

DECEMBER 20, 2019

**REHABILITATION OF BRIDGE NO. 03903 MOSHER AVENUE
OVER AMTRAK RAILROAD**

**FEDERAL AID PROJECT NO. 6058(002)
STATE PROJECT NO. 0058-0336
TOWN OF GROTON**

ADDENDUM NO. 2

SPECIAL PROVISIONS

NEW SPECIAL PROVISIONS

The following Special Provisions are hereby added to the Contract:

- NOTICE TO CONTRACTOR – ELECTRONIC ENGINEERING DATA (EED)
- NOTICE TO CONTRACTOR – SNOW REMOVAL
- NOTICE TO CONTRACTOR – GLOBAL POSITIONING SYSTEM (GPS)
COORDINATES FOR SIGNS

- SECTION 12.00 – GENERAL CLAUSE FOR HIGHWAY SIGNING

- ITEM NO. 0216012A – CONTROLLED LOW STRENGTH MATERIAL
- ITEM NO. 0603233A – GALVANIZING STRUCTURAL STEEL (SITE NO. 1)
- ITEM NO. 0822017A – TEMPORARY PRECAST CONCRETE BARRIER
CURB WITH CHAIN LINK FENCE
- ITEM NO. 0900000A – NOISE MITIGATION
- ITEM NO. 0913069A – TEMPORARY 8’ CHAIN LINK FENCE
- ITEM NO. 0969062A – CONSTRUCTION FIELD OFFICE, MEDIUM
- ITEM NO. 0970007A – TRAFFICPERSON (UNIFORMED FLAGGER)

REVISED SPECIAL PROVISIONS

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

- CONTRACT TIME AND LIQUIDATED DAMAGES
- NOTICE TO CONTRACTOR – WORK ON OR ABOVE AMTRAK
PROPERTY

- SECTION 1.06 – CONTROL OF MATERIALS
- SECTION 1.08 – PROSECUTION AND PROGRESS

- ITEM NO. 0514271A – PRECAST CONCRETE/STEEL COMPOSITE SUPERSTRUCTURE
- ITEM NO. 0601054A – ULTRA HIGH PERFORMANCE CONCRETE
- ITEM NO. 0601275A - PRECAST SUBSTRUCTURE ELEMENTS
- ITEM NO. 0601277A – PRECAST CONCRETE BRIDGE COMPONENTS
- ITEM NO. 0603474A – METALLIZING STRUCTURAL STEEL (SITE NO. 1)
- ITEM NO. 0712021A – GRS ABUTMENT AND WINGWALL
- ITEM NO. 0712023A – REINFORCED SOIL FOUNDATION (RSF)
- ITEM NO. 0721024A – REINFORCED INTEGRATED APPROACH
- ITEM NO. 0913068A – TEMPORARY 6’ CHAIN LINK FENCE
- ITEM NO. 0921011A – CONCRETE DRIVEWAY
- ITEM NO. 1300005A – RELOCATION OF WATER MAINS
- ITEM NO. 1301019A – TEMPORARY RELOCATION OF WATER MAINS

CONTRACT ITEMS

NEW CONTRACT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>
<u>0202501</u>	<u>CUT CONCRETE PAVEMENT</u>	<u>L.F.</u>	<u>200</u>
<u>0202502</u>	<u>REMOVAL OF CONCRETE PAVEMENT</u>	<u>S.Y.</u>	<u>350</u>
<u>0216000</u>	<u>PERVIOUS STRUCTURE BACKFILL</u>	<u>C.Y.</u>	<u>100</u>
<u>0216012A</u>	<u>CONTROLLED LOW STRENGTH MATERIAL</u>	<u>C.Y.</u>	<u>59</u>
<u>0603233A</u>	<u>GALVANIZING STRUCTURAL STEEL (SITE NO. 1)</u>	<u>L.S.</u>	<u>L.S.</u>
<u>0822017A</u>	<u>TEMPORARY PRECAST CONCRETE BARRIER CURB WITH CHAIN LINK FENCE</u>	<u>L.F.</u>	<u>234</u>
<u>0900000A</u>	<u>NOISE MITIGATION (ESTIMATED COST)</u>	<u>EST.</u>	<u>\$10,000.00</u>
<u>0913069A</u>	<u>TEMPORARY 8’ CHAIN LINK FENCE</u>	<u>L.F.</u>	<u>105</u>

<u>0950005</u>	<u>TURF ESTABLISHMENT</u>	<u>S.Y.</u>	<u>1,562</u>
<u>0969062A</u>	<u>CONSTRUCTION FIELD OFFICE, MEDIUM</u>	<u>MO.</u>	<u>17</u>

REVISED CONTRACT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>ORIGINAL QUANTITY</u>	<u>REVISED QUANTITY</u>
<u>0203000</u>	<u>STRUCTURE EXCAVATION (EARTH-COMPLETE)</u>	<u>2,287 C.Y.</u>	<u>1,692 C.Y.</u>
<u>0214100</u>	<u>COMPACTED GRANULAR FILL</u>	<u>99 C.Y.</u>	<u>18 C.Y.</u>
<u>0401441</u>	<u>1/2" PREFORMED EXPANSION JOINT FILLER</u>	<u>29 S.F.</u>	<u>33 S.F.</u>
<u>0406173</u>	<u>HMA S0.25</u>	<u>51 TON</u>	<u>47 TON</u>
<u>0602030</u>	<u>DEFORMED STEEL BARS – GALVANIZED</u>	<u>2,6242 LB</u>	<u>27,492 LB</u>
<u>0712021A</u>	<u>GRS ABUTMENT AND WINGWALL</u>	<u>602 C.Y.</u>	<u>903 C.Y.</u>
<u>0712024A</u>	<u>REINFORCED INTEGRATED APPROACH</u>	<u>417 C.Y.</u>	<u>220 C.Y.</u>
<u>0822005A</u>	<u>TEMPORARY PRECAST CONCRETE BARRIER CURB (STRUCTURE)</u>	<u>350 L.F.</u>	<u>117 L.F.</u>
<u>0913068A</u>	<u>TEMPORARY 6' CHAIN LINK FENCE</u>	<u>150 L.F.</u>	<u>53 L.F.</u>
<u>0944000</u>	<u>FURNISHING AND PLACING TOPSOIL</u>	<u>646 S.Y.</u>	<u>1,562 S.Y.</u>
<u>0970007</u>	<u>TRAFFICPERSON (UNIFORMED FLAGGER)</u>	<u>288 HR</u>	<u>2,200 HR</u>

DELETED CONCRRACT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>ORIGINAL QUANTITY</u>	<u>REVISED QUANTITY</u>
<u>0728033</u>	<u>NO. 8 CRUSHED STONE</u>	<u>3,962 C.F.</u>	0
<u>1206013</u>	<u>REMOVAL OF EXISTING SIGNING</u>	<u>L.S.</u>	0

PLANS

NEW PLANS

The following Plan Sheets are hereby added:

- 05.08-1.A2

REVISED PLANS

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

- 02.01.A2
- 03.05.A2, 03.08.A2, 03.09.A2, 03.17.A2, 03.20.A2
- 04.02.A2, 04.03.A2, 04.04.A2, 04.05.A2, 04.06.A2, 04.07.A2, 04.08.A2, 04.09.A2
- 05.02.A2, 05.03.A2, 05.04.A2, 05.05.A2, 05.08.A2, 05.09.A2, 05.10.A2, 05.11.A2, 05.12.A2, 05.13.A2, 05.14.A2, 05.15.A2, 05.17.A2, 05.18.A2, 05.19.A2, 05.20.A2, 05.21.A2, 05.22.A2, 05.23.A2, 05.24.A2, 05.27.A2, 05.30.A2, 05.31.A2, 05.32.A2
- 06.02.A2, 06.03.A2, 06.04.A2, 06.05.A2, 06.06.A2, 06.07.A2
- 07.03.A2, 07.04.A2
- 08.02.A2, 08.03.A2

The Detailed Estimate Sheets do not reflect these changes.

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

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

The foregoing is hereby made a part of the contract.

CONTRACT TIME AND LIQUIDATED DAMAGES

Five Hundred Eighty-Nine (589) calendar days will be allowed for completion of the work on this Contract and the liquidated damages charge to apply will be Two Thousand Four Hundred Dollars (\$2,400.00) per calendar day.

PROSECUTION OF WORK

In order to minimize the hazard, cost and inconvenience to the traveling public, pollution of the environment, and the detriment to the commercial and residential area, it is necessary to limit the time of construction work which interferes with traffic, as specified in Article 1.08.04 of the Special Provisions. Traffic operation for vehicles and pedestrians shall be in accordance with the plans and specifications for Maintenance and Protection of Traffic.

The allowable contract time was developed using standard working hours for the length of the Contract, taking into consideration the restrictions in the "Limitation of Operation," except during the road closure events listed below. There will be no extensions of time granted for weekends, holidays and weather-related shutdowns. The Contractor will be allowed to work during any time period which is not specifically disallowed in this Contract. Traffic disruptions will be permitted only during periods that the specifications allow.

All necessary advance, preparatory work must be completed prior to any Milestone Events that close the bridge to vehicular and/or pedestrian traffic. The Contractor shall notify the Engineer, Town and Noank Water Company Four (4) Weeks in advance of any closure.

CONTRACT MILESTONE EVENTS

The Contract has two Milestone Events with associated Liquidated Damages.

Milestone 1 is associated with the Installation of Reinforced Soil behind the abutments and the Relocation of the Water Main onto the temporary utility bridge.

Milestone 2 is associated with the Replacement of the Bridge Superstructure.

The Milestone Events are defined as follows:

Milestone 1: Installation of Reinforced Soil behind Abutments and Relocation of Water Main.

This Milestone is achieved when all of the required work described below is complete and accepted by the Engineer and the road and sidewalk are reopened to 2-way vehicular traffic and pedestrians and the water main on the temporary utility bridge is in-service and accepted by the Noank Water Company and the Engineer.

The Contractor shall move the existing utilities that are currently supported by the bridge out of the way to accommodate his work, as shown on the plans. A temporary utility bridge will be installed in order to support the utilities during the superstructure replacement. The utilities will remain in service at all times, except for the allowable outages described elsewhere in these specifications. The Contractor must demonstrate that he has coordinated with Amtrak the dates and times when his operations will impact train service.

The Contractor shall excavate the existing material behind both abutments and then backfill the excavation with geosynthetic reinforced soil. The roadway and sidewalk shall be paved and striped and all required roadside safety features shall be installed and accepted by the Engineer. Two-way vehicular traffic and pedestrian access shall be reestablished across the bridge and through the intersection with Ward Avenue, upon approval from the Engineer.

The Contractor shall install a new water main on the temporary utility bridge. The new water main shall be tested and put into service with the approval of the Noank Water Company and the Engineer.

In order to achieve this Milestone, the Contractor shall fully close the roadway and sidewalks across the bridge and detour vehicular traffic. All necessary signage for the road closure and detour must be in place, prior to the closure. The Contractor may shut off flow within the water main for the period of time described in these specifications, for each relocation of service. Close coordination with the Noank Water Company is required for all service interruptions.

Milestone 2: Replacement of the Bridge Superstructure.

This Milestone is achieved when all of the required work described below is complete and accepted by the Engineer and the bridge is reopened to 1-way alternating vehicular traffic and pedestrians in a dedicated pathway.

The Contractor shall prepare and submit a detailed schedule of major operations, broken down into daily intervals, or hourly intervals when appropriate, to the Engineer for review and approval, 4 weeks prior to the closure of the bridge. The schedule must be based on allowable track outages and should include contingency time to accommodate instances when anticipated track outages are not granted.

The Contractor shall have all required major components, equipment, materials and ancillary components approved and on site prior to the closure of the bridge. Or the Contractor shall have a plan and schedule to deliver them to the site at the required times, which has been reviewed and approved by the Engineer and confirmed in writing by the Contractor. The specific means to deliver the Precast Bridge Units (PBU) and Precast Concrete Components to the site, included the shipping route and required permits, and the schedule of delivery shall be submitted to the Engineer for approval. The Contractor must demonstrate that he has coordinated with Amtrak the dates and times when his operations will impact train service.

The major components include the PBUs and the Precast Concrete Components. The PBUs and Precast Concrete Components shall be fabricated and dry-fit in accordance with the requirements specified in the Special Provisions for Item Nos. 0514271A, 0601275A and 0601277A. Final testing must complete and accepted by the Engineer, prior to the closure of the roadway across the bridge.

The Contractor shall demolish the existing superstructure, modify the existing substructure and install the new PBUs. The new backwalls shall be installed and closure pour concrete shall be placed and cured.

The approach roadways shall be paved and striped and all required roadside safety features shall be installed and accepted by the Engineer. Alternating 1-way vehicular traffic and dedicated pedestrian access shall be reestablished across the bridge and through the intersection with Ward Avenue, with all necessary traffic control features in place, upon approval from the Engineer.

In order to achieve this Milestone, the Contractor shall fully close the roadway and sidewalk across the bridge and detour vehicular traffic. All necessary signage for the road closure and detour must be in place, prior to the closure.

MILESTONE LIQUIDATED DAMAGES PROVISIONS

The Contractor is responsible for developing his own phasing plan for the Engineer's review and approval for the project work. A suggested phasing plan, representing one possible sequence, is provided in the Contract Plans for the Contractor's information.

Although the Contractor is responsible for developing his own phasing plan, the Contractor shall comply with the construction milestones and maximum work durations described below. Failure to complete this work within the specified timeframes will result in the assessment of a Liquidated Damage charges, as described herein.

In order to achieve the requirements of the Milestones, the Contractor may need to employ multiple crews working simultaneously, during multiple shifts, and sometimes around the clock, during the road closure events.

Milestone 1: Installation of Reinforced Soil behind Abutments and Relocation of Water Main.

Five (5) consecutive Week Days, defined as Monday through Friday, will be allowed for the road closure to achieve the completion of Milestone 1. For the purposes of this milestone, a Day is defined as the 24-hour period beginning at 12:00 a.m. (midnight) and ending at 11:59 p.m. The closure can occur no later than the last full week of October.

