ Portable Impact Attenuation System” for the hours used to install and remove the pattern, typically 2 hours (1 hour to install and 1 hour to remove), and is also paid for the day as a “High Mounted Internally Illuminated Flashing Arrow”.

SECTION 6. USE OF TRAFFIC DRUMS AND TRAFFIC CONES

- 6.a) Traffic drums shall be used for taper channelization on limited-access roadways, ramps, and turning roadways and to delineate raised catch basins and other hazards.
- 6.b) Traffic drums shall be used in place of traffic cones in traffic control patterns that are in effect for more than a 36-hour duration.

- 6.c) Traffic Cones less than 42 inches in height shall not be used on limited-access roadways or on non-limited access roadways with a posted speed limit of 45 mph and above.
- 6.d) Typical spacing of traffic drums and/or cones shown on the Traffic Control Plans in the Contract are maximum spacings and may be reduced to meet actual field conditions as required.

SECTION 7. USE OF (REMOTE CONTROLLED) CHANGEABLE MESSAGE SIGNS (CMS)

- 7.a) For lane closures on limited access roadways, one CMS shall be used in advance of the traffic control pattern. Prior to installing the pattern, the CMS shall be installed and in operation, displaying the appropriate lane closure information (i.e.: Left Lane Closed - Merge Right). The CMS shall be positioned ½ - 1 mile ahead of the lane closure taper. If the nearest Exit ramp is greater than the specified ½ - 1 mile distance, than an additional CMS shall be positioned a sufficient distance ahead of the Exit ramp to alert motorists to the work and therefore offer them an opportunity to take the exit.
- 7.b) CMS should not be installed within 1000 feet of an existing CMS.
- 7.c) On non-limited access roadways, the use of CMS for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the CMS.
- 7.d) The advance CMS is typically placed off the right shoulder, 5 feet from the edge of pavement. In areas where the CMS cannot be placed beyond the edge of pavement, it may be placed on the paved shoulder with a minimum of five (5) traffic drums placed in a taper in front of it to delineate its position. The advance CMS shall be adequately protected if it is used for a continuous duration of 36 hours or more.
- 7.e) When the CMS are no longer required, they should be removed from the clear zone and have the display screen cleared and turned 90° away from the roadway.
- 7.f) The CMS generally should not be used for generic messages (ex: Road Work Ahead, Bump Ahead, Gravel Road, etc.).
- 7.g) The CMS should be used for specific situations that need to command the motorist's attention which cannot be conveyed with standard construction signs (Examples include: Exit 34 Closed Sat/Sun - Use Exit 35, All Lanes Closed - Use Shoulder, Workers on Road - Slow Down).
- 7.h) Messages that need to be displayed for long periods of time, such as during stage construction, should be displayed with construction signs. For special signs, please coordinate with the Office of Construction and the Division of Traffic Engineering for the proper layout/dimensions required.

7.i) The messages that are allowed on the CMS are as follows:

<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>	<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>
1	LEFT LANE CLOSED	MERGE RIGHT	9	LANES CLOSED AHEAD	REDUCE SPEED
2	2 LEFT LANES CLOSED	MERGE RIGHT	10	LANES CLOSED AHEAD	USE CAUTION
3	LEFT LANE CLOSED	REDUCE SPEED	11	WORKERS ON ROAD	REDUCE SPEED
4	2 LEFT LANES CLOSED	REDUCE SPEED	12	WORKERS ON ROAD	SLOW DOWN
5	RIGHT LANE CLOSED	MERGE LEFT	13	EXIT XX CLOSED	USE EXIT YY
6	2 RIGHT LANES CLOSED	MERGE LEFT	14	EXIT XX CLOSED USE YY	FOLLOW DETOUR
7	RIGHT LANE CLOSED	REDUCE SPEED	15	2 LANES SHIFT AHEAD	USE CAUTION
8	2 RIGHT LANES CLOSED	REDUCE SPEED	16	3 LANES SHIFT AHEAD	USE CAUTION

For any other message(s), approval must be received from the Office of Construction prior to their use. No more than two (2) displays shall be used within any message cycle.

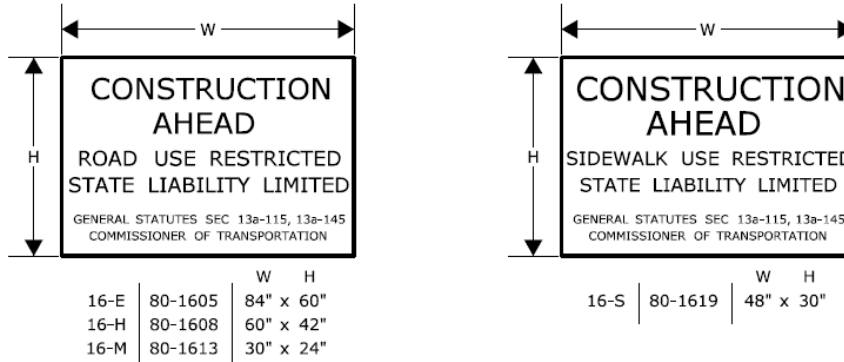
SECTION 8. USE OF STATE POLICE OFFICERS

8a) State Police may be utilized only on limited access highways and secondary roadways under their primary jurisdiction. One Officer may be used per critical sign pattern.

Shoulder closures and right lane closures can generally be implemented without the presence of a State Police Officer. Likewise in areas with moderate traffic and wide, unobstructed medians, left lane closures can be implemented without State Police presence. Under some situations it may be desirable to have State Police presence, when one is available. Examples of this include: 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.

- 8b) Once the pattern is in place, the State Police Officer should be positioned in a non-hazardous location in advance of the pattern. If traffic backs up beyond the beginning of the pattern, then the State Police Officer shall be repositioned prior to the backup to give warning to the oncoming motorists. The State Police Officer and TMA should not be in proximity to each other.
- 8c) Other functions of the State Police Officer(s) may include:
 - Assisting entering/exiting construction vehicles within the work area.
 - Enforcement of speed and other motor vehicle laws within the work area, if specifically requested by the project.
- 8d) State Police Officers assigned to a work site are to only take direction from the Engineer.

SERIES 16 SIGNS



THE 16-S SIGN SHALL BE USED ON ALL PROJECTS THAT REQUIRE SIDEWALK RECONSTRUCTION OR RESTRICT PEDESTRIAN TRAVEL ON AN EXISTING SIDEWALK.

SERIES 16 SIGNS SHALL BE INSTALLED IN ADVANCE OF THE TRAFFIC CONTROL PATTERNS TO ALLOW MOTORISTS THE OPPORTUNITY TO AVOID A WORK ZONE. SERIES 16 SIGNS SHALL BE INSTALLED ON ANY MAJOR INTERSECTING ROADWAYS THAT APPROACH THE WORK ZONE. ON LIMITED-ACCESS HIGHWAYS, THESE SIGNS SHALL BE LOCATED IN ADVANCE OF THE NEAREST UPSTREAM EXIT RAMP AND ON ANY ENTRANCE RAMP PRIOR TO OR WITHIN THE WORK ZONE LIMITS.

THE LOCATION OF SERIES 16 SIGNS CAN BE FOUND ELSEWHERE IN THE PLANS OR INSTALLED AS DIRECTED BY THE ENGINEER.

SIGNS 16-E AND 16-H SHALL BE POST-MOUNTED.

SIGN 16-E SHALL BE USED ON ALL EXPRESSWAYS.

SIGN 16-H SHALL BE USED ON ALL RAMP, OTHER STATE ROADWAYS, AND MAJOR TOWN/CITY ROADWAYS.

SIGN 16-M SHALL BE USED ON OTHER TOWN ROADWAYS.

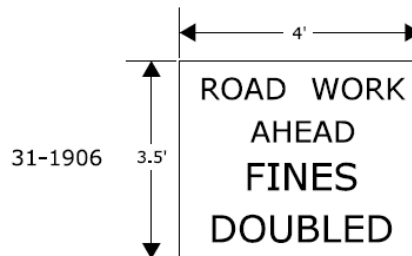
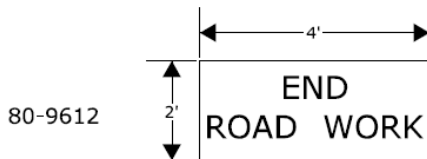
REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"

THE REGULATORY SIGN "ROAD WORK AHEAD FINES DOUBLED" SHALL BE INSTALLED FOR ALL WORK ZONES THAT OCCUR ON ANY STATE HIGHWAY IN CONNECTICUT WHERE THERE ARE WORKERS ON THE HIGHWAY OR WHEN THERE IS OTHER THAN EXISTING TRAFFIC OPERATIONS.

THE "ROAD WORK AHEAD FINES DOUBLED" REGULATORY SIGN SHALL BE PLACED AFTER THE SERIES 16 SIGN AND IN ADVANCE OF THE "ROAD WORK AHEAD" SIGN.

"END ROAD WORK" SIGN

THE LAST SIGN IN THE PATTERN MUST BE THE "END ROAD WORK" SIGN.



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
REQUIRED 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 TO DESIGNATE A LARGER WORK ZONE THAN THE WORK ZONE THAT IS ENCOMPASSED ON THIS PLAN.
3. SEE TABLE 1 FOR ADJUSTMENT OF TAPERS IF NECESSARY.
4. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN TRAFFIC DRUMS SHALL BE USED IN PLACE OF TRAFFIC CONES.
5. ANY LEGAL SPEED LIMIT SIGNS WITHIN THE LIMITS OF A ROADWAY / LANE CLOSURE AREA SHALL BE COVERED WITH AN OPAQUE MATERIAL WHILE THE CLOSURE IS IN EFFECT, AND UNCOVERED WHEN THE ROADWAY / LANE CLOSURE IS RE-OPENED TO ALL LANES OF TRAFFIC.
6. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN ANY EXISTING CONFLICTING PAVEMENT MARKINGS SHALL BE ERADICATED OR COVERED, AND TEMPORARY PAVEMENT MARKINGS THAT DELINEATE THE PROPER TRAVELPATHS SHALL BE INSTALLED.
7. DISTANCES BETWEEN SIGNS IN THE ADVANCE WARNING AREA MAY BE REDUCED TO 100' ON LOW-SPEED URBAN ROADS (SPEED LIMIT < 40 MPH).
8. IF THIS PLAN IS TO REMAIN IN OPERATION DURING THE HOURS OF DARKNESS, INSTALL BARRICADE WARNING LIGHTS - HIGH INTENSITY ON ALL POST-MOUNTED DIAMOND SIGNS IN THE ADVANCE WARNING AREA.
9. A CHANGEABLE MESSAGE SIGN SHALL BE INSTALLED ONE HALF TO ONE MILE IN ADVANCE OF THE LANE CLOSURE TAPER.
10. SIGN (P) SHALL BE MOUNTED A MINIMUM OF 7 FEET FROM THE PAVEMENT SURFACE TO THE BOTTOM OF THE SIGN.