The Contractor will be assessed liquidated damages for failure to achieve the completion of Milestone 1 by 11:59 p.m. on the 5th day and by October 30, 2020, in the amount of Ten Thousand Dollars (\$10,000) per Day, for each day or any portion thereof, after the 5th Day and

October 30, 2020. For Milestone 1, the aggregate amount of the liquidated damage shall not exceed Fifty Thousand Dollars (\$50,000).

Milestone 2: Replacement of the Bridge Superstructure.

Eighty-Four (84) consecutive Days will be allowed for the road closure to achieve the completion of Milestone 2. The milestone must be achieved no later than May 23, 2021. For the purposes of this milestone, a Day is defined as the 24-hour period beginning at 12:00 a.m. (midnight) and ending at 11:59 p.m.

The Contractor will be assessed liquidated damages for failure to achieve the completion of Milestone 2 by 11:59 p.m. on the 84th day and by May 23, 2021, in the amount of Ten Thousand Dollars (\$10,000) per Day, for each day or any portion thereof, after the 84th Day and May 23, 2021. For Milestone 2, the aggregate amount of the liquidated damage shall not exceed Three Hundred, Sixty Thousand Dollars (\$360,000).

MILESTONE LIQUIDATED DAMAGES TERMS AND CONDITIONS

The milestone liquidated damage provisions shall apply to all circumstances in which the Engineer has not received verification in writing from the Contractor that the Contract work, required to achieve the completion of the milestone, has been completed on or before the Milestone Completion Date, specified above.

If the Contractor does not complete the pertinent work on or before the applicable Milestone Completion Date, the Department will deduct from monies otherwise owed to the Contractor the pertinent milestone liquidated damages amount listed in the “Milestone Liquidated Damages Provisions”.

There will be no Incentive Payment for this work.

These Milestone aggregate amounts shall be considered separate from any Liquidated Damages assessed to the Contractor for failure to complete the total project on time per Section 1.08.09 of the Form 817 Standard Specifications.

NOTICE TO CONTRACTOR - ELECTRONIC ENGINEERING DATA (EED)

The EED is an assembly of engineering data files that were used to produce the Contract plans.

Electronic Engineering Data (EED) is provided for information purposes only. In case of conflict between the EED and the Contract plans and specifications, the contract plans and specifications shall govern. The EED has been reviewed by the Department for quality control purposes, but it is the Contractor's responsibility to build the Project per the contract plans and specifications.

The EED is being provided to the Engineer for GPS/RTS inspection. The Contractor may use the EED to assist in bidding, layout and Automated Machine Control/Guidance.

The EED includes geospatially-correct 2D CAD files and may include horizontal and vertical alignment data files, 3D surface model files (break-line features and triangles) and a preference file. The data is being provided in two formats:

- Native Format
 - Bentley MicroStation CAD files (dgn)
 - Bentley SS2 InRoads Alignment Files (alg)
 - Bentley SS2 InRoads Digital Terrain Models (dtm)
 - Bentley SS2 InRoads Preference File (xin)
- Converted Format (for use in GPS/RTS Site equipment)
 - AutoCAD CAD files (dxf)
 - Alignment files (xml)
 - Surface Models (xml)

For a complete list of EED files, see the EED file manifest (PDF) located in the EED_0058-0336.zip file, which is posted with the contract PS&E's on the State Contracting portal.

NOTICE TO CONTRACTOR – SNOW REMOVAL

The Contractor is hereby notified that snow removal supplementary to the Town of Groton snow removal along the detour route shall be required by the Contractor, when ordered by the Engineer, for the maintenance and protection of traffic through the detour. This work shall be paid for under the 817 per Section 9.71.03, “Construction Methods.”

**NOTICE TO CONTRACTOR – GLOBAL POSITIONING SYSTEM (GPS)
COORDINATES FOR SIGNS**

The Contractor shall obtain and provide to the Engineer sign installation data, including Global Positioning System (GPS) latitude and longitude coordinates, for all new State owned and maintained signs. The Engineer shall forward the sign data to the Division of Traffic Engineering for upload into the Highway Sign Inventory and Maintenance Management Program (SIMS). Sign data submissions or questions relating to SIMS or GPS shall be sent to DOT-SignInventory@ct.gov. Refer to the special provision for Section 12.00 General Clauses For Highway Signing.

GENERAL

NOTICE TO CONTRACTOR – WORK ON OR ABOVE AMTRAK PROPERTY

The Contractor acknowledges that work to be accomplished under this Contract is to be performed on Railroad territory, which consists of territory owned by the National Railroad Passenger Corporation (Amtrak). The Contractor's work must be accomplished simultaneously with ongoing daily railroad operations. Such operations include, but are not limited to, the passage of trains, storage of trains, flagging, inspection, repair, construction, reconstruction, and maintenance of the railroad right-of-way and facilities and must be in conformance with Amtrak EP3014.

The Contractor will be required to perform the following on or above Amtrak Right of Way:

1. Construct temporary utility support structure
2. Demolish existing structure
3. Construct new structure including, but not limited to:
 - a. Lifting and setting Prefabricated Bridge Units (PBU)
 - b. Placing concrete deck closure pours
 - c. Setting and relocating temporary structure barrier
 - d. Forming and placing cast-in-place parapets and sidewalks on structure
 - e. Installing protective fencing

The Contractor is advised that Amtrak controls all activity and the Department expects that these conditions may cause delays and possibly a complete suspension of construction activity. If the Contractor is delayed or suspended in the completion of work by Amtrak operations or restrictions, the Contractor will be entitled to a time extension for every full day that he can demonstrate that the delays affected the completion date of the contract. This extension of time will be considered non-compensable and the Contractor will not be entitled to any additional compensation for damages incurred for all direct and indirect costs including, but not limited to, all delay and impact costs, and inefficiencies.

There is a potential for limitations on track outages and extraordinary requirements for vehicular access coordination. The Contractor must conduct his work within such limitations. This will require night work and may require premium time (weekend work) or double shifts. The Contractor is fully responsible to complete the contract work.

Coordination of Work

The Contractor shall be responsible for the coordination of the work of his various subcontractors. The Contractor shall coordinate his operations with those of the Railroad in carrying out railroad force account work.

Amtrak will make available railroad protection personnel and other railroad employees to provide various Support Services, including without limitation, protection services, inspection, and other services to ensure the safety of railroad operations and to protect contractor employees during the course of the construction. Notwithstanding any other provision of this contract, no work on the

GENERAL

project in the vicinity of Amtrak property may be performed before all protection services required by Amtrak are in place.

Amtrak will make available railroad construction personnel, to perform construction of Amtrak facilities in accordance with the plans. Specifically, all work involving rails, ties, ballast (uppermost 4" only), communication and signal equipment, and other Amtrak owned appurtenances, unless designated otherwise within the contract, will be performed by Amtrak. The contractor may not remove track unless given prior written approval by Amtrak and the Engineer.

The Contractor must make his own arrangements with Amtrak for the use of railroad equipment or changes in railroad facilities that are requested solely to facilitate the Contractor's operations. Any temporary at-grade crossings required to complete the project, if any, are identified on the plans. Temporary at-grade crossings other than those identified on the plans will not be permitted, except as approved by Amtrak. The expense incurred by making any such arrangement with Amtrak, including temporary at-grade crossings, shall be at the Contractors expense and not a part of this contract.

Some of the Contractor's activities will be required to take place during de-energizing of the catenary system. As the result of the time associated with Amtrak de-energizing and re-energizing the catenary system, there is a potential for limitations on track outages or foul time. The Contractor must conduct his work within such limitations. This may require the Contractor to perform night work, weekend work, or multiple shifts, all of which may be at premium time. The Contractor is fully responsible to complete the contract work.

The Contractor is notified the Contract plans may not reflect the current configuration of the railroad. Furthermore, the existing track structure may differ from the historical configuration of the railroad. It shall be the Contractor's responsibility to prepare a site specific work plan based on railroad facilities in their current configuration.

The work required to complete the project will require extensive coordination with Amtrak. As such, Amtrak has designated a primary point of contact for the initiative. All construction coordination, including but not limited to, scheduling of protection services, requesting of track outages, review/approval of site specific work plans, and other activities as determined by Amtrak, shall all be made through the designated point of contact. Amtrak's designee is:

Mr. Joseph Travaglino
 Project Engineer
 National Railroad Passenger Corporation (Amtrak)
 MOW Base – Hamden CT
 255 Welton Street, 2nd Floor Rear
 Hamden, CT 06517
 (201)397-4750
Joseph.Travaglino@amtrak.com

Access to Amtrak Property

Contractors seeking permission to enter Amtrak property in furtherance of the project, or to do work on, over or adjacent to Amtrak property must first execute Amtrak's then-current standard

GENERAL

“Temporary Permit to Enter Upon Property (Temporary Permit)” and comply with all requirements thereto, including but not limited to, all insurance and safety requirements. The current version of the Temporary Permit shall be obtained by the contractor directly from Amtrak.

All matters pertaining to the Amtrak Temporary Permit and Insurance Requirements shall be directed to:

Mr. Michael Kolonauski
Senior Manager - Engineering
National Railroad Passenger Corporation
30th Street Station, 4S-027, Mailbox 64
2955 Market Street
Philadelphia, PA 19104
Telephone No. (215) 349-1127
Michael.Kolonauski@Amtrak.com

Amtrak Contractor Safety and Security Training

The Contractor, Subcontractors, and representative employees must first attend Owner’s Safety Orientation Class. They are required to comply with Owner’s safety requirements throughout the entire construction period. The Safety Orientation Class will be provided under the jurisdiction of the Project Engineer, who will be responsible to assure that the Contractor, Subcontractors, and the respective employees have completed the Safety Orientation Class. The Safety Orientation class is an online computer based program that is available 24 hours per day / 7 days per week, provided at the sole expense of the Contractor and Subcontractor on a per-person basis at <http://www.amtrakcontractor.com/>. All participants completing this course are required to be able to read, comprehend and demonstrate in English their understanding of the materials presented, as well as all the safety instructions, briefings and warnings. All other costs encountered due to complying with the Owner’s safety requirements will be at the sole expense of the Contractor and Subcontractor.

The Contractor should contact the Amtrak Contractor Safety Enrollment Coordinator for information concerning the training class. The coordinator’s contact information is as follows:

Mr. Joseph Travaglino
Project Engineer
National Railroad Passenger Corporation (AMTRAK)
MOW Base – Hamden, CT
255 Welton Street, 2nd Floor Rear
Hamden, CT 0617
Phone (201) 397-4750
Joseph.Travaglino@Amtrak.com

Potential Track Outages and Foul Time

In general, unless otherwise authorized by Amtrak, operations directly over or adjacent to operating right-of-way will be performed during the time periods noted in the “Notice to Contractor – Allowable Track Outages”, elsewhere in these special provisions.

GENERAL

Amtrak anticipates that track outages from 11:30pm-3:30am (Mon-Sun) will be available in 2021, however, this is not guaranteed.

Overhead Catenary System (OCS) outages are required, therefore the available time will be reduced by 1 hour on each end to obtain/release the OCS clearance. Amtrak cannot guarantee the availability of any outage at a particular time. It should also be expressly understood that; a) actual length of time for any track outage is contingent upon operating schedules at time of construction; b) programmed Amtrak construction and maintenance work requiring track outage within the same operating block will have priority, therefore contract work requiring track outage, if scheduled within the same time frame, must be coordinated with such work; and c) the potential times for track outages are not guaranteed and are for normal operating conditions. Contractors will be required to submit a two week look ahead schedule to coordinate work outages with other projects. Outages are subject to availability based on Train operations and other Amtrak projects.

As established under the contract, and as detailed under the Standard Specifications (Form 817), this Notice to Contractor, and the additional Amtrak requirements included herein, the Contractor's operations shall be planned and staged to avoid track usage unless absolutely essential. The Contractor's plans for demolition, erection, and any operation adjacent to or within the Railroad Right of Way shall be submitted to the Engineer for Railroad approval, prior to start of work. Further, track usage is granted by Amtrak based on need, not for the convenience of the Contractor.

Train Operations

- Currently, through the project area, there are 38 Amtrak trains Monday – Friday and 24 Saturday and 28 Sunday.
- There is one schedule freight train that runs from Monday through Friday at night, and no freight trains running on Saturday or Sunday day/night. However, this is subject to change.
- The maximum speed of passenger trains is 80 mph (35 mph freight). A “Slow Down Order” will not be in effect through the project site.
- The track(s) through the project site are considered “Main Line”.

Amtrak Specifications and Requirements

The Contractor is hereby notified that the following railroad specifications are included as part of this Notice and shall be made a part of this contract. The Contractor shall be bound to comply with all requirements of these specifications. The requirements and conditions set forth in the subject specifications shall be binding on the Contractor just as any other specification would be.