TABLE 1 - MINIMUM TAPER LENGTHS

POSTED SPEED LIMIT (MILES PER HOUR)	MINIMUM TAPER LENGTH FOR A SINGLE LANE CLOSURE
30 OR LESS	180' (55m)
35	250' (75m)
40	320' (100m)
45	540' (165m)
50	600' (180m)
55	660' (200m)
65	780' (240m)

METRIC CONVERSION CHART (1" = 25mm)

ENGLISH	METRIC	ENGLISH	METRIC	ENGLISH	METRIC
12"	300mm	42"	1050mm	72"	1800mm
18"	450mm	48"	1200mm	78"	1950mm
24"	600mm	54"	1350mm	84"	2100mm
30"	750mm	60"	1500mm	90"	2250mm
36"	900mm	66"	1650mm	96"	2400mm



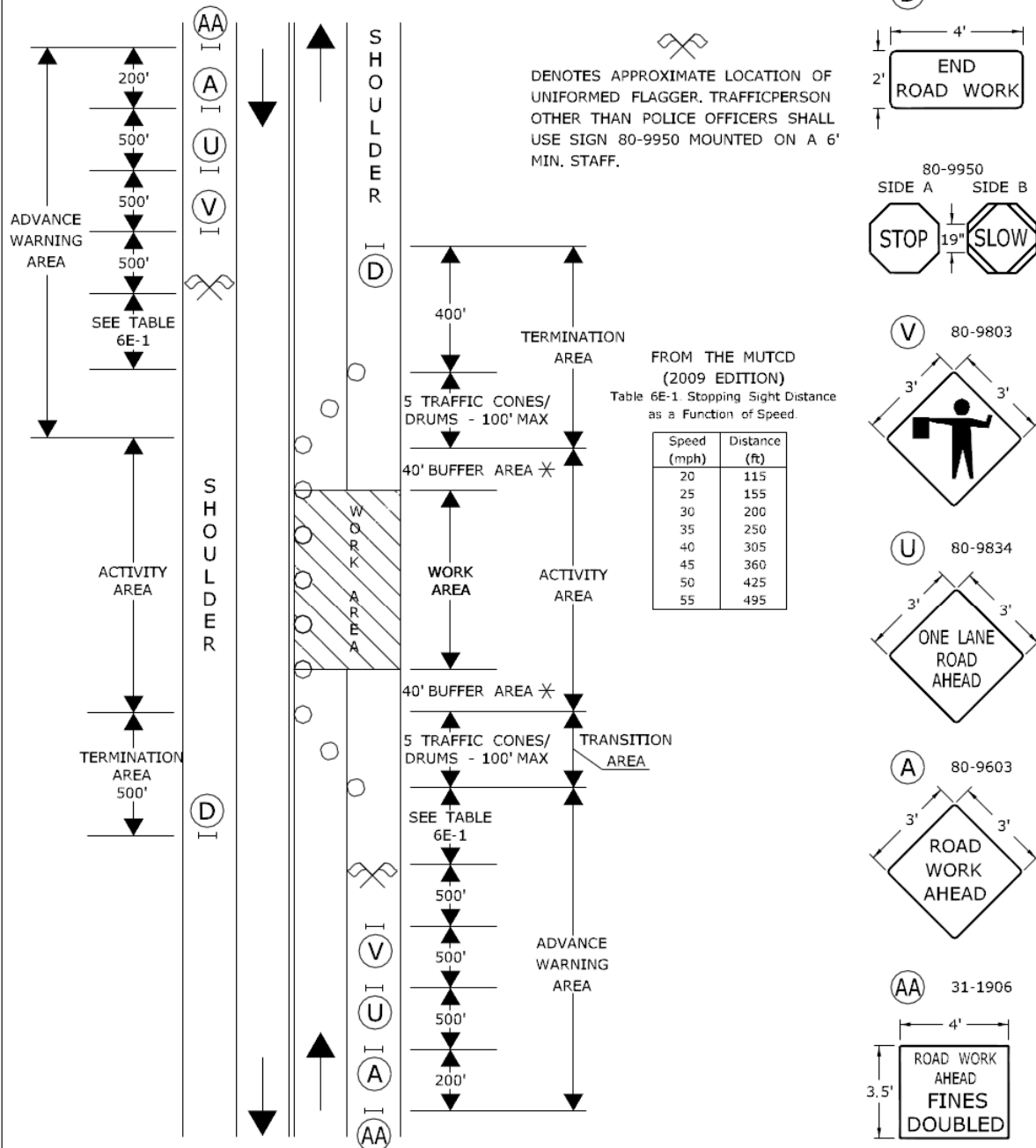
SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN

NOTES

WORK IN TRAVEL LANE AND SHOULDER TWO LANE HIGHWAY ALTERNATING ONE-WAY TRAFFIC OPERATIONS

SIGN FACE
108 SQ. FT (MIN.)



- TRAFFIC CONE **OR** TRAFFIC DRUM
- ✱ OPTIONAL ⊗ TRAFFIC DRUM — PORTABLE SIGN SUPPORT
- ◀ HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW



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* 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

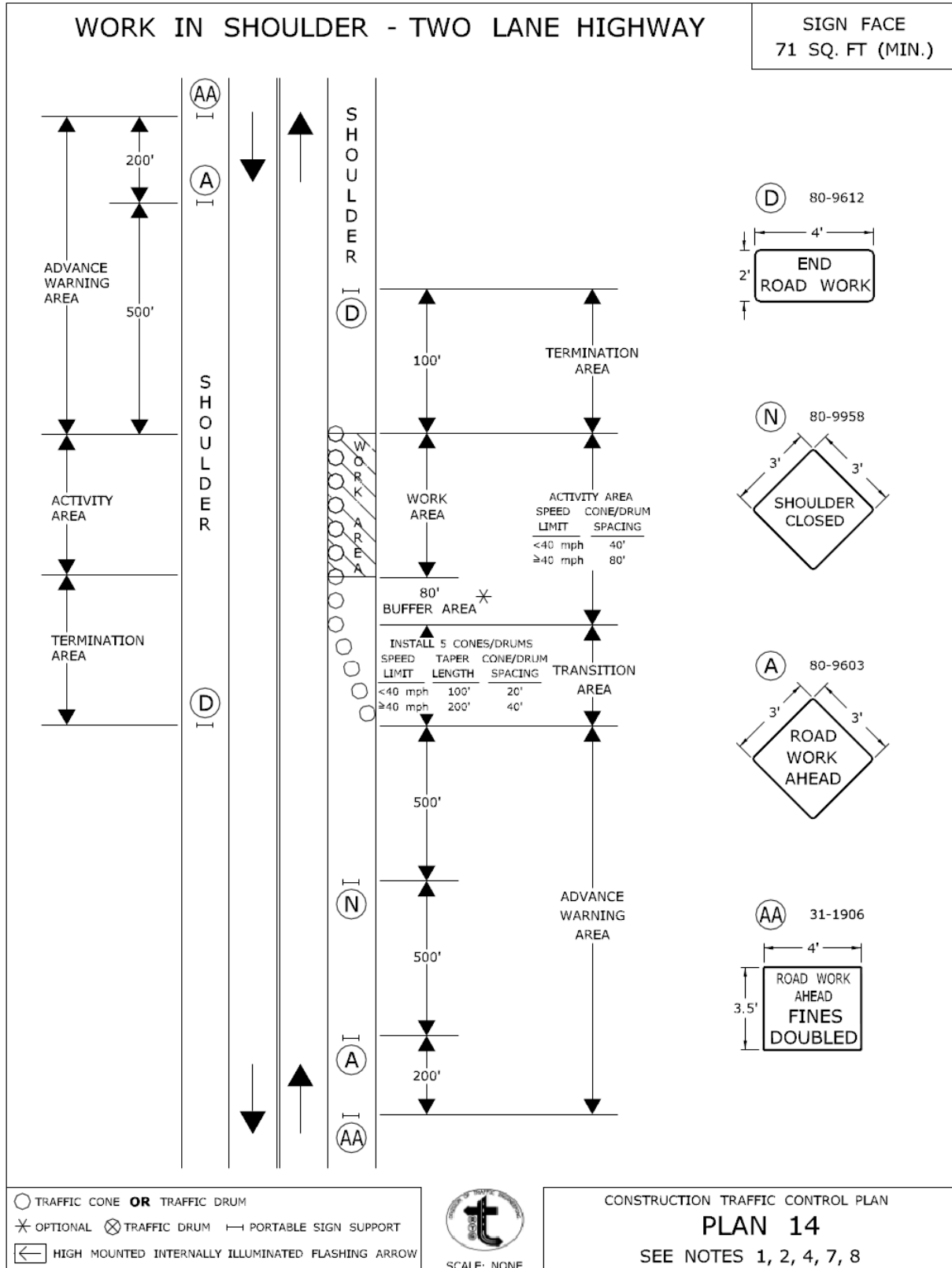


SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 13 - SHEET 2 OF 2
SEE NOTES 1, 2, 4, 6, 7, 8

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APPROVED *Charles S. Harlow*
PRINCIPAL ENGINEER Charles S. Harlow
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- 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

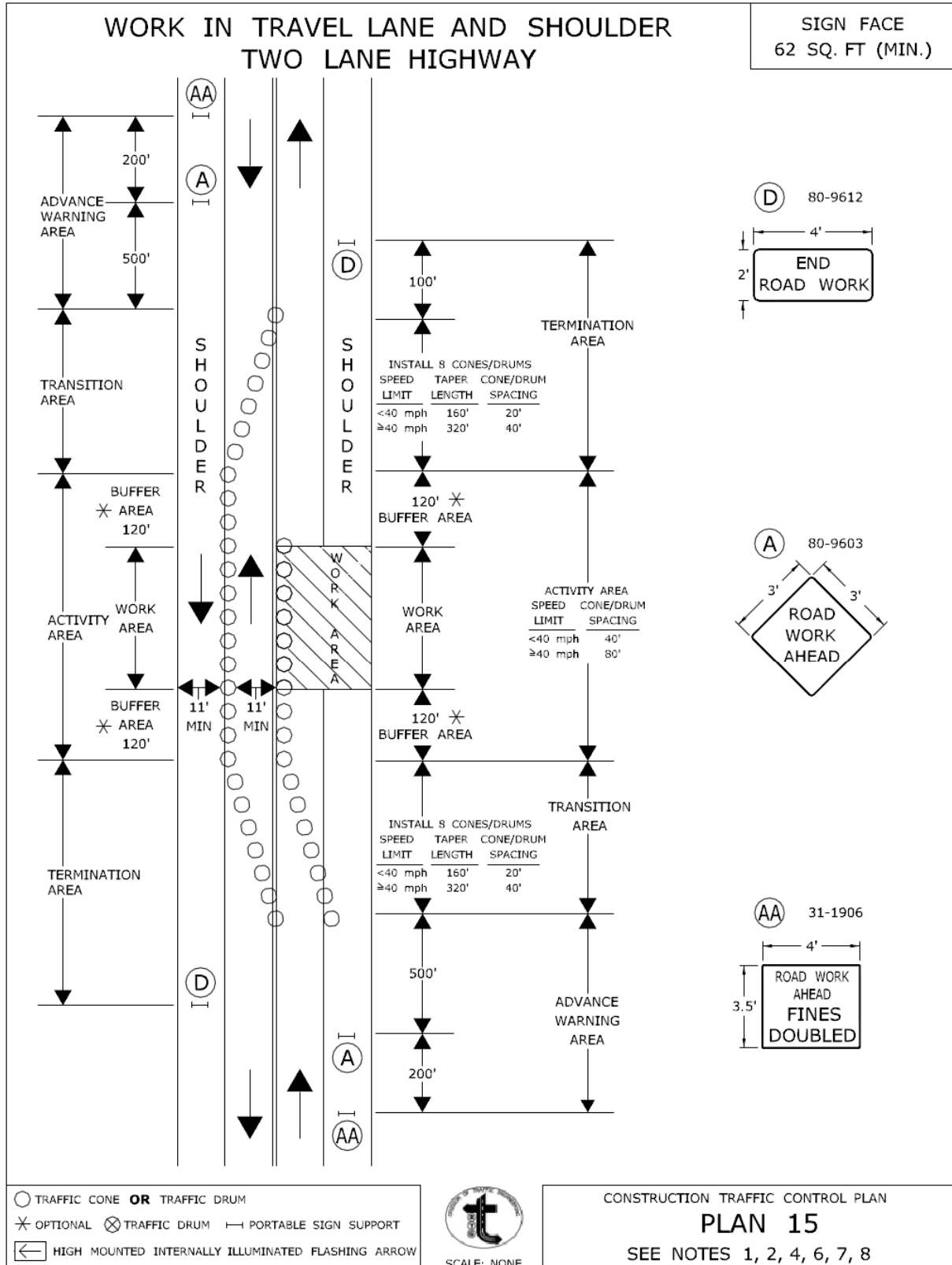
SEE NOTES 1, 2, 4, 7, 8

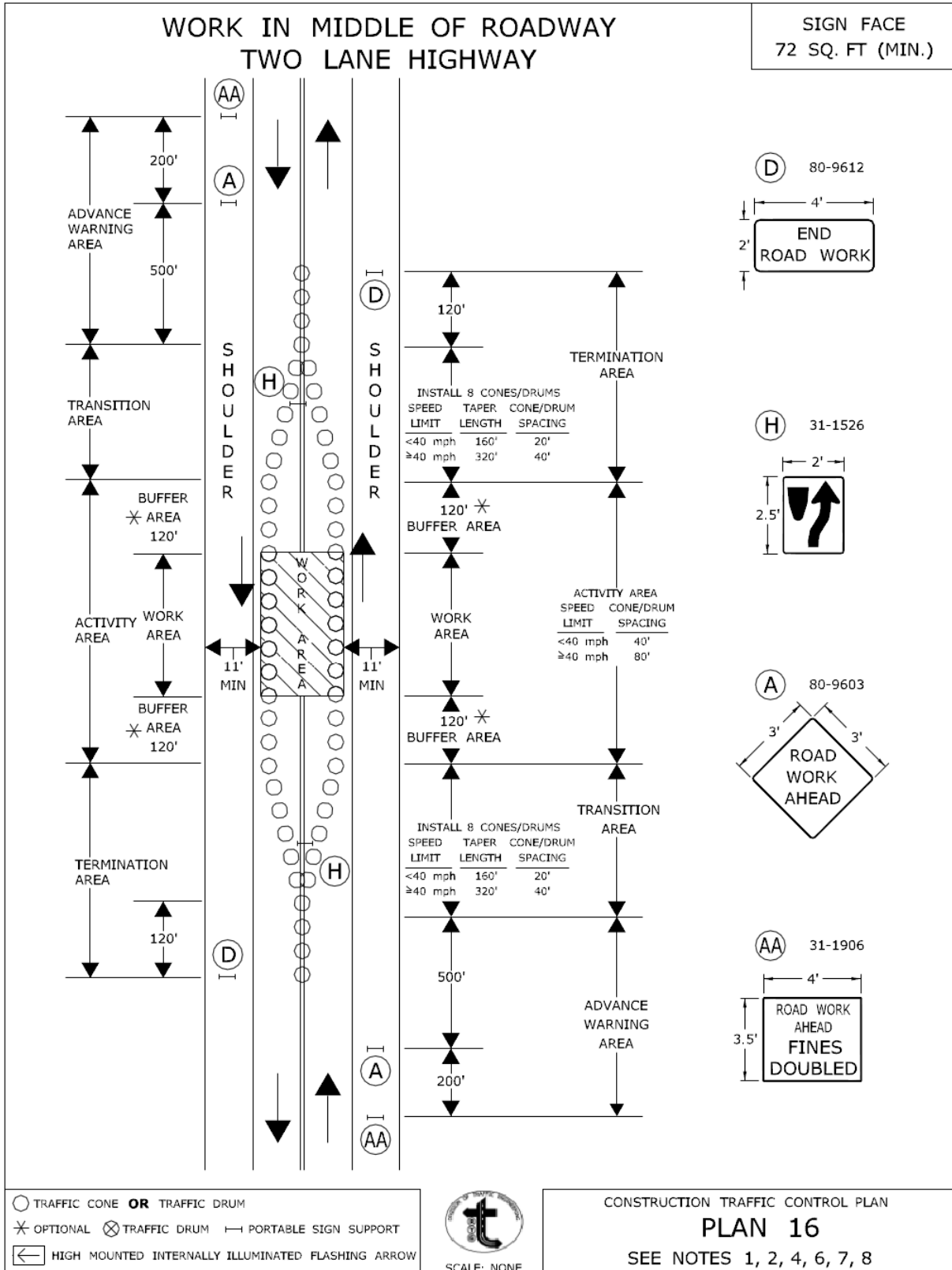
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BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

Charles S. Harlow
PRINCIPAL ENGINEER

Charles S. Harlow
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- 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

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Article 9.71.05 – Basis of Payment is supplemented by the following:

The temporary relocation of signs and supports, and the furnishing, installation and removal of any temporary supports shall be paid for under the item “Maintenance and Protection of Traffic”. Temporary overhead sign supports and foundations shall be paid for under the appropriate item(s).

The cost of furnishing, installing, and removing the material for the 4H:1V traversable slope shall be paid for under the item “Maintenance and Protection of Traffic.”

<u>Pay Item</u>	<u>Pay Unit</u>
Maintenance and Protection of Traffic	L.S.

ITEM NO. 1206023A - REMOVAL AND RELOCATION OF EXISTING SIGNS

Section 12.06 is supplemented as follows:

Article 12.06.01 – Description is supplemented with the following:

Work under this item shall consist of the removal and/or relocation of designated side-mounted extruded aluminum and sheet aluminum signs, sign posts, sign supports, and foundations where indicated on the plans or as directed by the Engineer. Work under this item shall also include furnishing and installing new sign posts and associated hardware for signs designated for relocation.

Article 12.06.03 – Construction Methods is supplemented with the following:

The Contractor shall take care during the removal and relocation of existing signs, sign posts, and sign supports that are to be relocated so that they are not damaged. Any material that is damaged shall be replaced by the Contractor at no cost to the State.

Foundations and other materials designated for removal shall be removed and disposed of by the Contractor as directed by the Engineer and in accordance with existing standards for Removal of Existing Signing.

Sheet aluminum signs designated for relocation are to be re-installed on new sign posts.

Article 12.06.04 – Method of Measurement is supplemented with the following:

Payment under Removal and Relocation of Existing Signs shall be at the contract lump sum price which shall include all extruded aluminum and sheet aluminum signs, sign posts, and sign supports designated for relocation, all new sign posts and associated hardware for signs designated for relocation, all extruded aluminum signs, sheet aluminum signs, sign posts and sign supports designated for scrap, and foundations and other materials designated for removal and disposal, and all work and equipment required.

Article 12.06.05 – Basis of Payment is supplemented with the following:

This work will be paid for at the contract lump sum price for “Removal and Relocation of Existing Signs” which price shall include relocating designated extruded aluminum and sheet aluminum signs, sign posts, and sign supports, providing new posts and associated hardware for relocated signs, removing and disposing of foundations and other materials, and all equipment, material, tools and labor incidental thereto. This price shall also include removing, loading, transporting, and unloading of extruded aluminum signs, sheet aluminum signs, sign posts, and sign supports designated for scrap and all equipment, material, tools and labor incidental thereto.

<u>Pay Item</u>	<u>Pay Unit</u>
Removal and Relocation of Existing Signs	L.S.

ITEM #1301082A 8" DUCTILE IRON PIPE (WATER MAIN)
ITEM #1302004A 8" GATE VALVE

13.01.01 Description

- A. This work will consist of furnishing and installing ductile iron water mains and appurtenances; removing, resetting, adjusting, or relocating existing water facilities; testing the completed water mains for pressure and leakage requirements; and disinfecting all completed water main, including all appurtenances; all in conformity with the requirements of this Specification and other Contract Documents. Work under this item shall also consist of installing all water main support brackets as shown on the plans.

Pre-insulated pipe, joints and fittings shall be used where available cover will be less than 4.5 feet. Pre-insulated pipe, joints and fittings for below grade applications shall be as supplied by Urecon Ltd., or approved equal, complete with 50-100 mils black polyethylene jacket with UV inhibitor. The jacket thickness is dependent on the diameter and intended function. The insulation of associated joints, fittings and accessories shall be as per the manufacturer's recommendations, depending on the size and type of pipe involved. The product shall be manufactured in accordance to ISO 9001-2000 Standards, or approved equal.

- B. The Contractor shall coordinate all work under this Section with the City of Meriden Water Department. The City shall be responsible for opening and closing all valves as required for the Contractor's work. The Contractor shall notify the City a minimum of 48 hours in advance of any desired valve operations. The Contractor is advised that the Water Department may not be able to respond to valve operation requests within 24 hours because of emergency conditions and that no claim shall be made against the Owner for this occurrence.
- C. The Contractor shall notify the City in writing with a copy to the Engineer of any service disruptions related to work on this project at least 48 hours in advance of such disruptions. In addition, a notice concerning service disruptions must be placed in the local newspaper one day before, and on the actual day of the scheduled disruption.
- D. The Contractor shall furnish to the Engineer, in the manner as directed, three (3) notarized Certificates of Conformance and Manufacture that all materials and/or equipment to be furnished under this contract meets the specification requirements. When directed, each shipment of material shall be accompanied by the manufacturer's notarized Certificate of Conformance and Manufacture. Unless otherwise specifically specified, all testing of materials shall be provided by the Contractor at no additional expense to the Owner. In addition, each manufacturer's Certificate shall be endorsed or accompanied by the Contractor's Certificate that the material certified by the manufacturer would be the material incorporated in the work.
- E. The Contractor shall maintain at the jobsite, in good order, one copy of all contract documents. Upon completion of work, the Contractor shall record on a 24" x 36" mylar

set of the contract drawings, any field changes of dimensions and detail that may have occurred, changes by change orders, and details not on the original contract drawings.