EP3005 - PIPELINE OCCUPANCY

SECTION 2081A - PIPELINE OCCUPANCY

GENERAL

SECTION 2082A -	ADDITIONAL REQUIREMENTS FOR HORIZONTAL DIRECTIONAL DRILLING (HDD) / DIRECTIONAL BORING
EP3006 -	DESIGN AND CONSTRUCTION CRITERIA FOR OVERHEAD BRIDGES
EP3014 -	MAINTENANCE AND PROTECTION OF RAILROAD TRAFFIC DURING CONTRACTOR OPERATIONS
SECTION 01141A -	SAFETY AND PROTECTION OF RAILROAD TRAFFIC AND PROPERTY
SECTION 01142A -	SUBMISSION DOCUMENTATION REQUIRED FOR AMTRAK REVIEW AND APPROVAL OF PLANS FOR BRIDGE ERECTION, DEMOLITION AND OTHER CRANE/ HOISTING OPERATIONS OVER RAILROAD RIGHT-OF-WAY
SECTION 01520A -	REQUIREMENTS FOR TEMPORARY PROTECTION SHIELDS FOR DEMOLITION AND CONSTRUCTION OF OVERHEAD BRIDGES AND OTHER STRUCTURES
SECTION 02261A -	REQUIREMENTS FOR TEMPORARY SHEETING AND SHORING TO SUPPORT AMTRAK TRACKS
EP3016 -	STORM WATER DRAINAGE AND DISCHARGE FROM ADJACENT PROPERTY ONTO AMTRAK RIGHT OF WAY
SPEC. NO. 150 -	STORMWATER MANAGEMENT POLICY
AED-1	PROCEDURES AND DESIGN CRITERIA TO BE EMPLOYED BY ELECTRIFICATION CONSULTANTS ENGAGED IN THE DESIGN OF ELECTRIFICATION FACILITIES ON THE NATIONAL RAILROAD PASSENGER CORPORATION
CE-4	ELECTRIFIED TERRITORY SPECIFICATION FOR WIRE, CONDUIT AND CABLE OCCUPATIONS

Contractor Requirements for Work Affecting Amtrak Railroad

The Contractor shall be governed by the terms of the Contract and the referenced sections of the document entitled “State of Connecticut Department of Transportation, Standard Specifications for Roads, Bridges, and Incidental Construction, Form 817,” dated 2016, and supplemental specifications thereto dated January 2019, with the following additions:

GENERAL

1. All matters requiring National Railroad Passenger Corporation (Amtrak) approval or coordination shall be directed to:

Mr. Michael Kolonauski
Director I&C Projects
Amtrak - National Railroad Passenger Corporation
30th Street Station, 4S-027, Box 64
2955 Market Street
Philadelphia, PA 19104
(215) 349-1127

2. In general, unless otherwise authorized by Amtrak, operations directly over or adjacent to operating right-of-way will be performed during the time periods noted in the “Notice to Contractor – Allowable Track Outages”, elsewhere in these special provisions.

Temporary at-grade crossings across any tracks in the project area for vehicles and equipment for ANY purpose shall be approved by AMTRAK. Railroad property shall be accessed as shown on the Contract Plans.

Any work involving rail, ties, and other track components on active tracks, unless specifically designated otherwise within the contract, will be performed by Amtrak employees.

All tracks within the project limits shall be assumed to be operating / live, unless otherwise designated by Amtrak.

Protection of Utilities

All underground utilities, cable, and facilities must be located and protected before any excavating, drilling, boring/direction drilling, ground penetrating activities, or construction takes place. This includes railroad and commercial utilities, cables, duct lines, and facilities. These activities will not be performed in close proximity to the Amtrak duct lines unless monitored by on-site Amtrak Communications and Signal (C&S) department personnel. Hand digging may be required, as directed by Amtrak through the on-site Amtrak C&S support personnel. Amtrak maintains the right to access all existing cables and conduits throughout construction. Amtrak also reserves the right to upgrade and install new cables and conduits in the affected area. The “One-Call” process must be followed. Be aware that Amtrak is not a part of the One-Call process; contact Amtrak Engineering to have all Amtrak underground utilities and assets located. If requested by Amtrak, existing depths of utilities being crossed must be verified through test pits performed by the Contractor as directed by and under the direct supervision of Amtrak C&S support personnel. Precautions must be taken to prevent any interruption to Amtrak’s operation. Precautions must be taken to prevent any interruption to Amtrak’s operation.

Insurance Requirements

Amtrak “Exhibit D Insurance Requirements” are attached to this NTC.

Permit to Enter Upon Property

All contractors must execute the then current version of Amtrak's "Temporary Permit to Enter Upon Property" which requires all persons that are on or adjacent to Amtrak property successfully complete the Contractor Orientation Training. All contractors must carry their "Amtrak Contractor Roadway Worker Protection" card with them at all times while on or adjacent to Amtrak property. Information for Temporary Permits to Enter Upon Amtrak Property (PTE) in the State of CT is attached to this NTC.

Clearance Requirements

This project requires shielding to protect the track(s) and train operations during construction. As far as practical, the shielding shall be designed and constructed to provide a clear envelope around the track(s) that is equal to or greater than the envelope shown in the detail titled "Standard Track Plan Minimum Roadway Clearances" which is included in the Amtrak Specifications and Requirements and attached to this NTC.

This project reuses the existing abutments and therefore does maintain the existing vertical underclearance. Final approval for Design Exception Request 01 (DER-01) was granted by Amtrak on 12/4/2017, and will be part of the approval of the "Site Specific Work Plan". The approved DER-01 is attached to this NTC.

Due to the site constraints on this project, a design exception from Amtrak has been requested allowing a smaller clearance envelope with the dimensions of 21'-4" vertically from the top of the rails to the shielding. Design Exception Request 02 (DER-02) has been approved and will be part of the "Site Specific Work Plan". The approved DER-02 is attached to this NTC.

EXHIBIT D**INSURANCE REQUIREMENTS**

NATIONAL RAILROAD PASSENGER CORPORATION (AMTRAK) CHICAGO
 UNION STATION COMPANY (CUSCO)
 WASHINGTON TERMINAL COMPANY (WTC)
 Revised as of March **14, 2013**

DEFINITIONS

In these Insurance Requirements, "Railroad" or "Amtrak" shall mean National Railroad *Passenger* Corporation and, as appropriate, its subsidiaries Chicago Union Station Company ("CUSCO") and Washington Terminal Company ("WTC"). "Contractor" shall mean the party identified as "Permittee" in the Temporary Permit to Enter Upon Property Agreement or the party with whom Amtrak has contracted in another agreement (e.g., Preliminary Engineering Agreement, Design Phase Agreement, Construction Phase Agreement or Force Account Agreement), as well as its officers, employees, agents, servants, contractors, subcontractors, or any other person acting for or by permission of Contractor. "Operations" shall mean activities of or work performed by Contractor. "Agreement" shall mean the Temporary Permit to Enter Upon Property Agreement or other such agreement, as applicable.

INSURANCE

Contractor shall procure and maintain, at its sole cost and expense, the types of insurance specified below. Contractor shall evidence such coverage by submitting to Amtrak the original Railroad Protective Liability Policy and certificates of insurance evidencing the other required insurance, prior to commencement of Operations. In addition, Contractor agrees to provide certified copies of the insurance policies for the required insurance within 30 days of Amtrak's written request. All *insurance* shall be procured from insurers authorized to do business in the jurisdiction(s) where the Operations are to be performed. Contractor shall require all subcontractors to carry the insurance required herein or Contractor may, at its option, provide the coverage for any or all subcontractors, provided the evidence of insurance submitted by Contractor to Amtrak so stipulates. The insurance shall provide for thirty (30) days prior written notice to Amtrak in the event coverage is substantially changed, canceled or non-renewed. All insurance shall remain in force until all Operations are satisfactorily completed (unless otherwise noted below), all Contractor personnel and equipment have been removed from Railroad property, and any work has been formally accepted. Contractor may provide for the insurance coverages with such deductibles or retained amounts as Amtrak may approve from time to time, except, however, that Contractor shall, at its sole expense, pay for all claims and damages which fall within such deductible or retained amount on the same basis as if there were full commercial insurance in force in compliance with these requirements. Contractor's failure to comply with the insurance requirements set forth herein shall constitute a violation of the Agreement.

1. Workers' Compensation Insurance complying with the requirements of the statutes of the jurisdiction(s) in which the Operations will be performed, covering all employees of Contractor.

GENERAL

Employer's Liability coverage with limits of not less than \$1 million each accident or illness shall be included.

In the event the Operations are to be performed on, over, or adjacent to navigable waterways, a U.S. Longshoremen and Harbor Workers' Compensation Act Endorsement and Outer Continental Lands Act Endorsement are required.

2. Commercial General **Liability** (CGL) Insurance covering liability of Contractor with respect to all operations to be performed and all obligations assumed by Contractor under the terms of the Agreement. Products-completed operations, independent contractors and contractual liability coverages are to be included, with the contractual exclusion related to construction/demolition activity within fifty (50) feet of the railroad deleted and no exclusions for Explosion/Collapse/Underground (X-C-U) applicable or added.

The policy shall name National Railroad Passenger Corporation and, as appropriate CUSCO or WTC, and all commuter agencies and railroads that operate over the property or tracks at issue as additional insureds with respect to the operations to be performed. In addition, the policy shall include an ISO endorsement Form CG 24 17 1001 or its equivalent providing contractual liability coverage for railroads listed as additional insureds. Coverage for such additional insureds shall be primary and non-contributory with respect to any other insurance the additional insureds may carry.

Coverage under this policy shall have limits of liability of not less than \$5 million each occurrence, combined single limit, for bodily injury (including disease or death), personal injury and property damage (including loss of use) liability. Such coverage may be provided by a combination of a primary CGL policy and a following form excess or umbrella liability policy.

3. Automobile **Liability Insurance** covering the liability of Contractor arising out of the use of any vehicles which bear, or are required to bear, license plates according to the laws of the jurisdiction in which they are to be operated, and which are not covered under Contractor's CGL insurance. The policy shall name National Railroad Passenger Corporation and, as appropriate CUSCO or WTC, and all commuter agencies and railroads that operate over the property or tracks at issue as additional insureds with respect to the operations to be performed. Coverage under this policy shall have limits of liability of not less than \$1 million each occurrence, combined single limit, for bodily injury (including disease or death), personal injury and property damage (including loss of use) liability.

In the event Contractor or any subcontractor will be transporting and/or disposing of any hazardous material or waste off of the jobsite, a MCS-90 Endorsement is to be added to this policy and the limits of liability are to be increased to \$5 million each occurrence.

4. **Railroad Protective Liability (RRP) Insurance** covering the Operations performed by Contractor or any subcontractor within fifty (50) feet vertically or horizontally of railroad tracks. The current ISO Occurrence Form (claims-made forms are unacceptable) in the name of National Railroad Passenger Corporation (and as appropriate CUSCO or WTC, and all commuter agencies and railroads that operate over the property or tracks at issue) shall have limits of liability of not less than \$5 million each occurrence, combined single limit, for Coverages A and B, for losses arising out of injury to or death of all persons, and for physical loss or damage to or destruction of property, including the loss of use thereof. A **\$10** million annual aggregate shall apply. Additionally, Policy Endorsement CG 28 31 - Pollution Exclusion Amendment, is required to be

GENERAL

endorsed onto the policy. Further, "Physical Damage to Property" as defined in the policy is to be deleted and replaced by the following endorsement:

"It is agreed that 'Physical Damage to Property' means direct and accidental loss of or damage to all property owned by any named insured and all property in any named insured's care, custody and control."

The original RRP Liability Insurance Policy must be submitted to Amtrak prior to commencement of Operations.

All Risk Property Insurance covering damage to or loss of all remaining personal property of Contractor, its contractors and subcontractors used during Operations including, but not limited to, tools, equipment, construction trailers and their contents and temporary scaffolding at the project site, whether owned, leased, rented or borrowed for the full replacement cost value. Insurance policies of Contractor, its contractors and subcontractors, covering tools, equipment and other personal property will include a waiver of subrogation and any other rights of recovery in favor of Amtrak and Contractor.

6. Contractor's Pollution Liability Insurance covering the liability of Contractor arising out of any sudden and/or non-sudden pollution or impairment of the environment, including clean-up costs and defense, that arise from the Operations of Contractor, with National Railroad Passenger Corporation and, as appropriate CUSCO or WTC, and all commuter agencies and railroads that operate over the property or tracks at issue named as additional insureds. Coverage under this policy shall have limits of liability of not less than \$2 million each occurrence. The coverage shall be maintained during the term of the project, and for at least two (2) years following Amtrak's acceptance of the completion of all Operations to be performed.

7. Pollution Lefial Liability Insurance is required if any hazardous material or waste is to be transported or disposed of off of the jobsite. Contractor, its subcontractor or transporter, as well as the disposal site operator, shall maintain this insurance. Contractor shall designate the disposal site, and must provide a certificate of insurance from the disposal facility to Amtrak. The policy shall name National Railroad Passenger Corporation and, as appropriate CUSCO or WTC, and all commuter agencies and raikoads that operate over the property or tracks at issue as additional insureds, with limits of liability of not less than \$2 million per claim.

Further, any additional insurance coverages, permits, licenses and other forms of documentation required by the United States Department of Transportation, the Environmental Protection Agency and/or related state and local laws, rules and regulations shall be obtained by Contractor.

8. Professional Liability Insurance covering the liability of Contractor for any and all errors or omissions committed by Contractor in the performance of the Operations, regardless of the type of damages. The coverage shall be maintained during the term of the Operations, and for at least three (3) years following completion thereof. The policy shall have a retroactive date that precedes any design work on the project and shall have limits of liability of not less than \$2 million per claim and \$2 million in the annual aggregate. . For a Project scopes which include under grade bridges (bridges which carry trains) the policy shall have limits of liability not less than \$10 million per claim and \$10 million in the annual aggregate.

If Contractor is not performing professional design or engineering services, Contractor may elect to satisfy this requirement through the addition of endorsement CG2279 "Incidental Professional

Liability” to its CGL policy.