Specifically, the following information shall be shown on the record drawings for utilities within the contract work area:

1. As-built surface profile of proposed utility.
2. Top of rock profile, if applicable.
3. Type, size and rates of grade of existing and proposed pipes.
4. Stations and elevations of existing manholes, wyes, and catch basins.
5. All existing sanitary and storm lateral with depth to the invert at end of lateral indicated.
6. All building utility services shall be accurately shown on the map. The existing sanitary sewer, water, gas, electric, or telephone services encountered shall be located by dimensions and elevation.
7. All newly installed water lines shall be shown with curb boxes, valves, reducers, increasers, T's, hydrants (for water only) and house lines. Accurate dimensions to each valve from ranges of buildings or curb lines shall be shown. The proposed water main shall be located from the curb line and labeled with size and date of installation.
8. Building and lot numbers shall be shown for all lots where applicable. On a set of specifications, the Contractor shall legibly mark each section to record the manufacturer, trade name, catalog number and supplier of products, which were actually installed. These record documents consisting of contract drawings and specifications shall be delivered to the Engineer as one of the requirements for final payment.

13.01.02 Materials

- A. All materials shall be tested at the place of manufacture. All materials shall be subject to careful inspection in the presence of the Engineer or authorized inspector just before being laid or installed and shall be subject to approval before acceptance. All material found during the progress of the work to have cracks, flaws, or other defects shall be rejected by the Engineer or authorized inspector, and the Contractor shall promptly remove such defective material from the site of the work.
- B. Ductile iron pipe and fittings shall be ductile iron pipe manufactured in accordance with AWWA C151 latest revision, thickness Class 54 per AWWA C150, latest revision. Fittings shall be ductile iron rated at 350 PSI conforming to AWWA C110 latest revision. Ductile iron pipe and fittings shall be provided with a double thickness of cement-mortar lining conforming to AWWA C104 latest revision. The cement-mortar lining shall be seal coated. Exterior surfaces of pipe and fittings shall be given a standard bituminous coating of coal tar or asphalt of 1 mil minimum thickness. Joints for ductile iron pipe shall be rubber gasket push-on type, while fittings shall have mechanical joints with retainer glands. Pipe and fitting joints shall conform to AWWA C111, latest revision.

- C. The Contractor shall furnish and install the water main support brackets as indicated on the plans. The water main support shall be a B-Line Series Galvanized Steel B3064-3 Adjustable Strut Bracket, PHD Figure 855 Type No. 2 Bracket, or approved equal. Bracket supports shall be electro-galvanized in accordance with ASTM B633-15. Miscellaneous bolts, nuts and washers required for assembly or mounting shall be electroplated.
- D. Anchoring couplings shall be ductile iron mechanical joint couplings that provide a positive restrained connection between fitting and valve. Anchoring tees shall have mechanical joint main run ends. The branch shall have a plain end with an integral gland and mechanical joint gland, which can be rotated, to provide a restrained connection with the adjacent valve; fitting, etc. All bolts, nuts, rods and miscellaneous connecting pieces not provided with an acceptable factory coating shall be given two (2) coats of bituminastic paint after installation. All pipe and fittings shall be plainly marked for weight and pressure rating. Fittings of substandard weight or dimensions will not be accepted.
- E. Transition couplings or connecting sleeves shall be mechanical sleeve couplings designed for the specific types of pipe to be joined and shall be manufactured by the Dresser Manufacturing Division or approved equal,
- F. Concrete for thrust blocks shall conform to the requirements of Article M.03 for Concrete Class PCC03340.
- G. Strap rods shall be 3/4 inch round steel or wrought iron. Clamps shall not be less than 2" wide and 3/8" thick. Bolts securing clamps shall not be less than 5/8 inch round. Clamps and rods are to be protected against corrosion by a heavy coat of bituminous asphalt varnish after final assembly.
- H. Gate valves shall be of the iron body, bronze mounted, resilient seated, solid wedge disc, non-rising stem type, fitted with "O" ring seals, conforming to the requirements of A WW A C509, latest revision. Valves shall be suitable for 200-PSI minimum working pressure and 400-PSI test pressure. The operating nut shall be two (2) inches square and valves shall open "right" or clockwise. All interior and exterior surfaces of the valve body and bonnet and any exposed metallic surfaces of the gate shall be coated with a fusion bonded epoxy conforming to the requirements of A WW A C550, latest revision.
- I. Valve boxes shall be heavy pattern cast-iron three piece, screw type construction consisting of top section, mid-section and enlarged base (No- 6 for valve sizes up to 8" and No. 160 for 8" valves of sufficient length to provide without extension the required cover. The lower section shall be at least 5 1/4" inside diameter belled at the bottom to fit over the valve top. The middle section shall connect securely to the bottom section. The upper section shall screw over the outside threads of the middle section and be provided with a 6" diameter cover with the word "water" cast in raised letters. Valve boxes shall be coated with coal-tar pitch enamel or equal accepted coating. Valve boxes shall be

"Buffalo" type as manufactured by Buffalo Pipe and Foundry, J.C. Clow & Sons, Inc., or equal.

- J. Underground-type plastic line marker shall be a manufacturer's standard permanent, bright-colored, continuous-printed plastic tape, not less than 3" wide x 4 mils thick. Provide tape with printing which indicates "buried water."
- K. Support brackets shall be Eaton B-Line Series B3065-3 with pipe anchor B3147B-12 or approved equivalent.
- L. Miscellaneous materials not specified herein, shall be of the type, size, material and manufacture as shown on the drawings or as required for the installation. Such miscellaneous material shall be as approved by the Engineer.
- M. Pre-insulated pipe, joints and fittings shall be in accordance with the following:

Insulation

- i. Material: rigid polyurethane foam, factory applied
- ii. Thickness: 2" or as required
- iii. Density: (ASTM D 1622) 2.2-3.0 lbs/ft³
- iv. Closed cell content: (ASTM D 2856) 90%, minimum
- v. Water absorption: (ASTM D 2842) 4.0% by volume
- vi. Thermal conductivity: (ASTM C518) 0.14-0.17 Btu-in/ft²-hr-°F
- vii. Temperature limitations: Cryogenic to 200°F

System Properties

- i. System compressive strength: (modified ASTM D 1621 with 2" jacket) approximately 60-80 lbs/in², varies with pipe diameter
- ii. Temperature limitations: minimum ambient installation temperature @ -30°F; service temperature approximately -49°F

Outer Jacket on Pipe Insulation with Enhanced Cold Climate Handling Properties

The outer protective jacket shall consist of either-

Tape Wrap System

- i. Jacket material: Scapa #366 polyethylene, UV inhibited, specially formulated for superior cold environment properties
- ii. Sealant: butyl rubber and resin, applied hot in 25 mils multiple layers providing a shrink tightened waterproof bond throughout its entire length
- iii. Minimum elongation: (ASTM D 1000) 300%, 6 month test
- iv. Tensile strength: (ASTM D-1000) 38 lbs/in wide

Extruded System

The outer protective jacket on the casing system shall consist of high density polyethylene copolymer black PE, UV inhibited, factory applied as per the following specifications:

- i. Minimum cell classification 435560A for PE as per ASTM D 3350

- ii. Minimum 2% carbon black, well dispersed
- iii. Density 0.953 gm/cc ASTM D 4883
- iv. Tensile Strength at yield (2"/min) 3,700 psi, ASTM D 638

Recommended PE Jacket Thicknesses for Below Grade Applications

Jacket OD: ≤16" @ 50 mil

Jacket OD: >16" to <24" @ 75 mil

Jacket OD: ≥24" @ 100 mil

Insulated Pipe Joints

- i. Butt-Fused and Welded Joints: Insulated pipe joints shall be completed using pre-fabricated rigid polyisocyanurate or urethane half shells and sealed with the application of suitable wrap around adhesive lined heat shrink sleeves as supplied by the manufacturer. The heat shrink sleeves shall overlap the insulation jacket by a minimum of 3" on either side of the joint.
- ii. Bell & Spigot Joints: Insulated pipe joints shall be sealed with a 6" wide heat shrink sleeve or butyl mastic tape if the system is not electrically heat traced, 12" wide if traced.

Insulation Kits for Fittings

Insulation kits for fittings shall consist of rigid polyisocyanurate or urethane foam insulation with a fully bonded polymer protective coating on all exterior and interior surfaces, including ends. Kits to be supplied complete with silicone caulking for seams, stainless steel attachment straps and clips, and heat shrink sleeves or butyl mastic tape to seal between pipe and insulation kit.

- i. Rigid Polyisocyanurate or Urethane Foam Insulation
 - a) Density: (ASTM D1622) 1.7-2.0 lbs/ft³
 - b) Compressive strength: (ASTM D1621) 19-23 lbs/in²
 - c) Closed cell content: 90%, minimum
 - d) Water absorption: (ASTM C272) 4.0% by volume
 - e) Thermal Conductivity: (ASTM C 518) 0.19 Btu-in/ft²-hr-°F
 - f) Thickness: to match pipe insulation thickness
- ii. Polymer Coating
 - a) Two component high density polyurethane coating, black in color
 - b) Density: 73 lbs/ft³
 - c) Durometer D scale 60
 - d) Tensile strength: 1610 lbs/in²
 - e) Tear strength: 151 lbs/in
 - f) Thickness: 75 mils outside surfaces; 20 mils inside surfaces

13.01.03 Construction Methods

- A. Trenching and backfilling shall be completed in conformance with specification for "Trench Excavation" and "Rock in Trench Excavation".

- B. The construction of new water mains, services, and appurtenances shall be done by the Contractor subject to these documents. The Meriden Water Department shall retain the right to limit the length of time any main, or mains, shall be out of service, as emergency requirements demand. The length of any section of water main, temporarily removed from service for the operations under the Contract, shall be determined by the capability of the distribution system to supply water by other routes to the areas adjacent to or directly affected by, the section of service. Water service to individual customers may be interrupted only during the Contractor's work hours and as allowed by the Water Department.
- C. All pipe, fittings and valves shall be carefully inspected for defects prior to installation.
- D. Support brackets shall be mounted to the outside face of the downstream bridge parapet and spaced as shown on the plans.
- E. Each pipe shall be handled into the trench carefully. The Contractor shall furnish all slings, straps to permit satisfactory support of all spans of pipe when it is being handled. The Contractor shall take all necessary precautions to prevent movement of pipe in the event of the trench flooding. Any length of pipe broken or damaged due to mishandling or negligence on the part of the Contractor shall be replaced at no cost to the Owner.
- F. Ends of the pipe shall be thoroughly cleaned before joint is made. The surface of the joint shall be painted with required lubricant applied in accordance with the manufacturer's directions. The lubricant shall be of type recommended by pipe manufacturer. Pipes shall be jointed in strict accordance with pipe manufacturer's directions and work shall be done by skilled personnel.
- G. Pipe shall be laid on fine gravel bedding as shown on the trench details in the contract drawings with the bedding tamped under, around and up to the spring line of the pipe.
- H. No pipe or fittings shall be laid in water or on a frozen trench bottom or when, in the opinion of the Engineer, the trench conditions or the weather is unsuitable for such work. All joints shall be checked by feeler ring gauge to insure proper positioning of rubber gaskets.
- I. At locations where water main construction involves abrupt changes in pipe alignment, the changes shall be made with fittings as indicated on the contract drawings or ordered by the Engineer. Changes in pipe alignment shown at other locations shall be made with deflection of pipe joints and short lengths as required.
- J. All ductile iron pipe filler pieces that must be cut on-site from full pipe lengths shall be cut with a power saw and prepared in accordance with the pipe manufacturer's recommendations. Insofar as it is practical, the Contractor shall have on hand manufacturer supplied filler pieces (short length of pipe with plain ends) and short lengths of pipe to minimize on-site cutting of pipe.