9. Waiver of Subrogation As to all insurance policies required herein, Contractor waives all rights of recovery, and its insurers must waive all rights of subrogation of damages against Amtrak and, as appropriate, CUSCO and WTC, and their agents, officers, directors, and employees. The waiver must be stated on the certificate of insurance.
10. Punitive Damages Unless prohibited by law, no liability insurance policies required above shall contain an exclusion for punitive or exemplary damages.
11. Claims-Made Insurance If any liability insurance specified above shall be provided on a claims-made basis then, in addition to coverage requirements above, such policy shall provide that:
 - a. The retroactive date shall coincide with or precede Contractor’s start of Operations (including subsequent policies purchased as renewals or replacements);
 - b. The policy shall allow for the reporting of circumstances or incidents that might give rise to future claims;
 - c. Contractor will use its best efforts to maintain similar insurance under the same terms and conditions that describe each type of policy listed above (e.g., CGL, Professional Liability) for at least three (3) years following completion of the Operations; and
 - d. If insurance is terminated for any reason, Contractor will purchase an extended reporting provision of at least six (6) years to report claims arising from Operations.
12. Evidence of Insurance Contractor shall furnish evidence of insurance as specified above at least fifteen (15) days prior to commencing Operations. Prior to the cancellation, renewal, or expiration of any insurance policy specified above, Contractor shall furnish evidence of insurance replacing the cancelled or expired policies. **THESE DOCUMENTS SHALL INCLUDE A DESCRIPTION OF THE PROJECT AND THE LOCATION ALONG THE RAILROAD RIGHT-OF-WAY (typically given by milepost designation) IN ORDER TO FACILITATE PROCESSING.** The fifteen (15) day advance notice of coverage may be waived by Amtrak in situations where such waiver will benefit Amtrak, but under no circumstances will Contractor begin Operations without providing satisfactory evidence of insurance as approved by Amtrak. Such evidence of insurance coverage shall be sent to:

Director I&C Projects
National Railroad Passenger Corporation 30th Street
Station, Mail Box 64 Philadelphia, PA 19104-281 7

**National Railroad Passenger Corporation
30th Street Station, Mail Box 64
2955 Market Street
Philadelphia, PA 19104**

Temporary Permits to Enter Upon Amtrak Property (PTE) in the State of CT

Requests for Temporary Permits to Enter Upon Amtrak Property (PTE) in the State of CT must be submitted to Amtrak in writing and include the following information:

*(** for DOT Projects, omit 4-7 and include DOT job number**)*

1. Name of company requesting the permit (include address and telephone number)
2. Who's attention the permit should be addressed to
3. Permittee's e-mail address
4. Exact location of work (including railroad milepost, if known)
5. Specific work activity being performed on railroad property (please provide dollar value of the contract if work being performed is other than surveys or bridge inspections)
6. Projected duration of work being performed on railroad property in days
7. Contact, phone and address where invoices should be sent for payment by Permittee.

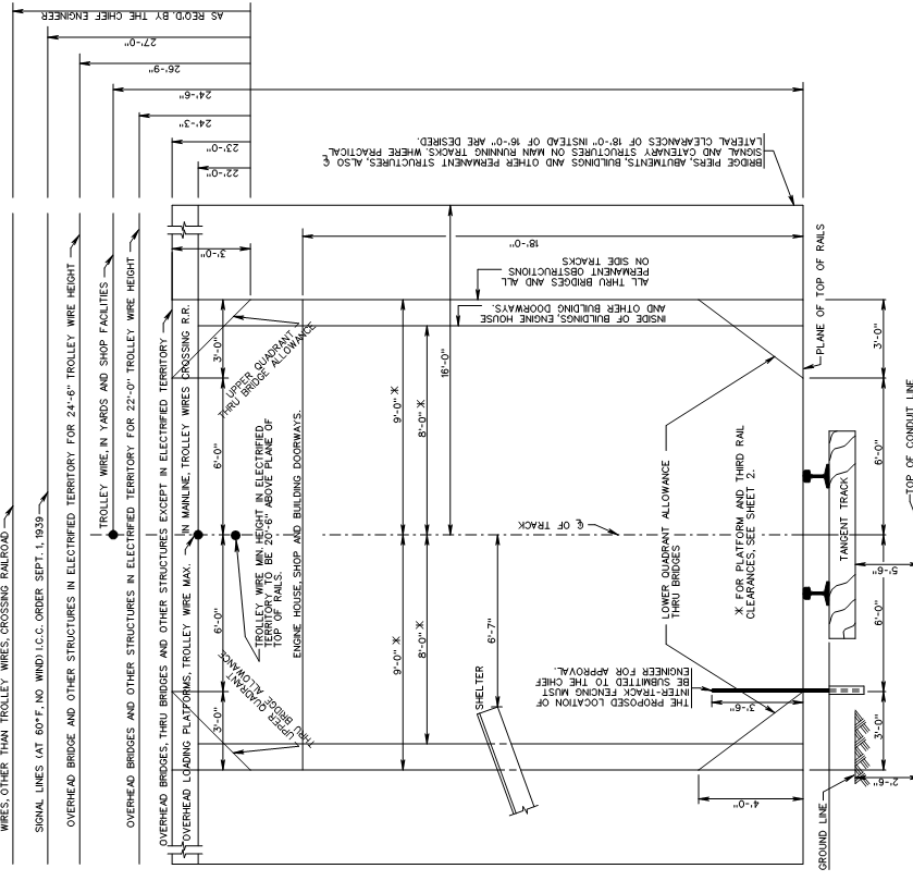
Due to the heavy volume of requests for Temporary Permits to Enter Upon Amtrak Property, the processing time for initial Permit requests is approximately 30 business days.

Note: *Temporary Permits for performing any environmental or geotechnical tests or studies (e.g., air, soil or water sampling) may be issued subsequent to completion of Amtrak's environmental review and approval process. Requests are reviewed on a case-by-case basis. Depending on the site specific circumstances, a separate Site Access Agreement that addresses environmental liability issues may be required prior to any Temporary Permit.*

All PTE Requests must be submitted to the Amtrak Engineering Construction Department e-mail or mail as noted below:

- Faxed to [\(215\) 349-3550](tel:2153493550) or MCGRATM@AMTRAK.COM
- Email to mcgratm@amtrak.com
- Mailed to the following address:
Director I&C Projects
National Railroad Passenger Corporation
30th Street Station (Mail Box 64)
Philadelphia, PA 19104

SHEET 1 OF 2



NOTES:

CLEARANCE REQUIREMENTS SHOWN ON THIS PLAN ARE FOR CONSTRUCTION OF NEW CONSTRUCTION. EXISTING STRUCTURES SHALL BE MAINTAINED AS IS AND EXTENDED AT PRESENT CLEARANCES, UNLESS OTHERWISE REQUIRED BY LOCAL OR STATE AUTHORITIES.

STRUCTURES MUST NOT BE LOCATED NEARER TO THE TRACK CENTERLINE THAN THE CLEARANCES SHOWN ON THIS PLAN AND THESE DISTANCES SHOULD BE EXCEEDED WHERE POSSIBLE. CONSIDERATION SHOULD BE GIVEN TO CENTER LINES, WIDENING ROADED SHOULDERS AND WIDENING AND DEEPENING DITCHES, AND THE STRUCTURES SHOULD BE LOCATED ACCORDINGLY.

FOR STANDARD DISTANCES BETWEEN TRACK CENTER LINES, LIMITING OBJECTS ARE LOCATED SEE AM-1000 SPECIFICATIONS FOR INSPECTION, CONSTRUCTION AND MAINTENANCE OF TRACKS.

FOR CURVED TRACKS, CLEARANCES INSIDE INSURMOUNTABLE RESTRICTIONS EXCESSIVE CLEARANCES CLOSER THAN THOSE SPECIFIED, THE MATTER MUST BE SUBMITTED TO THE ENGINEER FOR ANY MODIFICATIONS AND EXCEPTIONS TO THIS STANDARD.

MINIMUM CLEARANCES SHOWN ON THIS PLAN ARE FOR TANGENT LEVEL TRACK.

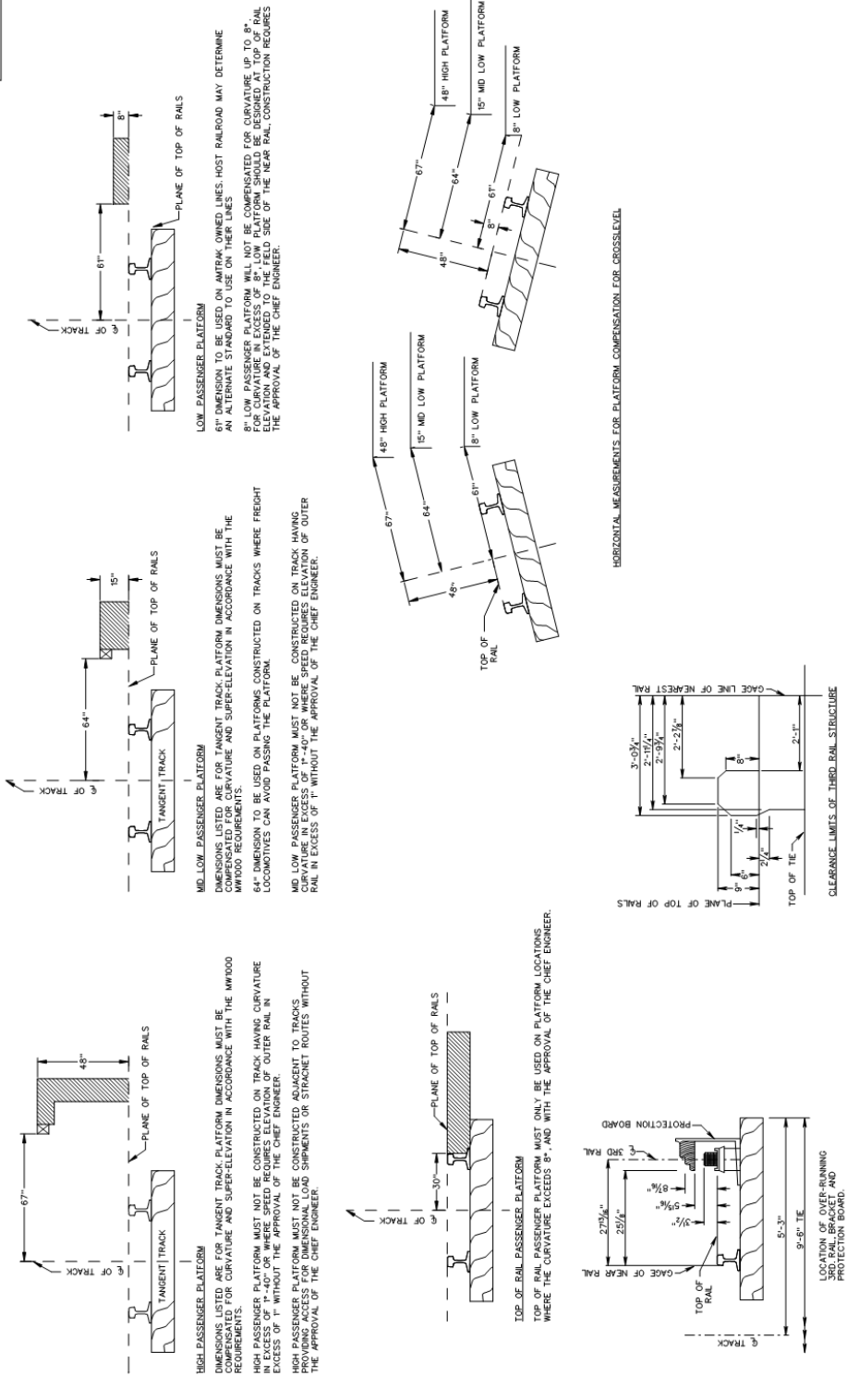
FOR CURVED TRACK THE FOLLOWING PROVISIONS APPLY:

VERTICAL - MEASURED VERTICALLY ABOVE HIGH RAIL EXCEPT FOR PASSENGER AND FREIGHT PLATFORMS WHICH ARE MEASURED PERPENDICULAR TO THE PLANE OF TOP OF RAIL.

LATERAL - OUTSIDE AND INSIDE CLEARANCES SHALL BE MEASURED PERPENDICULAR TO THE PLANE OF TOP OF RAIL. IN ADDITION, THE INSIDE CLEARANCE FOR STRUCTURES SHALL BE INCREASED BY SIX INCHES FOR EACH INCH OF SUPERELEVATION FOR EACH 5 FEET OF HEIGHT ABOVE TOP OF LOW RAIL.

X FOR STATE CLEARANCE REQUIREMENTS, SEE A.R.E.M.A. MANUAL CHAPTER 28, SECTION 3.6, LEGAL CLEARANCE REQUIREMENTS BY STATES.

<p>Amtrak</p> <p>OFFICE OF THE CHIEF ENGINEER OF TRACK</p>		<p>STANDARD TRACK PLAN</p>	
		<p>MINIMUM ROADWAY CLEARANCES</p>	
<p>PHILADELPHIA, PA. Date August 1, 2016 Approved</p>		<p>Drawn: TBI-SLC Checked: MT Dotat: 08-01-16 [Proj. No.: 70050.001.08]</p>	
<p>08 ADDED SHEET 2</p>		Date:	By:
<p>Revisions</p>			



No.	Revisions	Date	By
08	ADDED SHEET 2	08-01-18	K/W

PHILIP PA. Date August 1, 2018 Approved
 OFFICE OF THE CHIEF ENGINEER OF TRACK

Amtrak
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STANDARD TRACK PLAN
 MINIMUM ROADWAY CLEARANCES

NATIONAL RAILROAD PASSENGER CORPORATION
Engineering Department, 30th Street Station, 4th Floor South Tower, Box 64
2955 Market Street, Philadelphia, PA 19104



December 4, 2017

Rabih M. Barakat, PE
Transportation Principal Engineer
CT Department of Transportation
2800 Berlin Turnpike
P.O. Box 317546
Newington, CT 06131-7546

Subject: Noank, CT, Shore Line, CDOT Project No. 58-336 PE
Rehabilitation of Mosher Street Bridge No. 03903 (OH 130.31) over Amtrak
Design Exception Request DER-01, Approved by Amtrak

Dear Mr. Barakat:

Amtrak has reviewed and approved the subject Design Exception Request information provided with your letter dated November 20, 2017.

If you have any questions concerning this matter, please contact Kathy Haywood, Project Manager II, at 215-349-4367.

Sincerely,

A handwritten signature in blue ink, appearing to read "Earl Watson III".

Earl Watson III
Senior Manager Engineering

Attachment

cc: R. Clark – CME
M. Piteo – DOT



STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION



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

November 20, 2017

AMTRAK

NOV 30 2017

I & C Projects

Mr. Earl Watson, III
Director – Project Initiation and Development
South Tower, 3rd Floor
30th Street Station
Philadelphia, Pennsylvania 19104

Dear Mr. Watson:

Subject: Design Exception Request, DER-01
State Project No. 58-336
List 29 Bridge Rehabilitation Program
Bridge No. 03903, Mosher Avenue over Amtrak
Town of Groton

This letter is in reference to State Project No. 58-336, the rehabilitation of Bridge No. 03903, which carries Mosher Avenue over Amtrak in Groton, Connecticut (OH 130.31). The bridge is located near the intersection of Mosher Avenue and Ward Avenue. The existing superstructure of the bridge, which is a non-redundant steel through-girder type bridge, needs to be replaced due to its poor structural condition. The existing substructure is in fair condition, and will be repaired and reused. The low chord of the current superstructure is 21 feet-5 inches, which is below Amtrak’s requirement of 24 feet-3 inches for bridges in electrified territory with a 22 foot trolley wire height.