- K. Concrete thrust blocks shall be constructed at all tees, bends, valves, plugs and caps. Thrust blocks shall be of the size indicated on the drawings and shall, in all cases be poured against undisturbed earth. Where thrust blocks are in contact with the pipe, concrete shall be kept clear of pipe joints.
- L. Ductile iron fittings of the proper type shall be furnished and installed wherever shown on the drawings and as required by the Engineer. All mechanical joints of fitting shall be restrained with retainer glands torqued to 70 ft-lb or as recommended by the manufacturer. In addition, all pipe joints within 24 feet of bends or tees shall be restrained.
- M. Vertical bends where shown on the drawings shall be anchored in both directions with pipe clamps and tie rods. The Contractor shall provide the necessary tie rods and clamps. Tie rods and clamps shall be as manufactured by the Grinnell Company, Inc., or equal.
- N. Valves shall be installed in the mains approximately where shown on the contract drawings. Each valve shall be installed with a gate box set vertically with top even with finished grade.
- O. The existing water main pipe shall be cut using methods approved by the pipe manufacturer with the open pipe end prepared for installation of watertight cap or plug. If the condition of the existing pipe is such that a cap or plug cannot be installed, then the Contractor shall install a flexible coupling and capped filler piece. The Contractor shall close all valves on abandoned water mains and remove the upper sections of their valve boxes.
- P. Wherever curves are negotiated by deflecting successive lengths of pipe, the deflection of each length of pipe shall not exceed three (3) degrees at any one joint. Consult manufacturer's literature for allowable deflection in inches for various pipe sizes and lengths to meet this requirement.
- Q. During trench filling, install a continuous underground-type plastic line marker, located directly over buried pipe at 3 feet below finished grade.
- R. Adjusting water gates shall mean the minor adjustment of existing curb stop and gate valve boxes to the proposed grade not involving major reconstruction of the unit. (Examples of adjusting are: screwing/sliding adjustable type boxes up or down to bring the valve box to required grade, or using approved extension pieces to bring valve boxes to required grades).
- S. Resetting gate boxes shall mean the minor construction required to re-align the valve boxes so that they are set plumb and are centered on the valve-operating nut. Care must be taken to ensure no part of the riser section bears on any pan of the valve.
- T. For the pre-insulated pipe, joints and fittings: Pipe and casing shall be cleaned of surface dust or dirt, if necessary, to insure adhesion of the foam to the pipe and casing surface.

The pipe may be treated by sand blasting or the application of a chemical foam-bonding compound to enhance adhesion, as deemed necessary by the manufacturer and project requirements.

Hydrostatic Testing

- A. Test for leakage shall be conducted on all portions of completed water pipelines and appurtenances and all methods and procedures for performing the testing of water mains shall be subject to the acceptance of the Engineer. Unless otherwise permitted, the testing shall be conducted with partial backfilling over the barrel of any new pipe, between new pipes, pipe fittings, valves and appurtenances of the section. Interiors of all pipes shall be cleaned of all dirt and foreign materials. The water pipelines may be tested in convenient sections acceptable to the Engineer.
- B. Testing of water mains shall conform to the requirements of Section 4 of the AWWA Specification C 600, latest revision, except as herein specified. The test pressure shall be a minimum of 150 PSI or 50% above working pressure; whichever is greater, for at least a three-hour duration. Maximum allowable leakage shall be as specified in the following table for the appropriate pipe diameter. Test results shall be accurate to within 0.4 of a liter.

Allowable Leakage per 1000 ft (305 m) of Pipeline*—gph†

Avg. Test Pressure psi (bar)	Nominal Pipe Diameter—in.															
	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48	54
450 (31)	0.48	0.64	0.95	1.27	1.59	1.91	2.23	2.55	2.87	3.18	3.82	4.78	5.73	6.69	7.64	8.60
400 (28)	0.45	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00	3.60	4.50	5.41	6.31	7.21	8.11
350 (24)	0.42	0.56	0.84	1.12	1.40	1.69	1.97	2.25	2.53	2.81	3.37	4.21	5.06	5.90	6.74	7.58
300 (21)	0.39	0.52	0.78	1.04	1.30	1.56	1.82	2.08	2.34	2.60	3.12	3.90	4.68	5.46	6.24	7.02
275 (19)	0.37	0.50	0.75	1.00	1.24	1.49	1.74	1.99	2.24	2.49	2.99	3.73	4.48	5.23	5.98	6.72
250 (17)	0.36	0.47	0.71	0.95	1.19	1.42	1.66	1.90	2.14	2.37	2.85	3.56	4.27	4.99	5.70	6.41
225 (16)	0.34	0.45	0.68	0.90	1.13	1.35	1.58	1.80	2.03	2.25	2.70	3.38	4.05	4.73	5.41	6.03
200 (14)	0.32	0.43	0.64	0.85	1.06	1.28	1.48	1.70	1.91	2.12	2.55	3.19	3.82	4.46	5.09	5.73
175 (12)	0.30	0.40	0.59	0.80	0.99	1.19	1.39	1.59	1.79	1.98	2.38	2.98	3.58	4.17	4.77	5.36
150 (10)	0.28	0.37	0.55	0.74	0.92	1.10	1.29	1.47	1.66	1.84	2.21	2.76	3.31	3.86	4.41	4.97
125 (9)	0.25	0.34	0.50	0.67	0.84	1.01	1.18	1.34	1.51	1.68	2.01	2.52	3.02	3.53	4.03	4.53
100 (7)	0.23	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50	1.80	2.25	2.70	3.15	3.60	4.05

*If the pipeline under test contains sections of various diameters, the allowable leakage will be the sum of the computed leakage for each size.

†To obtain leakage in litres/hour, multiply the values in the table by 3.785.

- C. Testing of water mains shall be performed by the Contractor at their expense as witnessed by the Engineer. Notarized records of the test results shall be submitted by the Contractor to the Engineer. In case the specified rate of leakage for the portion of the pipeline being tested is exceeded, the Contractor shall find and repair the leaks and the pipelines shall be

retested repeatedly if necessary, by the Contractor, until the required conditions are met, at no additional expense to the Owner.

Disinfecting Water Mains and Appurtenances

- A. All portions of completed water mains and appurtenances are to be disinfected before acceptance for operation by the City. Water mains shall be disinfected by the Contractor in conformance with AWWA Specification C 601, latest revision. In particular, the Contractor shall follow all of the disinfection procedures of Section 9 -Disinfection Procedures of AWWA Specification C 601, unless otherwise directed by the Engineer. The Contractor shall be responsible for satisfactory disposal of all flushing water and chlorinated water at no additional expense to the Owner. The Contractor shall submit to the Engineer, the type of chlorine to be used, the disinfection experience for the workers, and the procedures and equipment to be used.
- B. After the mains have been flushed clean, samples of the water contained in the mains shall be arranged by the Contractor to be taken for bacterial analysis by a testing laboratory certified in Connecticut. Only after the analyses of the samples are acceptable to the City shall the mains be made part of the system. In the event that positive reports of contamination are received, the Contractor shall flush and rechlorinate the mains as many times as may be necessary to obtain acceptable results. Samples shall be obtained from corporation cocks with copper gooseneck assemblies installed as directed along the main to be disinfected. The taking of samples from hoses or fire hydrants will not be allowed. After samples have been collected, the gooseneck assembly may be removed and retained for future use.
- C. The Contractor shall be warned the water main disinfection should be only accomplished by specially trained personnel and that the project's water mains are vital to the safety and well being of the municipality. State Health Department approval of the water main disinfection is to be received by the Contractor in a timely manner so as to quickly place the water mains into service.
- D. The Contractor shall submit an affidavit of compliance to the Engineer. The affidavit of compliance shall be the bacteriological test results certifying the water samples from the water main to be free of coliform bacteria contamination.
- E. The Contractor's workers who are responsible for the water main work should be aware of the potential health hazards with chlorine and should be trained to observe carefully the prescribed construction practices and disinfection procedures. The effectiveness of disinfection depends in large measure on maintaining clean pipes and avoiding major contamination during construction.
- F. The Contractor shall give thorough consideration to the impact of highly chlorinated water flushed to the receiving environment. If there is any question that damage may be caused by a chlorinated water discharge (to fish life, plant life, physical installations, or other downstream water uses of any type), then an adequate amount of reducing agent

should be applied by the Contractor to the water being disposed of in order to neutralize thoroughly the chlorine residual remaining in the water.

- G. To prevent possible backflow or siphonage of contaminants into the water distribution system which is in service, the Contractor will be required to provide a reduced pressure backflow preventer (RPD) on the temporary piping which is supplying water from the distribution system to the water main being treated and to provide such other safety and control measures as directed by the City.
- H. The Contractor shall be required to take samples and have testing performed by a certified testing laboratory for a minimum of the following items:
 - I.
 - 1. Total Coliform
 - 2. Standard Plate
 - 3. Count Gross Hydrocarbons
 - 4. Volatile Organics
- J. The Contractor shall take the required water samples after completion of flushing and disinfecting of the water main as directed by the Engineer. The Contractor shall be responsible for coordination and delivery of the samples to the certified testing laboratory. The Contractor shall also bear the costs of all water quality testing and analysis expenses by the certified laboratory.

13.01.04 Method of Measurement

- A. Ductile iron pipe for water mains shall be measured for payment by the linear feet for 8” size as measured along the axis of the pipe from the face of the hub forming the beginning of the work to the hub or spigot constituting the end of the line, measured through all fittings and valves in the line. Pipe for side street connections shall be measured from the centerline of the cross or tee to the point of connection to existing pipe.
- B. Flexible couplings, transition couplings, crosses, tees, bends, anchor couplings, joint restraints, thrust blocks will not be measured separately for payment, the cost of which shall be included in the price bid per linear feet for furnishing and installing the various sizes of ductile iron pipe for water mains.
- C. Support brackets will not be measured separately for payment and will be included in the cost of the pipe.
- D. Gate valves will be measured for payment by the unit of the 8” size in place and accepted, including valve box.
- E. Testing, flushing and disinfection of new water mains and appurtenances will not be measured for payment.

F. Maintaining temporary service connections and providing temporary water will be paid for under the item "Temporary Support of Utilities".

G. The cost of pre-insulated pipe, joints and fittings shall be included in the cost of the item.

PAY ITEM
8" Ductile Iron Pipe (Water Main)
8" Gate Valve

PAY UNIT
L.F.
EA.

ITEM #1303198A HYDRANT WATER MAIN
ITEM #1303201A RELOCATE HYDRANT (COMPLETE)

13.03.01 Description

- A. The work required by this section of the Specifications consists of the furnishing of all labor, equipment, appliances and materials and in performing all operations in connection with furnishing and installing new fire hydrants and the relocation of fire hydrant assemblies at the locations and to the details indicated and/or as directed by the Engineer including all pipe, fittings, valves and accessories, connections to other piping and structures, and testing of assemblies.

13.03.02 Materials

- A. Ductile iron pipe and fittings shall be ductile iron pipe manufactured in accordance with AWWA C151, latest revision, thickness Class 52 per AWWA C150, latest revision. Fittings shall be ductile iron rated at 2450 MPa conforming to AWWA C110, latest revision. Ductile iron pipe and fittings shall be provided with a double thickness of cement-mortar lining conforming to AWWA C104, latest revision. The cement-mortar lining shall be seal coated. Exterior surfaces of pipe and fittings shall be given a standard bituminous coating of coal-tar or asphalt of 1 mil minimum thickness. Joints for ductile iron pipe shall be rubber gasket push-on type, while fittings shall have mechanical joints with retainer glands. Pipe and fitting joints shall conform to AWWA C110 and C111; latest revision. All pipe, pipe, fittings, accessories and appurtenances shall be new and unused.
- B. All bolts, nuts, rods, and miscellaneous connecting pieces not provided with an approved factory coating shall be given two (2) coats of bitumastic 50 after installation.
- C. Crushed stone shall consist of clean, hard, durable, crushed rock and shall be satisfactorily free from fine sand, silt or rock flour. Crushed stone shall be uniformly graded and ranging in sizes from 3/4" to 1/4" and conforming to ASTM Designation: D693, latest revision.
- D. Hydrants shall be of the "dry barrel fire hydrant" post, compression shut-off type and shall conform to AWWA Specification C 502; latest revision and to the additional requirements specified herein.
1. Hydrants shall be equipped with the following features:
 - a. Type of hydrant: Traffic type
 - b. Bury depth: 5 feet.
 - c. Number of hose and pumper outlets:
 1. Two - 2 .5 inch hose outlets
 2. One 4.5 inch pumper outlets.
 - d. Type of outlet nozzle threads:
 1. 2.5 inch hose outlets to have national standard thread

2. 4.5" pumper outlet to have the following thread specifications:
(The Contractor shall confirm with the Fire Chief prior to ordering hydrants) Outside diameter thread 0.7", Pitch Diameter 5.25", Root diameter 5.125", 6 threads per 1"
 - e. Size of hydrant (nominal diameter of main valve opening): 5.25"
 - f. Size of inlet connection: 6"
 - g. Type of inlet connection; Mechanical joint with retainer gland
 - h. Direction of operating nut opening rotation: Right
 - i. Size of operating nut: National standard 1.5" Pentagon
 - j. Stem seal type: O-ring
 - k. Nozzles shall be furnished with caps and chains
2. Hydrants shall conform to the torque requirements specified in AWWA Specification C502, latest revision, regardless of bury length.
3. The opening between the wrench nut and top of the hydrant bonnet shall be protected from rain and dirt by an acceptable means (dry top construction).
4. Hydrant top section shall receive two shop coats of primer conforming to the requirements of Section 4.2 of AWWA Specification C502, latest revision. Second prime coat is to be red in color. Hydrants shall receive two field coats of red paint meeting the acceptance of the owner.
5. For purposes of standardization, hydrants shall be Model No. B-62B as manufactured by American Darling Valve, Birmingham, Alabama, Centurion, Model No. A423, as manufactured by Mueller Company, Decatur, Illinois; or Guardian Model K-81A as manufactured by Kennedy. No substitutions will be permitted.

13.03.03 Construction Methods

- A. Trenching and backfilling shall be completed in conformance with the specification for "Trench Excavation" and "Rock in Trench Excavation".
- B. All new pipe shall have cast on it or stamped on it by means of a hand die stamp, the maker's name or mark, and the year in which the pipe was cast. Also, the weight, thickness, class and sampling period shall be painted on each pipe. All pipe, fittings, hydrants and accessories shall be carefully inspected by the Contractor for damage before relocation and all defective, unsound or damaged materials shall be rejected. The Engineer will make such additional inspection he deems necessary and the Contractor shall furnish all necessary assistance for such inspection.
- C. No pipe joints shall be covered in any way until the joints have been inspected.
- D. Proper implements, tools and facilities, satisfactory to the Engineer shall be provided by the Contactor for the proper and satisfactory execution of the work.

- E. The Contractor shall coordinate new installation and relocation work with and in accordance, to the City of Meriden Water Bureau.
- F. The interior of pipe, valves, hydrants and fittings shall be thoroughly cleaned of foreign matter before being lowered into the trench and shall be kept clean during laying operations.
- G. The trench bottom and bedding shall be shaped and compacted to give substantially uniform unyielding circumferential support to the lower quarter of pipe and valves along their entire length. Bell holes shall be excavated so that after placement only the barrel of the pipe receives bearing pressure from the trench bottom.
- H. Hydrant assemblies, including all pipe, fittings, and accessories shall be installed in conformance with the AWWA Specification C600, latest revision, and the additional requirements specified herein.
- I. Ductile iron pipe shall be cut only by means of abrasive saws, hack saws, wheel type cutters or milling type cutters. The use of "squeeze" type pipe cutters, cutting torches, diamond points, and dog chisels will not be permitted. This work shall be done by the Contractor in a manner satisfactory to the Engineer and only experienced men shall be engaged thereon. Flame cutting of pipe by means of an oxyacetylene torch shall not be allowed.
- J. Jointing of mechanical joints, fittings, and valves shall be provided in accordance with the printed recommendations of the pipe manufacturer and as specified. The mechanical joint fittings, specials, and valves shall be suitable for jointing with the pipe with which they are used and the Contractor shall provide, at no additional expense to the Owner; all necessary adapters for the proper jointing of pipe, pipe fittings, specials, and valves. The last 7.75" outside of the spigot and inside of the bell of mechanical joints shall be thoroughly cleaned to remove oil, grit, excess coating, and other foreign matter from the joint.
- K. When assembling the joint it is essential that the gland be brought into place and bolts tightened in a manner to insure the maintaining of the same space between the gland and the face of the flange at all points around the socket. The range of bolt torque in making the joints shall be as recommended by the manufacturer of the mechanical joints. Overstressing of bolts will not be permitted; if effective sealing is not obtained at the recommended maximum bolt torque, the joint shall be disassembled, thoroughly cleaned and reassembled.
- L. Hydrants and appurtenances shall be installed as detailed on the contract drawings. Hydrants shall be set straight and true on a firm base. Bury depth shall be as required to maintain 5' cover on the hydrant branch pipe. The above ground portion of each new hydrant shall be covered with a burlap bag until it is accepted and ready for use.

- M. The Contractor shall remove each existing hydrant, assembly-using methods that will not damage the assembly. The Contractor shall furnish and install tie rods and clamps and concrete thrust blocks as necessary to ensure existing facilities are properly secured prior to removing hydrant assembly. The Contractor shall exercise care in the removal of these facilities. Any existing facilities damaged by the Contractor due to operations shall be replaced with new facilities, meeting these material specifications, by the Contractor with no separate payment for these items. Removed hydrant assemblies shall be brushed, cleaned, transported to the Owner's Water Department yard on Parker Avenue and stacked there at a location suitable to the Owner.
- N. A new hydrant shall be installed as detailed on the contract drawings and as noted in these specifications under Article 13.03.
- O. Existing facilities (gate valves and piping) which are deemed unserviceable by the Engineer, shall be removed and properly disposed of and replacement facilities shall be furnished and installed by the Contractor with payment provided per the appropriate bid items for such work. Existing fire hydrants with associated valves when necessary, shall be relocated as shown on the contract drawings or as directed by the Engineer.
- P. A solid sleeve shall be used for connection to the existing branch pipe and new 6" ductile iron pipe shall be installed as necessary so the hydrant may be relocated behind the new curb line. The existing 6" gate valve and ductile iron piping shall remain unless otherwise directed by the Engineer. The Contractor shall furnish and install tie rods and clamps and concrete thrust blocks as necessary to ensure facilities are properly secured prior to removing hydrant assembly. The Contractor shall exercise care in the removal and resetting of these facilities. Any existing facilities damaged by the Contractor due to operations shall be replaced with new facilities, meeting these material specifications, by the Contractor with no separate payments for these items.

Hydrostatic Testing

- A. Test for leakage shall be conducted on all portions of completed water pipelines and appurtenances and all methods and procedures for performing the testing of water mains shall be subject to the acceptance of the Engineer. Unless otherwise permitted, the testing shall be conducted with partial backfilling over the barrel of any new pipe, between new pipes, pipe fittings, valves and appurtenances of the section. Interiors of all pipe shall be cleaned of all dirt and foreign materials. The water pipelines may be tested in convenient sections acceptable to the Engineer.
- B. Testing of water mains shall conform to the requirements of Section 4 of the AWWA Specification C 600, latest revision, except as herein specified. The test pressure shall be a minimum of 22000 KSF or 50% above working pressure, which ever is greater, for at least a three-hour duration. Maximum allowable leakage shall be as specified in the following table for the appropriate pipe diameter. Test results shall be accurate to within 0.1 of a gallon.

- C. Testing of water mains shall be performed by the Contractor at their expense as witnessed by the Engineer. Notarized records of the test results shall be submitted by the Contractor to the Engineer. In case the specified rate of leakage for the portion of the pipeline being tested is exceeded, the Contractor shall find and repair the leaks and the pipelines shall be retested repeatedly if necessary, by the Contractor, until the required conditions are met, at no additional expense to the Owner.

Disinfecting Hydrant Assemblies

- A. All portions of completed water mains and appurtenances are to be disinfected. Disinfection shall be in conformance with AWWA Specification C601, latest revision. In particular, the Contractor shall follow all of the disinfection procedures of Section 9- "Disinfection Procedures When Cutting Into or Repairing Existing Mains" of AWWA Specifications C601, unless otherwise directed by the Engineer.
- B. The Contractor shall be responsible for satisfactory disposal of all flushing water and chlorinated water at no additional expense to the Owner.
- C. After the mains have been flushed clean, samples of the water contained in the mains shall be arranged by the Contractor to be taken by an approved testing laboratory for bacterial analysis. Only after the analysis of the samples are approved by the City shall the mains be made part of the water system. In the event that positive reports of contamination are received, the Contractor shall flush and rechlorinate the mains as many times as may be necessary to obtain approved results.
- D. The Contractor shall be required to take samples and have testing performed by an approved testing laboratory for a minimum of the following items:
 - 1. Total Coliform
 - 2. Standard Plate Count
 - 3. Gross Hydrocarbons
 - 4. Volatile Organics
- E. The Contractor shall take the required water samples after completion of flushing and disinfecting of the water mains as directed by the Owner. The Contractor shall be responsible for coordination and delivery of the samples to the approved testing laboratory. The Contractor shall also bear the costs of all water quality testing and analysis expenses by the approved laboratory. The Owner may also require additional testing if deemed necessary, at no additional expense to the Owner.
- F. The Contractor shall submit an affidavit of compliance to the Owner. The affidavit of compliance shall be the bacteriological test results certifying the water sampled from the water main to be free of coliform Bacteria contamination.