The Connecticut Department of Transportation (CTDOT) has researched the option of a superstructure replacement that would meet Amtrak’s required vertical underclearance of 24 feet-3 inches. This would result in an approximate 3 foot increase to the Mosher Avenue roadway profile at the end of the bridge. The change in profile would require approximately 500 feet of Ward Avenue to be regraded and reconstructed, as well as a 150 foot portion of Mosher Avenue to the west of the bridge.

The effects of regrading Ward Avenue include design and reconstruction of four private driveways. Three of these driveways already exceed the recommended maximum slope of 12 percent and could not be regraded without making them steeper. The alternative to making the driveways steeper would be to make extensive modifications to the properties.

For two of these properties, modifications would involve raising the existing detached garages, providing new grading and constructing permanent retaining walls. The third driveway leads to a garage that is part of the lower story of the property owner’s home. Therefore, this garage could no longer be used and would require the construction of a new garage with a higher floor and new associated grading. Based on current Department practices, the State would determine the required compensation, and the work would be undertaken by the property owner. Modification of these properties would require extensive cooperation from property owners and preferably would be completed before the State bridge project began. The coordination of contracting the required work and the inconvenience of extensive construction on their property would be an unwelcome burden to the property owners.

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Mr. Earl Watson, III

-2-

November 20, 2017

If the property owners objected to the compensation offered by the State, the State would likely face strong public objection. Noank is a small, close-knit community that would likely support the property owners in a conflict with the State. Additionally, any legal action by the property owners would likely delay the project, and delays to the project would have a significant impact to the community.

Project schedule delays have other impacts as well. Currently the sidewalk supports, which frame into the main through-girders, are in poor condition. These supports were evaluated by the Department's Bridge Safety unit recently because there was a concern about the safety of the sidewalk. Ultimately, the decision was made to keep the sidewalk open based on the anticipated service life which fits with the current project schedule. However, continued deterioration of the supports could lead to the closure of the sidewalk, and delays to the project make it more likely that this could occur.

The safety of pedestrians would be greatly reduced by the closure of the sidewalk. Spicer Park is located to the west of the bridge and Noank Play Area, a recreation area with basketball courts and a playground, are located to the east of the bridge. The sidewalk on the bridge provides a safe passage from Spicer Park to Noank Play Area. A protected area on the inside of the through-girders could be created if the sidewalk were closed. However, this would result in much narrower lanes, which is unfeasible because of the use of this bridge by tractor-trailers and trucks towing boats and the available turning radius at Ward Avenue would be greatly reduced.

With the closure of the bridge sidewalk, pedestrians would need to be more cautious of trucks with wide turning radii maneuvering through the intersection of Mosher Avenue and Ward Avenue. Additionally, it would worsen existing sub-standard site distances, putting both pedestrians and motorists at greater risk for accidents. For these reasons, delays to the project need to be avoided.

Additional construction impacts, associated with the significant raising of the profile, include the gas station to the south of the bridge on Ward Avenue. The roadway at the gas station would need to be raised approximately 3 inches at the curb line, requiring regrading of the gas station driveways and parking areas. Due to the age of the gas station and the hazardous nature of gasoline, the State would be at risk for the possibility of encountering contaminated soil during the excavation to reconstruct the driveway.

The Noank Fire Department driveway leading to the garage bays would also require redesign and reconstruction. This would have to be carefully coordinated so as not to prevent emergency personnel from responding to calls. Additionally, the sidewalk on the east side of Ward Avenue would be removed and reconstructed. Finally, the regrading could affect utility poles within the project limits that would need to maintain minimum vertical clearance below electric, communications and telephone cables. The effected properties, and the extent of the full depth reconstruction, are shown in the attached sketch.

These effects are both cost prohibitive and cause the Department, motorists and pedestrians unreasonable risk. For these reasons, the Department is requesting a design exception to Amtrak's vertical clearance standard. A design exception request form and the corresponding "Amtrak Standard Track Plan, Minimum Roadway Clearances Drawing No. 70050.001.08" have been included with this letter.

Mr. Earl Watson, III

-3-

November 20, 2017

In order to minimize the detrimental effects listed above, the Department has opted to replace the superstructure while maintaining the substructure geometry. The proposed vertical clearance is 21 feet-6 inches. Connecticut General Statute 13b-251 allows the State to maintain the existing vertical clearance over a railroad when the superstructure is being replaced and the abutments are being retained. The vertical profile of Mosher Avenue will still need to be raised to accommodate the slight increase in the superstructure depth due to the new structurally redundant cross-section. However, this increase will only require approximately 125 feet of Ward Avenue, and the intersection of Ward Avenue and Mosher Avenue, to be regraded and reconstructed. This option eliminates the impacts to the private driveways, the Noank Fire Department driveway, the driveway leading into the gas station, and the sidewalk on the east side of Mosher Avenue.

It is the Department's intent to proceed with the superstructure replacement maintaining the existing vertical underclearance. Additionally, temporary construction easements will need to be obtained to construct the new superstructure and repair the existing substructure. A response from Amtrak with any comments by November 16, 2017 would be much appreciated.

If you have any questions concerning this matter, please contact Mr. Andrew Cardinali, Project Manager, at (860) 594-3315.

Very truly yours,



Rabih M. Barakat P.E.
2017.11.20
10:47:03-05'00'

Rabih M. Barakat, P.E.
Transportation Principal Engineer
Bureau of Engineering and Construction

Enclosures

GENERAL

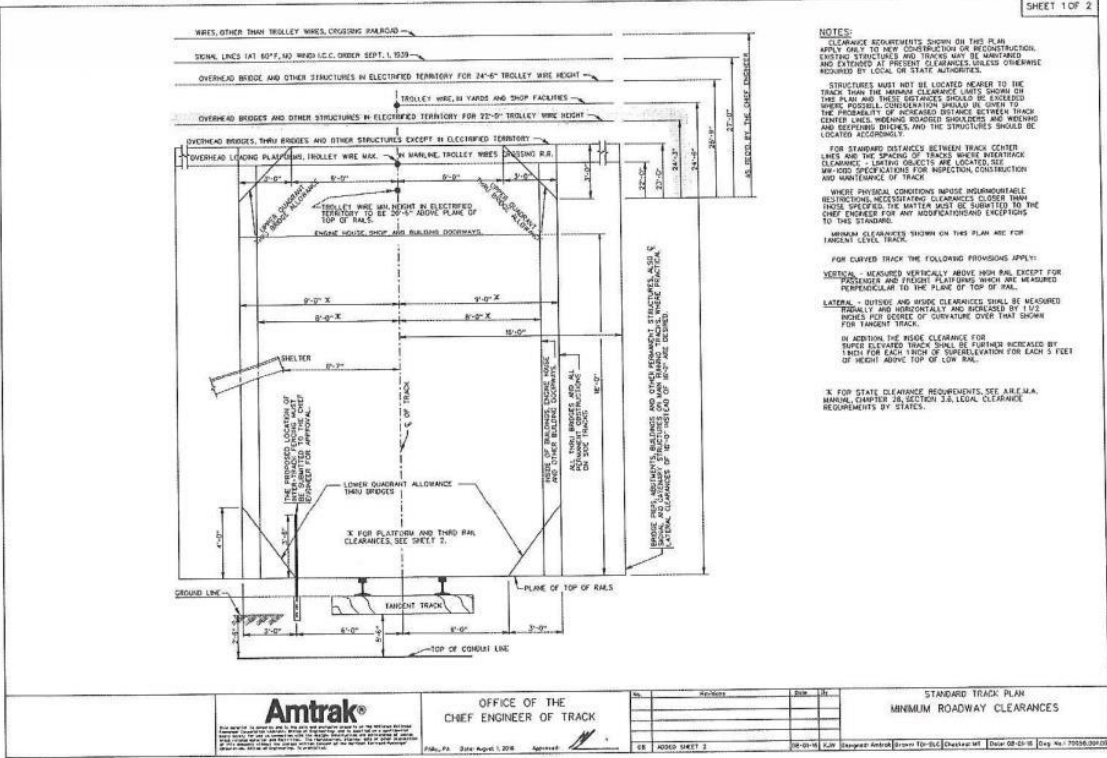
DESIGN EXCEPTION REQUEST (DER) 

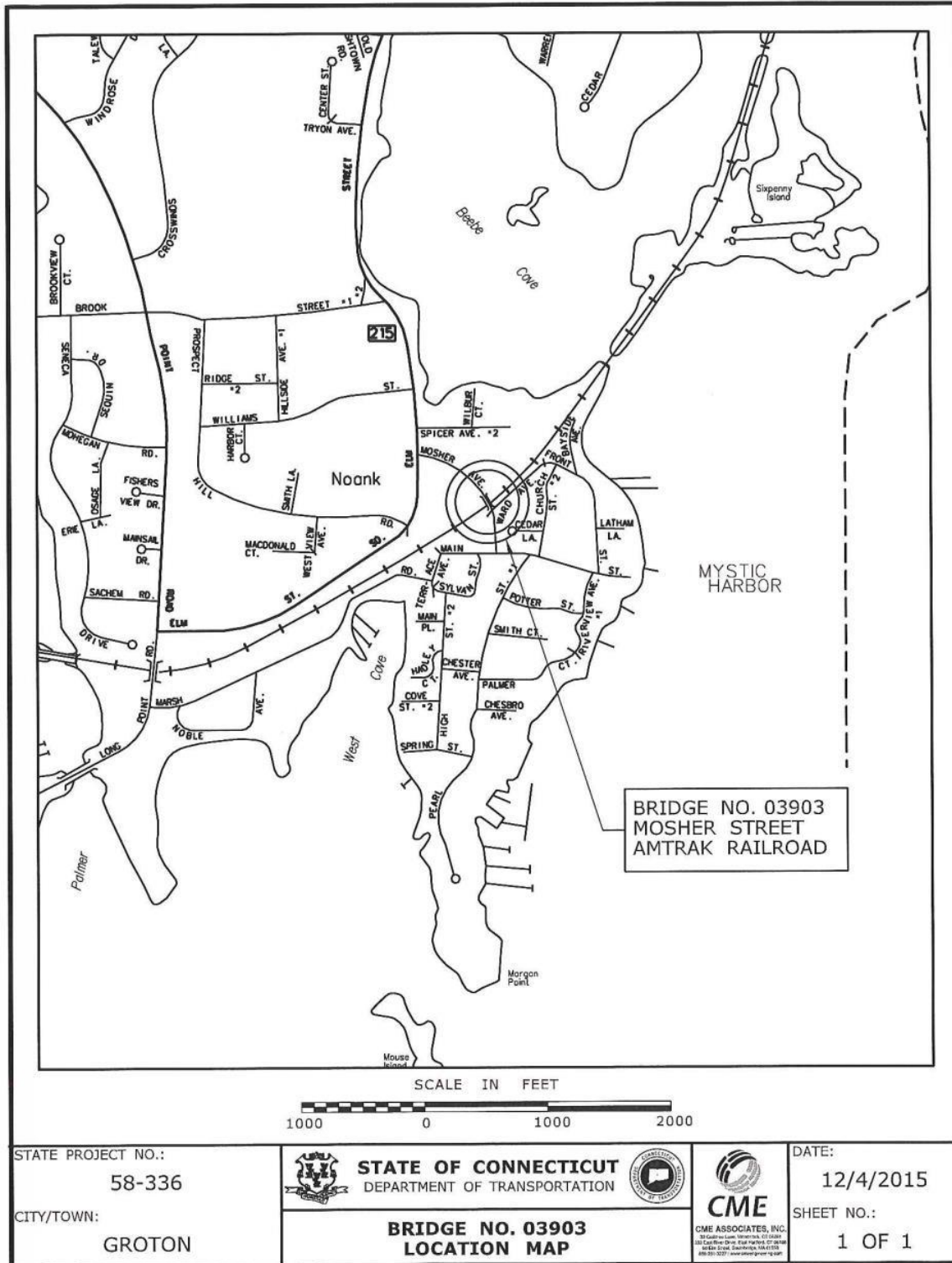
This form is to be used when a project warrants an exception to established design standards. Complete Section 1 and 2 and attach supporting documents prior to submission to Amtrak for consideration.

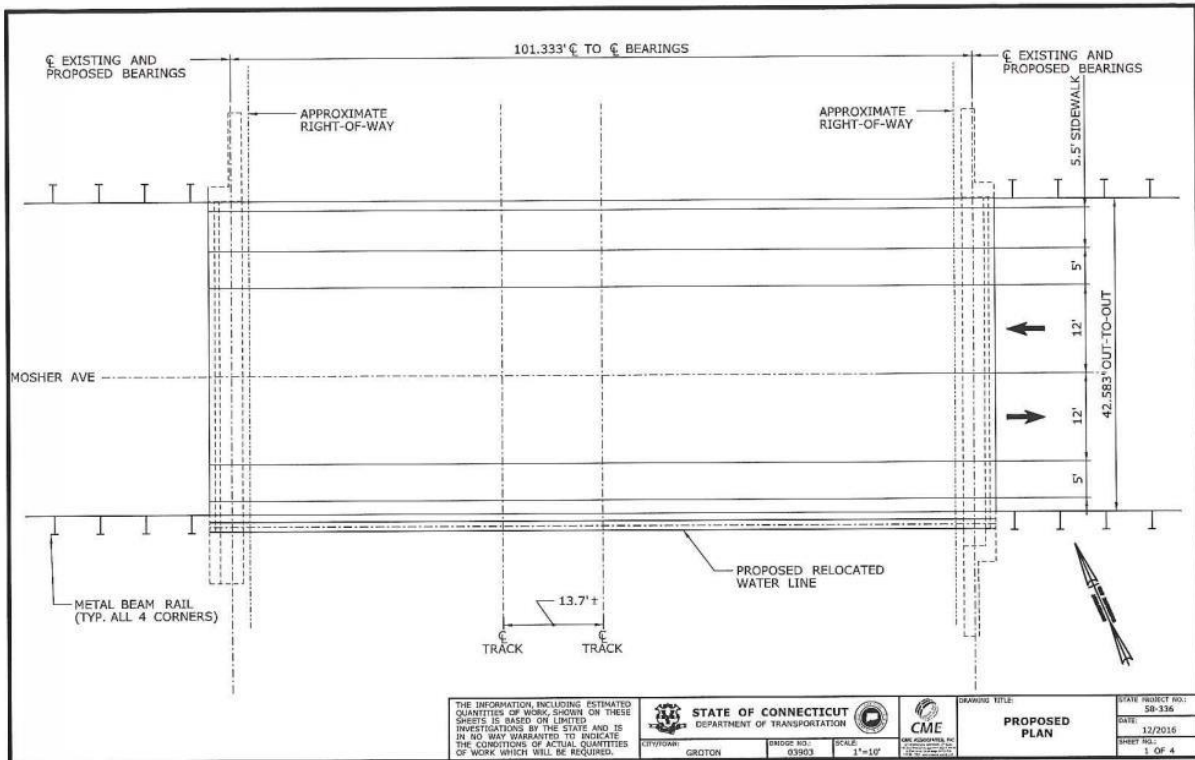
Section 1: Request Information			
Project Name	CTDOT Project No. 058-336; Rehabilitation of Bridge No. 03903 in Groton, CT		
Project DER No.	DER-01	Date	9/6/2017
Exception Location	Mosher Avenue over Amtrak; Groton, CT (OH 130.31)		
Requesting Agency	CTDOT	Requester	Rabih Barakat Principal Engineer
Section 2: Design Exception Description (Provide brief concise statements)			
Excepted Design Standard and section No.	70050.001.08 Minimum Roadway Clearances		
Attach Design Standard, <u>unless</u> it is an Amtrak or AREMA Standard			
Description of Exception	We are requesting a permanent Design Exception for substandard vertical underclearance over an electrified railroad for Bridge No. 03903 Mosher Avenue over Amtrak in Groton, CT. (OH 130.31)		
Reason for Request	<p>The existing minimum vertical underclearance from the top of the rail to the bottom of the superstructure of Bridge No. 03903 is noted as 21'-5" (see clearance diagram for Bridge No. 03903), which is less than the Amtrak standard of 24'-3". The bridge is in need of a superstructure replacement, while the substructure remains in fair and usable condition. Replacing the superstructure at the Amtrak standard of 24'-3" would result in an approximate 3' increase in the Mosher Avenue roadway profile at the end of the bridge, where Mosher Avenue intersects Ward Avenue. The effects of regrading Ward Avenue include design and reconstruction of four private driveways, which would make them steeper. Three of these driveways already exceed the recommended maximum slope of 12% and could not be regraded without making them steeper. The Noank Fire Department driveway leading to the garage bays would also require redesign and reconstruction. The roadway at the gas station would have to be raised approximately 3 inches at the curb line, requiring regrading of the gas station driveways and parking areas. Additionally, the sidewalk on the east side of Ward Avenue would be removed and reconstructed. Finally, the regrading could affect utility poles within the project limits that would need to maintain minimum vertical clearance below electric, communications and telephone cables. Affected properties, and the extent of the full depth reconstruction, are shown in the attached drawings. These effects are both cost prohibitive and cause CTDOT unreasonable risk due to the possibility of encountering contaminated soil at the gas station.</p>		
The potential impacts of a DER on: safety, capital costs, life cycle costs, future maintenance, or the right-of-way should be described in the Reason for Request field. Additional pages may be attached.			

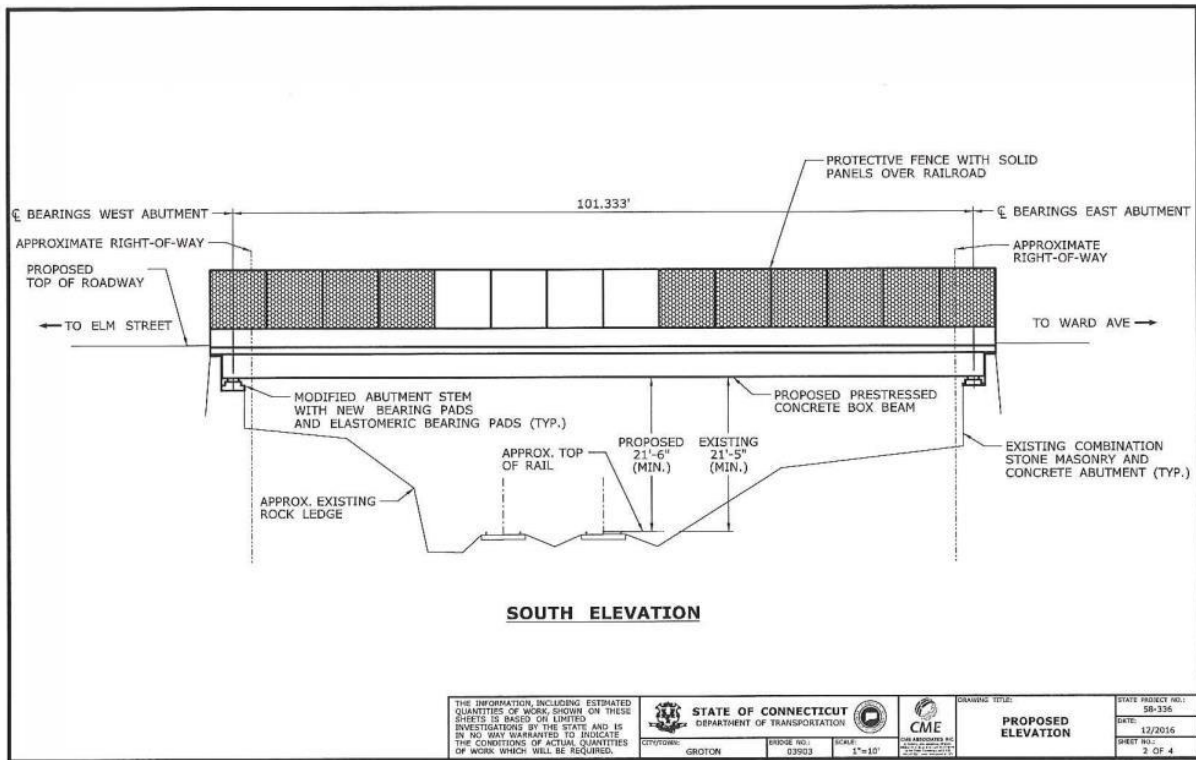
DESIGN EXCEPTION REQUEST (DER) | 

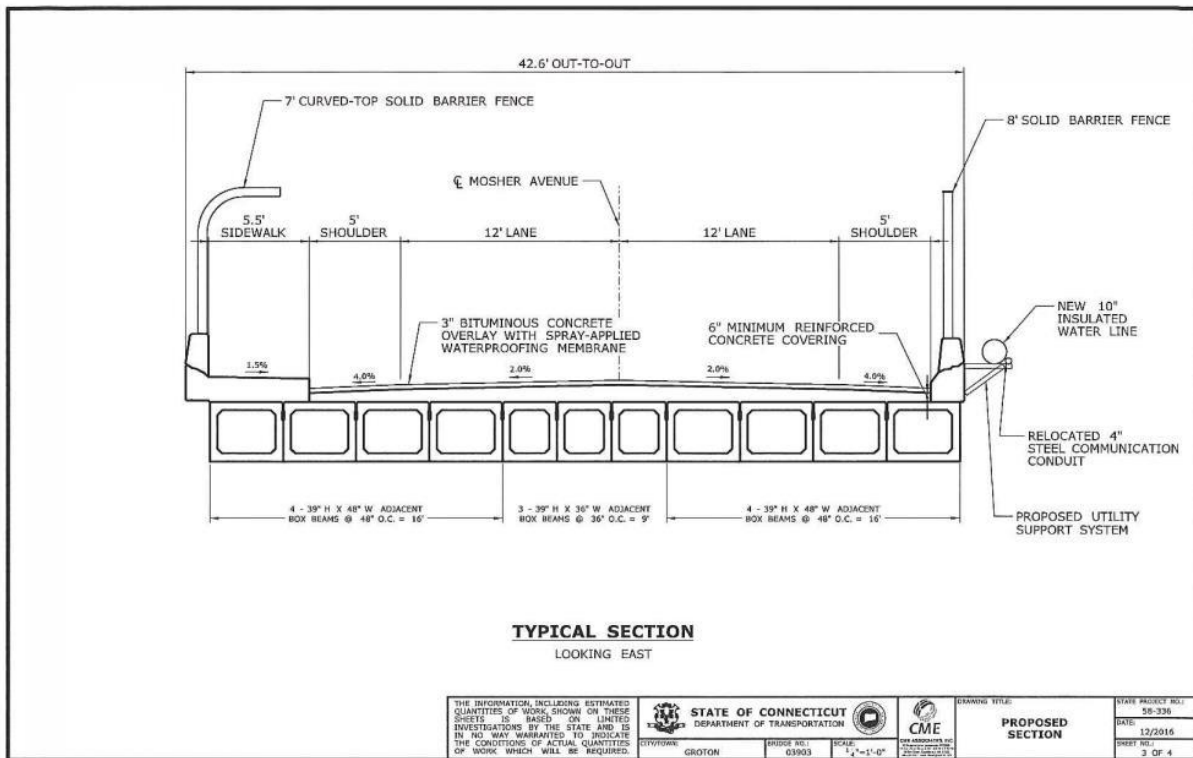
Section 3: Amtrak Review Comments				
Comments and Recommendation	NO EXCEPTION			
Reviewer Name		Title	Sp. Engineer Clearances	
Section 4: Amtrak Approval / Denial Status				
APPROVE or DENY	Signature		Date	12/4/17
	Name	ALFRED J. CLAVIER	Title	DCE TRACK
APPROVE or DENY	Signature		Date	
	Name		Title	

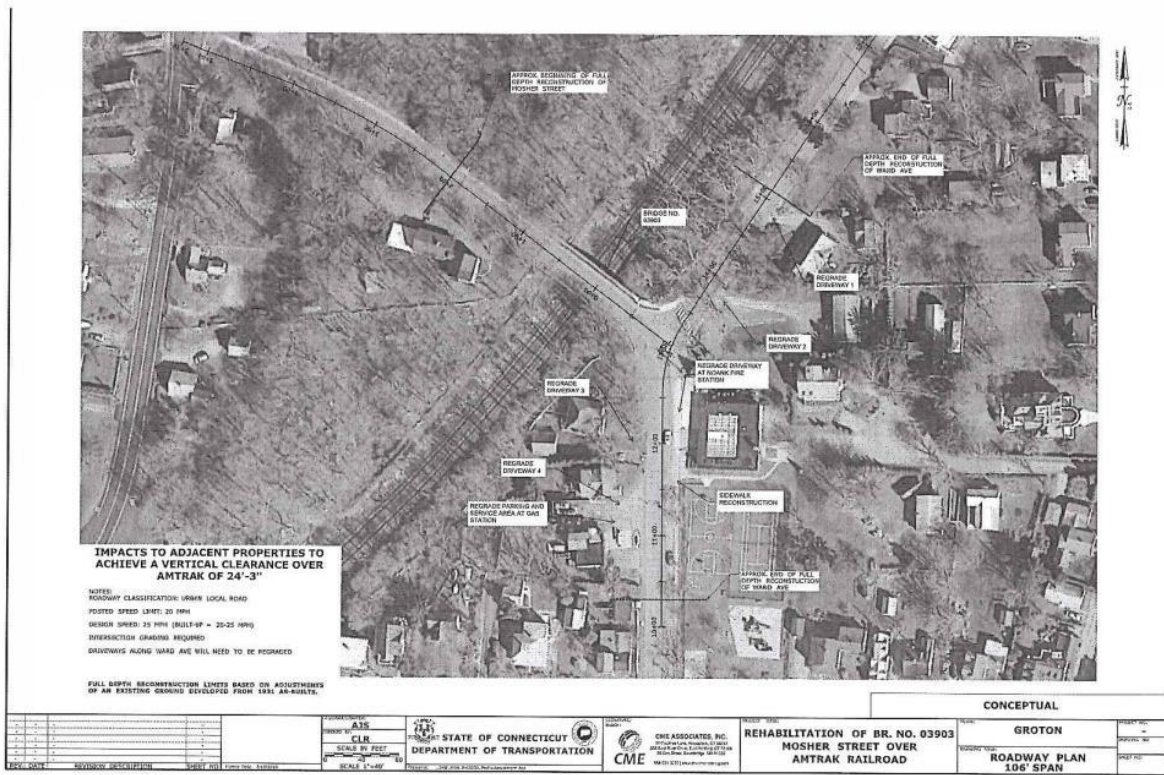












NATIONAL RAILROAD PASSENGER CORPORATION
Engineering Department, 30th Street Station, 4th Floor South Tower, Box 64
2955 Market Street, Philadelphia, PA 19104



December 14, 2018

Kimery Nervais
Utility Coordinator – CME
101 East River Drive, 1st Floor
East Hartford, CT 06108

Subject: Noank, CT, Shore Line, CDOT Project No. 58-336 PE
Rehabilitation of Mosher Street Bridge No. 03903 (OH 130.31) over Amtrak
Design Exception Request (DER-02), Conditionally Approved by Amtrak

Dear Mr. Nervais:

Amtrak has reviewed and conditionally approved the subject DER information subject to the comments in Section 3 of the DER provided with your email dated November 15, 2018.

If you have any questions concerning this matter, please contact Kathy Haywood, Project Manager II, at 215-349-4367.

Sincerely,

A handwritten signature in blue ink that reads "K Haywood".

for Michael Kolonauski
Senior Manager Engineering

Attachment

cc: R. Clark – CME
M. Piteo – DOT

DESIGN EXCEPTION REQUEST (DER) 

This form is to be used when a project warrants an exception to established design standards. Complete Section 1 and 2 and attach supporting documents prior to submission to Amtrak for consideration.