13.03.04 Method of Measurement

- A. Remove and reset hydrant assemblies will be measured for payment as a unit per each, complete in place and accepted by the Owner.
- B. Fire hydrants shall be measured as units, complete in place, regardless of bury depth as measured from, but not including the tee in the water main to the end of the excavation.
- C. Thrust blocks, retainer glands, testing, disinfection, and joint restraint shall not be measured for payment.

13.03.05 Basis of Payment

- A. Hydrant assemblies removed and reset shall be measured for payment at the contract unit price bid per each, for "Remove and Reset Fire Hydrant", which price and payment shall include ductile iron pipe, joint restraint, thrust blocks, pipe bedding and drain material, testing and disinfection, protection of utilities, and all labor, tools, equipment and incidentals necessary to complete the work: as specified, indicated and as directed by the Owner .
- B. New fire hydrant installations shall be paid for at the contract unit price each for "Fire Hydrant" (Water "Main) which price shall include the hydrant ductile iron pipe, valve and valve box., joint restraint, thrust blocks, pipe bedding and drain material, testing and disinfection, protection of utilities, and all labor, tools, equipment and incidentals necessary to complete the work as specified, indicated and as directed by the Owner.

PAY ITEM	PAY UNIT
Relocate Hydrant (Water Main)	Each
Fire Hydrant (Water Main)	Each

ITEM # 1401246A 16" DUCTILE IRON PIPE (SANITARY SEWER)

ITEM # 1401259A 27" DUCTILE IRON PIPE (SANITARY SEWER)

ITEM # 1401260A 30" 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 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.

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 M 01.01 of the Standard Specifications Form 818 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 Items for "Trench Excavation" and "Rock in Trench Excavation".

2.0 **TRENCH DEWATERING**

ITEM # 1401246A
ITEM # 1401259A
ITEM # 1401260A

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

ITEM # 1401246A
ITEM # 1401259A
ITEM # 1401260A

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 3/4-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.

4.0 DUCTILE IRON SEWER PIPE

4.1 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.

4.2 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.

4.3 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.

4.4 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.

4.5 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.

4.6 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

ITEM # 1401246A
ITEM # 1401259A
ITEM # 1401260A

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.

5.0 PIPE TESTS

5.1 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.

5.2 Visual Alignment Test:

Upon completion of a section of pipe, 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.

5.3 Low Pressure Air Test:

5.3.1 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.

5.3.2 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.

5.4 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.

5.5 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.

6.0 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 16” Ductile Iron Pipe (Sanitary Sewer), 27” Ductile Iron Pipe (Sanitary Sewer) and 30” 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 one of the following pay items:

- 16” Ductile Iron Pipe (Sanitary Sewer) 1.f.
- 27” Ductile Iron Pipe (Sanitary Sewer) 1.f.
- 30” Ductile Iron Pipe (Sanitary Sewer) 1.f.

The above pay items shall be complete and accepted in place, including all materials, equipment, tools and labor incidental thereto, including, but not limited to;

- A. 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. Pipe tests and all other materials, equipment, tools and labor incidental thereto.
- F. Planning and coordination of all work.

The contract unit price for the pay items for 16” Ductile Iron Pipe (Sanitary Sewer), 27” Ductile Iron Pipe (Sanitary Sewer) and 30” 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.

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 818, or latest.

PAY ITEM

PAY UNIT

16" Ductile Iron Pipe (Sanitary Sewer)
27" Ductile Iron Pipe (Sanitary Sewer)
30" Ductile Iron Pipe (Sanitary Sewer)

l.f.
l.f.
l.f.

ITEM # 1401675A SANITARY MANHOLE (6' DIA.) 10' TO 20' 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 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.
- C. 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.
- D. 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 and backfilling shall be completed in conformance with specification for "Trench Excavation" and "Rock in Trench Excavation".

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 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.

<u>Pay Item</u>	<u>Pay Unit</u>
Sanitary Manhole (6' Dia.) 10' to 20' Deep	Each

ITEM #1403115A – INVERTED SIPHON INLET CHAMBER (SANITARY SEWER)

ITEM #1403116A – INVERTED SIPHON OUTLET CHAMBER (SANITARY SEWER)

Description: Work under this item shall consist of designing, manufacturing, furnishing, and installing two (2) reinforced precast concrete sanitary sewer inverted siphon chambers, constructed of reinforced concrete cast to the size and length as shown on the plans. This item shall also include threaded rods, lifting and seating inserts, access doors, control gates, overflow weirs, baffle walls, restraining members, check valves, coatings, piping, non-shrink grout and all other materials and equipment necessary to complete the work.

Materials: Materials shall conform to the following requirements:

- A. Concrete: Concrete shall conform to the requirements of Subarticle M.14.01-1 of the Standard Specifications, as applicable. Concrete shall be air-entrained composed of Portland cement, fine and coarse aggregates, admixtures and water. The air-entraining feature may be obtained by the use of either air-entraining Portland cement or an approved air-entrained admixture. The entrained-air content shall be not less than 1.5 percent or more than 6 percent.
 - 1. The Contractor shall design and submit to the Engineer a concrete mix which shall attain a minimum 28-day strength (f'_c) of 4,000 psi. The Contractor shall further provide a certificate stating that the mix submitted shall meet this strength.
 - i. Coarse Aggregates shall consist of broken stone, having a maximum size of $\frac{3}{4}$ inch.
 - ii. Type III or Type IIIA Portland cement may be used at no additional cost to the State.
 - iii. Water-Reducing Admixture: The Contractor may submit, for approval of the Engineer, water-reducing admixture for the purpose of increasing workability and reducing the water requirement for the concrete.
 - iv. Calcium Chloride: The addition to the mix of calcium chloride or admixtures containing calcium chloride will not be permitted.
 - v. Reinforcing Steel, Welded Wire Fabric and Tie Wire: All deformed bars, stirrups, welded steel wire fabric, dowels, threaded dowels and tie wires shall be uncoated and conform to the requirements of Article M.06.01.

- B. Lifting Hooks and Seating Fixtures: Each chamber section shall contain a suitable number of reinforced lifting and/or seating fixtures to insure safe and level handling and to prevent structural damage during installation. Devices and attachments shall be of a design satisfactory for the purpose intended. All fixtures cast into the concrete for the purpose of lifting or chambers shall have a corrosive resistant coating.
- C. Nuts, Washers And All Other Miscellaneous Hardware: Nuts, washers and all other miscellaneous exterior hardware: shall be galvanized in accordance with ASTM Designation A153.
- D. Gaskets: Gaskets shall be flexible, expanded rubber conforming to the requirements of ASTM D 1056, and shall form and maintain a water tight and flexible joint.
- E. Non-Shrink Grout: Non-shrink grout shall conform to Subarticle M.03.01-12.
- F. Damproofing: Materials shall conform to the requirements of Section 7.08 – Damproofing.
- G. Corrosive Resistant Interior Coating: High performance coating for immersion/exposure (severe) including hydrogen sulfide (H₂S) vapor exposure. Surface preparation, primers, finish coating, application, thickness, curing, etc. per manufacturer's specifications. The following suppliers have been approved for furnishing protective coating systems.
1. Tnemic, Inc.
 2. Sauereisen
 3. Approved equal
- H. Threaded Inserts: Threaded inserts shall have a corrosive resistant coating and shall provide adequate resistance to pull-out for location and purpose for which they are to be used. The following threaded inserts have been approved for use in concrete control vaults.
1. Dayton Superior, Type f-57
 2. Richmond Screw Anchor Company, Type LF
 3. Star Expansion Industries Corporation, Type P-25-T
- I. Pipe: Inlet and outlet pipes cast into the chamber walls shall be ductile iron grade 60-42-10, an annealed grade with the following specified minimum properties: tensile strength, 60,000 psi; yield strength, 42,000 psi; elongation, 10 percent. Pipe shall conform to ANSI/AWWA C151/A21.51. #Ductile iron pipe may be pressure class or thickness class, and shall have a minimum wall thickness of 0.25-inch.
- J. Insert Stiffeners: Stainless steel or coated steel stiffeners are to be used at connection of HDPE to ductile iron pipe outside vaults. Stiffeners shall be placed inside the HDPE pipe to a depth exceeding the coupling length on the HDPE pipe. Stiffeners may be solid, wedge, or split type designs.

- K. Couplings: Couplings shall be suitable for joining HDPE and ductile iron pipe of the diameters specified on the plans. Coupling body shall be ductile iron (Epoxy Powder Coated) or stainless steel. Gasket material shall be EPDM or Nitrile. Couplings shall be full pressure rated – same as the pipes joined, and shall be self-restraining.
- L. Slide Gates: Slide gates are to be used to direct and isolate flow. Slide gates are to be of all stainless steel construction, including operating shafts. Gates are to be wall mounted or channel mounted with block outs, as noted on the plans. The operating shaft shall be installed with the top of the shaft within one foot of the top of the vault. Access to operating shafts is to be from exterior via access doors. Gates shall all have non-rising stems. Operating shafts shall include a 2-inch operating nut at the top of each shaft. Shafts are to be restrained with stem guides as per the manufacturer's recommendations. Restraint of shafts is per the method detailed in the plans. Where shown, block-outs are to be furnished for installation of slide gates. Block-outs are to be filled with non-shrink grout and finished smooth, prior to application of interior corrosion resistant interior coatings. Slide gates are to be AWWA C561 compliant. Gates shall operate for the full range without binding or mis-aligning. Gates shall be mounted with specified corrosive resistant threaded inserts. The following suppliers have been approved for furnishing slide gates.
1. Whipps, Inc.
 2. Fontaine/Aquanox
 3. Approved equal
- M. Weirs: Downward adjusting overflow weirs are to be used to control flow. Overflow weirs are to be of all stainless steel construction, including operating shafts. Weirs are to be wall mounted. The operating shaft shall be installed with the top of the shaft within one foot of the top of the vault. Access to operating shafts is to be from exterior via access doors. Weirs shall have non-rising stems. Operating shafts shall include a 2-inch operating nut at the top of each shaft. Shafts are to be restrained with stem guides as per the manufacturer's recommendations. Restraint of shafts is per the method detailed in the plans. Weirs are to be AWWA C561 compliant. Gates shall operate for the full range of threaded shaft length without binding or mis-aligning. Weirs shall be mounted with specified corrosive resistant threaded inserts. The following suppliers have been approved for furnishing overflow weirs.
1. Whipps, Inc.
 2. Fontaine/Aquanox
 3. Approved equal
- N. Flap Gates: Flap gates are to be furnished in the discharge (downstream) vault, to prevent backflow of sewage, as shown in the plans. Flap gates shall be wall mounted over inlet pipes to discharge vault. Flap gates shall be light-weight. Materials may be composite (fiberglass), aluminum, or stainless steel. Flap gates shall be mounted with specified corrosive resistant threaded inserts. The following suppliers have been approved for furnishing flap gates.