Section 1: Request Information			
Project Name	CTDOT Project No. 058-336; Rehabilitation of Bridge No. 03903 in Groton, CT		
Project DER No.	DER-02	Date	11/15/2018
Exception Location	Mosher Avenue over Amtrak; Groton, CT (OH 130.31)		
Requesting Agency	CTDOT	Requester	Mark Gardner Project Engineer
Section 2: Design Exception Description (Provide brief concise statements)			
Excepted Design Standard and section No.	70050.001.08 Minimum Roadway Clearances		
Attach Design Standard, <u>unless</u> it is an Amtrak or AREMA Standard			
Description of Exception	We are requesting a temporary Design Exception for the construction of protective shielding within close proximity to the Amtrak catenary wires, which will create substandard vertical underclearance over an electrified railroad for Bridge No. 03903 Mosher Avenue over Amtrak in Groton, CT. (OH 130.31)		
Reason for Request	<p>The existing minimum vertical underclearance from the top of the rail to the bottom of the superstructure of Bridge No. 03903 is 21'-5". The Amtrak Minimum Roadway Clearance diagram indicates a minimum underclearance of 24'-3" for railroads with 22'-0" trolley wire height. The minimum clearance between the messenger wire and the existing structure is approximately 18". In order to complete the proposed bridge repair work, consisting largely of replacing the existing bridge superstructure, concrete encasement will need to be chipped away from the existing beams, and lead paint will need to be removed. In order to prevent the concrete and lead paint debris from falling on the tracks, protective shielding will need to be installed temporarily (see sheets 3 and 4 of the attached PDF package, showing measurements and details of the proposed shielding). The shielding will have to be installed within close proximity to the existing Amtrak catenary wires that run parallel to the tracks, and perpendicular to the bridge. The minimum clearance between the messenger wire and the temporary shielding will be approximately 9". The protective shielding will be supported by cables that are attached to the bridge decking. The temporary shielding will be bonded and grounded in accordance with Amtrak's specifications.</p> <p>We anticipate that the contractor will drill through the bridge deck to allow for the installation of the support cables for the shielding. Drilling is not anticipated to create any substantial debris over the tracks. The contractor will provide collection of any debris that results from drilling. Since the existing catenary wires are estimated to be approximately 18" lower than the bottom flanges of the girders, the contractor will have sufficient space to install the protective shielding. However, this further infringes on the minimum vertical clearance over the railroad tracks.</p> <p>Installation and temporary use of the proposed protective shielding is not anticipated to impact the Amtrak Standard requiring a minimum of 16'-0" horizontal</p>		

DESIGN EXCEPTION REQUEST (DER) | 

	<p>clearance beginning at the centerline of the railroad tracks and extending to either side (see highlighted and boxed text on sheet 3 of attached PDF package). Therefore, impacts within the limits of the catenary towers are not anticipated as a result of the installation and temporary use of the protective shielding.</p> <p>There are no anticipated negative impacts regarding safety, capital costs, life cycle costs, future maintenance, or the right-of-way.</p>
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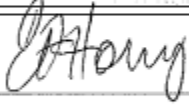
The potential impacts of a DER on: safety, capital costs, life cycle costs, future maintenance, or the right-of-way should be described in the Reason for Request field. Additional pages may be attached.

Section 3: Amtrak Review Comments

Comments and Recommendation	<p>The temporary protection shield is acceptable provided the following are met.</p> <ul style="list-style-type: none"> • Wire heights (messenger, feeder, and static) and existing clearances are confirmed by Amtrak Division. • 9" is maintained vertically between the shield and the nearest wire (messenger, feeder, or static). • The connection design from the shield to the cable supports is submitted for approval. • Wood may not be used for the temporary shielding.
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Reviewer Name	Joanna Pardini	Title	Senior Manager Engineering
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Section 4: Amtrak Approval / Denial Status

<input checked="" type="radio"/> APPROVE or <input type="radio"/> DENY	Signature		Date	12/5/18
	Name	ERIC F HORNUNG	Title	DOE, ET
<input type="radio"/> APPROVE or <input type="radio"/> DENY	Signature		Date	
	Name		Title	

SECTION 1.06 - CONTROL OF MATERIALS

Article 1.06.07 - Certified Test Reports and Materials Certificates:

After Article 1.06.07-1 add the following:

1) For the materials in the following items, a Certified Test Report will be required confirming their conformance to the requirements set forth in these plans or specifications or both. Should the consignee noted on a Certified Test Report be other than the Prime Contractor, then Materials Certificates shall be required to identify the shipment.

- Item No. 0603233A “Galvanizing Structural Steel (Site No. 1)”
- Item No. 0603474A “Metallizing Structural Steel (Site No. 1)”
- Item No. 0712021A “GRS Abutment and Wingwall”
- Item No. 0712023A “Reinforced Soil Foundation”
- Item No. 0712024A “Reinforced Integrated Approach”
- Item No. 1300005A “Relocation of Water Mains”
- Item No. 1301019A “Temporary Relocation of Water Mains”

After Article 1.06.07-2 add the following:

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

- Item No. 1008019 “4” Rigid Metal Conduit – Surface”
- Item No. 1008119 “4” Rigid Metal Conduit In Trench”
- Item No. 0904949A “Metal Bridge Rail (Solid Panel) (8’ High)
- Item No. 0904953A “Metal Bridge Rail (Solid Panel) (7’ High) (Curved Top)
- Item No. 1300005A “Relocation of Water Mains”
- Item No. 1301019A “Temporary Relocation of Water Mains”

SECTION 1.08 - PROSECUTION AND PROGRESS

Article 1.08.03 - Prosecution of Work:

Add the following:

The Contractor will not be allowed to install traffic signal or pedestrian heads until the controllers are on hand and ready for installation. Once installation of this equipment commences, the Contractor shall complete this work in a most expeditious manner.

Sequence of Construction/Operations

- Advance Stage 1 – Relocate utilities along approach roadways. Install protective shielding below bridge. Install temporary surface water main and demolish south overhang including water main.
- Advance Stage 2 – Install detour signing. Close Mosher Avenue to traffic, implement detour and perform abutment stabilization work. Install temporary utility support to south of bridge and connect temporary water main. End detour, maintain/cover the detour signing until required for subsequent stages.
- Stage 1A – Initiate construction work that can be completed prior to the official start of the construction season. Perform work in the off-peak hours to limit impacts to traffic. No Permanent work zone and lane closures will be established in this stage.
- Stage 1B – Close bridge to pedestrian traffic 1-week prior to full bridge closure and demolish the north overhang and sidewalk.
- Stage 2 – Close Mosher Avenue to all traffic, implement detour and install initial PBUs.
- Stage 3 – Demolish existing bridge deck and barriers.
- Stage 4 – Install remaining PBUs.
- Stage 5 – Install pre-cast backwall, place C.I.P. deck end closure pour. Install permanent GRS integrated approach zone behind new backwall and place temporary pavement.
- Stage 6 – Remove detour, install temporary one-way signalization and implement temporary signalization measures. Construct north side bridge parapet and sidewalk. Install permanent utilities mounted to north parapet. Prior to Stage 7 install northeast permanent sidewalk and crosswalk ramps on Mosher Avenue and Ward Avenue to maintain pedestrian access in Stage 7.
- Stage 7 – Revise TPCBC, signing, pavement markings and temporary signalization to facilitate construction of south bridge parapet. Remove temporary utility support structure.
- Post Stage 7 – Remove temporary signalization and utilize short term lane shifts and lane closures to facilitate remaining roadway and sidewalk construction work.
- Stage 8 – Complete approach work. Implement the full detour for 5 weekdays to complete full depth and final paving of Mosher and Ward Avenues. Stripe roadways and install roadway signage.

COORDINATION OF UNIFORMED FLAGGERS FOR DELIVERY TRUCKS

GENERAL

The Contractor is hereby notified that trucks pulling trailers over forty (40) feet in length shall be required to utilize Terrace Avenue during the detours. See Special Provision “0970007A – Trafficperson (Uniformed Flagger)” contained herein. The Engineer will submit to the Contractor a schedule indicating when Uniformed Flagger services are anticipated. Deliveries requiring trucks pulling trailers over forty (40) feet in length may be made to the following businesses:

Business Name:	Address:	Contact Information:
Noank Service Center	11 Ward Ave.	860-536-4364, noanksrc@sbcglobal.net
Carson’s Store	43 Main St.	860-536-0059, carsonstore1907@gmail.com
Universal Package Store	19 Pearl St.	860-536-0122, mystic@booze.wine
Noank Village Boatyard	38 Bayside Ave.	860-536-1770, ron@nvblc.com
Ford’s Lobsters	15 Riverview Ave.	860-536-2842, lobster@fordslobster.com
Abbott’s Lobster in the Rough	117 Pearl St.	860-536-7719, chelsea@abbotslobster.com
Costello’s Clam Shack	145 Pearl St.	860-572-2779
Noank Shipyard	145 Pear St.	860-536-9651, harry@noankshipyard.com

AMTRAK

Power and/or track outages will be limited to a window of 11:30 pm to 3:30 am (Foul Time). This time includes de-energizing and re-energizing line.

Article 1.08.04 – Limitations 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 that will interfere with the described traffic operations on all project roadways as follows:

Mosher Avenue

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. Except for the times described in the following:

During a consecutive 5-day period in the Fall of both Season 1 and Season 2, the Contractor shall be allowed to close Mosher Avenue Bridge and implement a detour as shown on the detour.

During a consecutive 12-week period in Season 2, the Contractor shall be allowed to close Mosher Avenue Bridge to facilitate superstructure replacement and implement a detour as shown on the detour.

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

Mosher Avenue shall be open to vehicular and pedestrian traffic prior to Friday of the Memorial Day Weekend.

Following the full 12 week closure of Mosher Avenue, the Contractor will be allowed to maintain an alternating one-way traffic operation controlled by Temporary Signalization for a duration not to exceed 84 consecutive days

The Contractor will be allowed to halt Mosher Avenue traffic for a period not to exceed 10 minutes to perform necessary work, as approved by the Engineer, between 12:01 a.m. and 5:00 a.m. on all non-Holiday days.

All Other Roadways

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

Additional Lane Closure Restrictions

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

The Contractor shall notify the project engineer on construction projects, or the district permit agent on permit jobs, when all traffic signal work is completed. This will include all work at signalized intersections including loop replacements, adjusting existing traffic signals or any relocation work including handholes. The project engineer or district permit agent will notify the Division of Traffic Engineering to coordinate a field inspection of all work. Refer to Section 10.00 – General Clauses for Highway Illumination and Traffic Signal Projects, Article 10.00.10 and corresponding special provision.

Article 1.08.07 - Determination of Contract Time:

Delete the second, third and fourth paragraphs and replace them with the following:

When the contract time is on a calendar day basis, it shall be the number of consecutive calendar days stated in the contract, INCLUDING the time period from December 1 through March 31 of each year. The contract time will begin on the effective date of the Engineer's

order to commence work, and it will be computed on a consecutive day basis, including all Saturdays, Sundays, Holidays, and non-work days.

1.08.08 - Extension of Time:

Delete the sixth paragraph, "If an approved extension of Contract time.... the following April 1".

Article 1.08.09 - Failure to Complete Work on Time:

Delete the second paragraph, "If the last day...the project is substantially completed" and replace it with "Liquidated damages as specified in the Contract shall be assessed against the Contractor per calendar day from that day until the date on which the project is substantially completed."

SECTION 12.00 – GENERAL CLAUSES FOR HIGHWAY SIGNING

Description:

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

12.00.07 – Global Positioning System (GPS) coordinates for signs:

The Contractor shall obtain and provide to the Engineer sign installation data, including Global Positioning System (GPS) latitude and longitude coordinates, for all new permanent State owned and maintained signs (temporary and construction signs are not to be included) installed in the project. The Engineer shall forward the sign data to the Division of Traffic Engineering for upload into the Highway Sign Inventory and Maintenance Management Program (SIMS). Sign data submissions or questions relating to SIMS or GPS shall be sent to DOT-SignInventory@ct.gov.

The horizontal datum is to be set to the State Plane Coordinate System, North American Datum of 1983 (NAD83) in feet. The minimum tolerance must be within 10 feet. The format of the GPS information shall be provided in a Microsoft Office compatible spreadsheet (Excel) file with data for each sign. The record for each sign installed is to be compatible with the anticipated CTDOT Sign Inventory and Management System (CTSIMS). The following format shall be used. However, the data fields noted by “#” are not required for the project submission. These entries will be completed as part of the Traffic Engineering CTSIMS data upload.

The cost of this work shall be included in the cost of the respective sign face – sheet aluminum and sign face – extruded aluminum items. The receipt of this electronic database must be received and accepted by the Engineer prior to final payment for items involving permanent highway signing. The electronic database information shall detail information regarding the sign actually installed by the project.

Field Number	Type	size	Description
1	text	20	Record Number (starting at 1...)
2	text	20	Sign Catalog Number
# 3	text	10	Size Height
# 4	text	10	Size Width
5	text	25	Legend
# 6	text	10	Background Color
# 7	text	10	Copy Color
8	Link	25	Material (see acceptable categories)
9	text	30	Comments if any
# 10	text	20	MUTCD Type
11	text	15	Town
12	text	5	Route
13	text	5	Route direction

GENERAL

#	14	text	10	Highway Log Mileage
	15	text	15	Latitude
	16	text	15	Longitude
	17	text	25	Mounting Type
	18	text	25	Reflective Sheeting Type
	19	date	25	Date Installed
	20	text	10	Number of Posts
	21	text	255	Sheeting Manufacturer name and address
	22	text	15	State Project Number (or)
	23	text	15	Encroachment Permit number.
	24	Graphic	*	Sign Picture Graphic.

* Graphics provided shall be representative of the sign supplied and be in color. Graphic formats shall be either JPG or TIFF and provided with a recommended pixel density of 800 x 600. The graphic shall be inserted in the supplied media in field 24 for each sign.