1. Plasti-Fab
 2. Whipps, Inc.
 3. Approved equal
- O. Access Doors: Access doors are to be furnished at the locations, configurations and to the sizes noted on the plans. Attention to the location of the hinge side of the doors is important. Access door material shall be aluminum. Doors shall be flush mounted to the roof of the chambers. Access doors shall be furnished with OSHA compliant safety railing/chains. Access doors shall be drainable. Access doors shall be locking. The following suppliers have been approved for furnishing access doors.
1. Bilco
 2. Nystrom
 3. Acudor

Construction Methods:

Calculations, Working Drawings & Shop Drawings: Before fabrication, the fabricator shall prepare and the Contractor shall submit shop drawings and working drawings, as well as complete design calculations, to the Engineer for approval in accordance with Article 1.05.02 (b). These drawings shall include complete details of the methods, materials, and equipment that are proposed to be used. Drawings and calculations shall be stamped by a professional engineer registered in the State of Connecticut. No fabrication is to commence on the precast units until the shop drawings and design calculations are approved by the Engineer. Working drawings shall include the following unless otherwise approved in advance.

1. Layout plan of Siphon Chamber
2. Typical cross-sections showing length, width, height and thickness of walls and slabs.
3. Type, size, location and spacing of steel reinforcing and inserts for anchoring threaded deformed steel bars. Bending diagrams, material lists and catalog cuts for inserts shall be provided.
4. Type, size and location of lifting holes and seating fixtures. All fixtures (inserts, etc.) cast permanently into the sections shall be recessed a minimum of $\frac{3}{4}$ inches. No more than four lifting holes or fixtures shall be located in each box section.
5. Location, spacing, type, and size of all inserts cast into the chambers.
6. Complete details of the lap joints at the end of the sections, which shall include the type, size and location of gaskets and additional steel reinforcement. Except where shown otherwise, the ends of the sections shall have lap joints with not less than $1\frac{1}{2}$ inches of concrete overlap. Each joint shall be provided with a pre-placed gasket.
7. The type and application method of the corrosive resistant coating.
8. Limits of Dampproofing.

9. Material designations.

Mixing and Placing Concrete: The concrete mix as designed and submitted by the Contractor shall be proportioned and mixed in a batch mixer to produce a homogeneous concrete conforming to the requirements. The transporting, placement and compaction of concrete shall be by methods that will prevent the segregation of the concrete materials and the displacement of the enforcement steel from its proper position in the form. There shall be no interruption in the pouring of any unit. Truck-mixed or transit-mixed concrete will not be allowed.

Concrete shall not be deposited into the forms when the ambient temperature is below 40° F or above 100° F, unless adequate heating or cooling procedures have been previously approved by the Engineer. The concrete temperature shall be 60° F to 90° F at the time of placement. At no time will truck-mixed or transit-mixed concrete be allowed.

Production during the winter season, from November 15 to March 15 inclusive, will be permitted only on beds located in a completely enclosed structure of suitable size and dimension that provides a controlled atmosphere for the protection of the casting operation and the product. Outside operations will not be permitted during rainfall unless the operation is completely under cover.

Vibrating shall be done with care in such a manner as to avoid displacement of reinforcing steel, voids, forms, or other components. There shall be no interruption in the pouring of any of the sections. Concrete shall be carefully placed in the forms and vibrated sufficiently to produce a surface free from imperfections such as honeycombing, segregation, cracking, or checking. Any deficiencies noted in the sections may be cause for rejection.

Curing: Precast units shall be cured by a method or combination of methods approved by the Engineer, that will give satisfactory results. Curing shall be for a sufficient length of time so that the concrete will develop the specified compressive strength at 28 days or less.

Touch-up: Repairs to the interior corrosion resistant coatings shall be made at all locations potentially exposed to sewage. Touch-up is to be in accordance with the manufacturers recommended methods.

Reinforcing: Top reinforcing steel in the top slab of the siphon chambers shall be epoxy-coated.

Inlet and Outlet Pipes: Ductile iron inlet and outlet pipes should be securely set into the chamber at the elevations and locations noted on the plans. Outlet pipes shall include the bell end of the pipe. Inlet pipes may be plain spools.

Test Cylinders: During the casting of the units, the Contractor shall make test cylinders under the supervision of the Engineer. A minimum of four (4) cylinders shall be taken during each production run or as ordered by the Engineer. The dimensions and type of cylinder mold shall be as specified by the Engineer. Cylinders shall be cured under laboratory control conforming to the requirements of ASTM C 192 and shall be used to determine the 28-day compressive strength

requirements (f'c). Failure of any of the 28-day test cylinders to meet 90 percent of the minimum compressive strength requirements may be cause for rejection. The Engineer also reserved the right to request and test core specimens from the units to determine their adequacy.

Quality Control: The dimensional tolerance of the units shall conform to the following:

1. Internal Dimensions and Finish: The internal dimensions shall not vary more than 1 percent from the design dimensions. The interior shall be smooth and free of irregularities.
2. Slab and Wall Thickness: The slab and wall thickness shall not be less than that shown in the design by more than 5 percent or $\frac{3}{16}$ inch, which ever is greater. A thickness more than that required in the design will not be a cause for rejection.
3. Position of Reinforcement: The maximum variation in the spacing of reinforcement shall be $\pm \frac{1}{4}$ inch. Cover shall be 1- $\frac{1}{2}$ inches minimum.

Finishing: All fins, runs, or mortar shall be removed from surfaces which will remain exposed. Form marks on exposed surfaces shall be smoothed by grinding as needed.

Handling and Storage: Handling devices shall be provided in each section for the purpose of handling and placing. Care shall be taken during storage, transporting, hoisting and handling of all units to prevent cracking or damage. Units damaged by improper storage, transporting or handling shall be replaced by the Contractor at his expense.

Inspection and Rejection: The quality of materials, the process of manufacture, and the finished units shall be subject to rejection on account of failure to conform to any of the specification requirements. Individual units may be rejected because of any of the following:

1. Fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint.
2. Defects that indicate imperfect proportioning, mixing and molding.
3. Honeycombed or open texture.
4. Damaged ends, where such damage would prevent making a satisfactory joint.
5. Incorrect, misaligned or non-function parts including but not limited to threaded rods, lifting and seating inserts, access doors, control gates, overflow weirs and baffle walls.

Installation: The precast units shall be installed in accordance with details and notes as shown on the plans and in conformance with these specifications.

Joints shall be provided with a pre-placed gasket, shall fit tight and provide good alignment of sections and inside faces.

In case of conflict and actual field construction cannot proceed according to proposed construction, the Engineer may direct special construction as may be deemed necessary for the completion of the work in a satisfactory and acceptable manner.

Excavation: Excavation for the installation of the chambers should conform to the specification for “Trench Excavation” and “Rock in Trench Excavation”. Topsoil that is removed during the excavation for the chambers should be stockpiled in designated areas and should not be mixed with subsoil or other materials.

The chambers should not be installed on frozen ground. Excavation should extend a minimum of 12 inches from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required

In areas with a high water table, continuous dewatering should be provided to ensure that the excavation is stable and free of water.

Leveling: A 12 inch layer of granular fill material (conforming to Section 2.14 of the Standard Specification Form 818) should be installed, compacted, and leveled at the bottom of the excavation to the proper elevation for the installation of the chamber base.

The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

Adjustment of the Chambers can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and reinstalling the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the chambers have been constructed, the lift holes should be plugged and mortared inside and outside.

Backfilling: Methods of backfilling shall be in conformance with the requirements of the plans and Section 2.16 except that fill placed around the siphon chambers shall be deposited on both sides to approximately the same elevation at the same time.

Method of Measurement: This item shall be measured as each unit completely installed and accepted in place.

Basis of Payment: Payment for this work will be made at the contract unit price for “Inverted Siphon Inlet Chamber (Sanitary Sewer)” and “Inverted Siphon Outlet Chamber (Sanitary Sewer)” as shown on the plans, completed and accepted, which price shall include design calculations, load ratings, shop drawings, working drawings, threaded inserts, damproofing, threaded dowels, pipe sleeves, void forms, non-shrink grout, gaskets and all materials, equipment, tools and labor incidental thereto.

Pay Item:

Pay Unit:

Inverted Siphon Inlet Chamber (Sanitary Sewer)
Inverted Siphon Outlet Chamber (Sanitary Sewer)

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ITEM #1504010A – TEMPORARY SUPPORT OF UTILITIES

Description:

Work under this item shall consist of the protection and temporary support of utilities currently attached to, supported by, or adjacent to the existing bridge which will require support during the construction of the new bridge. The Contractor shall be responsible for providing facilities for the temporary support of the following utilities during construction:

Water Main

All pipes, fittings, equipment and labor necessary to maintaining temporary service and providing temporary water will be included in this item.

Sanitary Sewer Main

All temporary bypass and pumping equipment and supports necessary to make the connection between the proposed and existing sanitary sewer system.

The Contractor shall provide an adequate bypass and pumping system with full redundancy necessary to handle the estimated average flow of 1,500 gpm. The contractor must notify the City and Engineer at least 2 weeks prior to performing any temporary bypass and pumping work. Pumping during the wet condition or without the City's and observation will not be allowed.

Gas Main

The contractor shall provide a temporary bridge capable of supporting the temporary gas main(s) during construction. All design, review and construction methods associated with the temporary support of the gas main shall be coordinated and approved by Eversource Gas.

Construction Methods:

The Contractor shall design and construct the temporary support system for the utilities in a temporary location necessary to complete the new structure and shall be solely responsible for the adequacy of his design. The Contractor shall obtain all necessary permits for the performance of the work and shall assume all liabilities in connection therewith. The Contractor shall prepare and submit to the Engineer or any regulatory agency, working drawings showing the plan for construction of the temporary support system. Working drawings shall be developed and submitted in accordance with Article 1.05.02. These drawings shall bear the seal of a Professional Engineer licensed in the State of Connecticut. Work shall not be initiated until approval from the Engineer and the City has been obtained.

The approval of any regulatory agency or of the Engineer shall not serve to relieve the Contractor of the responsibility for the safety of his method or equipment or from carrying out the work in full accordance with the plans and specifications.

All parts of any temporary structures used in this work shall be removed and disposed of off the site after relocation of the utilities to their final location.

Method of Measurement:

Work on this item, being paid for 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 "Temporary Support of Utilities", which price shall include all pipes, pumps, materials, equipment, tools, labor and work incidental thereto. This shall include the construction and removal of any temporary structure used for the temporary support of the existing utility.