ITEM #0216012A - CONTROLLED LOW STRENGTH MATERIAL

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

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

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

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

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

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

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

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

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

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

**ITEM #0514271A – PRECAST CONCRETE/STEEL COMPOSITE
SUPERSTRUCTURE**

Work under this item shall be in accordance with the applicable provisions of Sections 5.08, 6.01, 6.02 and 6.03, and the provisions contained herein.

Description: This item shall include the fabrication, delivery, temporary bracing, initial positioning, and final positioning (installation) of the Prefabricated Bridge Units (PBUs), including all necessary materials, labor and equipment to complete the work, as shown on the plans. The PBUs are comprised of metallized steel beams made composite with a reinforced concrete deck.

This item also includes appurtenances that are incidental to the PBU or projecting from the PBU such as diaphragms, bearing bolster and sole plates, projecting reinforcing steel, and inserts for attachments.

Due to the accelerated nature of this project, the PBUs, backwalls, and stem block units shall be manufactured, preassembled for verification, match marked for field assembly, and approved prior to the initiation of the full roadway closure at the site.

This item excludes the following: steel coating, steel shims, steel load plates vulcanized to elastomeric bearings, elastomeric bearings, pre-cast concrete backwall, deck concrete closure pours, field cast concrete (sidewalks, parapets), railings/fences, and utility supports.

Materials: The materials for Prefabricated Bridge Units shall conform to the following requirements:

1. Bridge Deck Concrete: Concrete shall be low permeability concrete that meets the requirements of Section M.03, for Class PCC04462, and shall have a minimum 28-day compressive strength of 4,400 psi. The use of calcium chloride or an admixture containing calcium chloride will not be permitted.

2. Structural Steel: Structural steel materials shall conform to the requirements of Article M.06.02. All structural steel in the superstructure shall conform to the requirements of AASHTO M270, Grade 50T2. This includes the steel girders, connection plates, bearing stiffeners, diaphragms, bolsters, sole plates, and drip bars.

3. Shear Connectors: Shear Connectors shall conform to Subarticle M.06.02-4.

4. High Strength Bolts: High Strength Bolts shall be galvanized and shall conform to Subarticle M.06.02-3.

5. Reinforcing Steel: Reinforcing steel shall be galvanized and conform to the requirements of Article M.06.01.

Construction Methods:

1. Submittals:

- (a) **Concrete Quality Control Plan:** Submit a Concrete Quality Control Plan (CQCP) in accordance with Subarticle 6.01.03-I, for the PBU bridge deck concrete.
- (b) **Shop Schedule:** Submit a detailed shop fabrication schedule in accordance with Subarticle 6.03.03-2b, for structural steel.
- (c) **Welding Procedures:** Submit all welding procedures in accordance with Subarticle 6.03.03-2c, for structural steel.
- (d) **Shop Drawings and Working Drawings:** Prior to the fabrication of any components, the Contractor shall prepare and submit shop and working drawings in accordance with Article 1.05.02. Multiple shop drawings will be required for the PBUs because the fabrication can take place in multiple separate facilities. The Contractor shall coordinate the preparation of the separate shop drawings to ensure that there are no conflicting details. The distinction between Working Drawings for Permanent Construction and Working Drawings for Temporary Construction shall be clearly indicated on each submission. Acceptance of the shop drawings and working drawings will be required prior to the ordering of the materials and the fabrication of the prefabricated bridge units.

For Reinforcing Steel, a complete set of shop drawings for the reinforcing steel cast within the PBUs shall be prepared and submitted for review and approval in accordance with Subarticle 6.02.03-1. The size, type, coating and location of all cast-in-place inserts, along with catalog cuts and other Manufacturer information, shall also be shown as part of the working drawings.

For Structural Steel, a complete set of shop drawings and working drawings shall be prepared and submitted for review and approval in accordance with Subarticle 6.03.03-2. In addition to the specified standard detailing of shop drawings and minimum requirements for working drawing submittals, the Contractor shall include the following information:

1. The stamp of the registered Professional Engineer licensed in the State of Connecticut who has reviewed and certified the shop drawings and working drawings.
2. All lifting inserts, hardware, or devices and locations for Engineer's approval. All lifting devices shall be designed by the Contractor.
3. Locations and details of the lifting devices, including supporting calculations, type, and amount of any additional reinforcing required for lifting. All lifting devices shall be designed based on the no cracking criteria in Chapter 8 of the PCI Design Handbook (Seventh Edition).

ITEM #0514271A

4. Details and methods for accommodating the dimensional requirement of each PBU accounting for profile grade and cross slope.
 5. Methods for controlling the accumulation of dimensional tolerances through the use of working points or working lines. The width of each individual unit along with the width of the closure pour shall be determined such that, when pieces are laid together, the prefabricated bridge units shall satisfy the required bridge out-to-out width and cross slopes shown on the plans.
 6. Field verified elevations of existing abutment elements interfacing with PBU's. Provide developed elevations from bridge seat through bolsters and top of PBU elements.
 7. The minimum required compressive strength of the concrete deck prior to handling the prefabricated bridge units.
- (e) **Concrete Placement:** Submit concrete placement information in accordance with Subarticle 6.01.03-II6(e), for the bridge deck concrete.
- (f) **Concrete Curing:** Submit a curing plan in accordance with Subarticle 6.01.03-II9(b).
- (g) **Assembly Plan:** The Assembly Plan is a document prepared by the Contractor and a qualified Professional Engineer with specific knowledge of the Contractor's equipment and "means and methods" for constructing the elements required to complete the work on the project. The development of this Assembly Plan is closely linked to the schedule of operations and the interim material strengths necessary for the work to progress. The Contractor shall coordinate the development of the Assembly Plans with the development of the Shop Drawings to ensure consistent detailing. For example, if additional lifting hooks, grout ports, leveling devices, etc. are required, they should be added to the shop drawings prior to approval.

The development of the Assembly Plan and Shop Drawings for the PBUs shall not be measured separately for payment and should be considered incidental to this Item.

The Assembly Plan shall be considered a Working Drawing for Temporary Construction. The development and approval of the Assembly Plan shall be according to Article 1.05.02. Approval of the Assembly Plan is required prior to the initiation of the full roadway closure.

Under no circumstances shall the fabrication of the prefabricated bridge units commence prior to the approval of the Shop Drawings and the Assembly Plan unless written permission is given by the Engineer. The Department shall reject any components fabricated before receiving written approval or components that deviate from the

approved drawings. Any expenses incidental to the revision of materials furnished, in accordance with the Shop Drawings and order lists, to make them comply with the plans and specifications, including costs incurred due to faulty detailing or fabrication, shall be borne by the Contractor.

At a minimum, the Assembly Plan shall include the following information:

1. Details and/or cut sheets of all equipment that will be employed for the assembly of the prefabricated bridge units.
2. Details of all equipment to be used to lift the PBUs including cranes, excavators, lifting slings, sling hooks, and jacks. Crane locations, operation radii, and lifting calculations shall also be included. The factors of safety for the lifting of PBUs shall be achieved by using 150% of the weight of the PBU being lifted. The Contractor is responsible for determining the center of gravity for all PBUs. Special care shall be used for PBUs that are not symmetrical. These elements may require special lifting hardware to allow for installation to the grades shown on the plans.
3. The Assembly plan shall include the evaluation of construction stress for the two PBUs that are loaded prior to closure pour. These PBUs may only be loaded by approved transport vehicles for the delivery for the adjacent PBUs. Include loaded transport vehicle axle loads and spacing. PBU delivery construction loads, subject to review by Engineer of Record, shall satisfy the following:
 - i. Unfactored Wheel Load shall not exceed 20,000 lbs
 - ii. Axle Spacing shall not be less than 4'-6"
 - iii. Unfactored Live Load Moment shall not exceed 1,000 kip-ft
4. The Assembly plan shall include a detailed transportation plan.
5. The Assembly plan shall address the potential for tension in the PBU deck during shipping and handling. Allowable tension stresses in the concrete shall be according Chapter 8 of the PCI Design Handbook (seventh edition). Calculations shall be prepared for the lifting and handling in accordance with the no discernible cracking criteria. Lifting hook locations and hardware shall be coordinated with the Fabricator(s).
6. A statement of compliance with all requirements of applicable railroad and environmental permits.
7. A statement of compliance with the construction timeframes specified in the "Maintenance and Protection of Traffic" and "Prosecution and Progress" specifications.

8. A work area plan, depicting all affected utilities, drainage, and protective measures that will be employed throughout the construction activities.
9. PDF drawings developed as full-size sheets depicting the assembly procedures for the PBUs.
10. A detailed schedule with the timeline for all operations. In development of the schedule the Contractor shall account for setting and cure times for concrete closure pours.
11. Methods of adjusting and securing the elements after placement.
12. Procedures for controlling erection tolerances for both the horizontal and vertical direction.
13. Methods of forming and curing closure pours in accordance with Special Provisions for Item Nos. 0601054A “Ultra High Performance Concrete” and 0601107A “High Early Strength Concrete”. The Contractor shall include description of curing materials if casting is anticipated during times when wet weather can be anticipated.
14. The Assembly Plan shall be bound into one complete document and shall be prepared and stamped by a registered Professional Engineer licensed in the State of Connecticut.

2. Fabrication Plants:

Fabrication of structural steel for PBUs shall be performed in accordance with Subarticle 6.03.03-3.

Casting and curing of the concrete deck shall conform to the requirements of Subarticle 6.01.03-II. Intermediate supports between the centerline of bearings at the girder ends will not be permitted during the placing and curing of the concrete deck.

At a minimum, the following requirements shall be met for fabrication of the PBUs:

- a. If a Concrete Subcontractor is used to construct the reinforced concrete deck on top of the girder pairs, the Subcontractor shall have an established Quality Control Management Plan that is accepted by the Department. The Subcontractor shall follow their own Quantity Control Management Plan in addition to the project specific CQCP that has been submitted to and approved by the Department.
- b. If the Prime Contractor elects to construct the reinforced concrete deck on top of the girder pairs, the Prime Contractor shall follow the project specific CQCP that has been submitted to and approved by the Department.

- c. The PBUs shall be constructed to tolerances shown on the plans. Where tolerances are not shown, follow tolerance limits in the PCI MNL 116-99, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products, 4th Edition". Elements that are found to be out of tolerance may be subject to rejection. Rejection of the elements may be waived by the Engineer if the Contractor can demonstrate that the out of tolerance element can be installed without significant modifications to the bridge. For example, an over width element may be acceptable if the adjacent element is under width or the closure pour width can be modified.
- d. The Concrete Subcontractor and Prime Contractor shall prevent cracking or damage of the PBUs during handling, storage, transportation, and final installation in permanent position.
- e. If damage occurs, replace defects and breakage of the PBUs in accordance with the following:
 - i. Members that sustain damage or surface defects during fabrication, handling, storage, hauling, or erection are subject to review or rejection.
 - ii. Approval must be obtained before performing repairs.
 - iii. Repair work must re-establish the elements' structural integrity, durability, and aesthetics to the satisfaction of the Engineer.
 - iv. Determine the cause when damage occurs and take corrective action.
 - v. Failure to take corrective action, leading to similar repetitive damage, can be cause for rejection of the damaged element.
 - vi. Cracks that extend to the nearest reinforcement plane and fine surface cracks that do not extend to the nearest reinforcement plane but are numerous or extensive are subject to review and rejection.

3. Quality Control: At a minimum, the following requirements shall be met:

- a. The Contractor is required to provide field survey to determine that the PBUs are placed within the horizontal and vertical tolerances herein or as stated on the plans.
- b. The Contractor is responsible for interim testing of concrete strength required to proceed with various stages of construction, including, but not limited to: shop assembly/dry fit, lifting, and transportation to project site. For materials used throughout the construction that have a proven strength gain at predetermined time interval, the compressive testing requirements may be waived by the Engineer. All testing furnished by the Contractor shall be performed by an AASHTO accredited laboratory. All Quality Control test results shall be submitted to the Division of Materials Testing section for approval. Additional testing by the Contractor shall be performed at no additional cost and will not be measured for payment. Final acceptance testing of concrete shall be in accordance with Subarticle 6.01.03-II4. Closure pour testing requirements shall be in accordance with each item's respective Special Provision.
- c. The plant shall document all test results. The quality control file shall contain at least the following information:

- i. Element identification
- ii. Date and time of casting
- iii. Concrete cylinder test results
- iv. Quantity of used concrete and the batch printout
- v. Form-stripping date and repairs if applicable
- vi. Location/number of blockouts and lifting inserts
- vii. Temperature and moisture of curing period
- viii. Document lifting device details, requirements, and inserts

4. PBU Marking: Permanently mark each prefabricated bridge unit with the date of casting and supplier identification. Stamp markings in fresh concrete.

5. PBU Handling and Storage: Materials for this work shall be stored off the ground before, during, and after fabrication. The PBUs shall be kept free from dirt, grease and other contaminants and shall be reasonably protected from corrosion. Care shall be taken during storage, transporting, hoisting and handling of all precast sections to prevent damage. Sections damaged by improper storing, transporting or handling shall be repaired or replaced by the Contractor, as directed by the Engineer and at no cost to the State. All storage and handling operations shall be as directed by the Engineer.

6. Dry Fit prior to Shipment: The Contractor has two options to ensure the proper fit up of the PBUs when placed on the bridge substructure.

Option 1: Fabricate PBUs individually using geometric controls to maintain vertical and horizontal tolerances at closure pours. A dry fit of adjacent elements prior to shipment is required to ensure that they can be properly joined in the field.

Option 2: Fabricate the total number of PBUs, required to make up the full bridge width, together on temporary supports in the same orientation as they will end up in their final location supported by the bridge substructure. A separate dry fit of the PBUs is not required prior to shipping the PBUs. However, concrete curing conditions must be kept consistent for all PBU decks so that the PBU cambers remain within tolerances. A final tolerance check must be performed and documented prior to transport of the PBUs.

Regardless of the Option above, selected for the fabrication of the PBUs, the PBUs shall be dry fit with the precast concrete stem block and backwall unit elements, prior to installation of the elements at the bridge site. Match mark all components during the dry fit operation for accurate field reassembly.

7. Field Installation: The Contractor field personnel shall have knowledge of and follow the approved Assembly Plan. If changes are warranted due to varying site conditions, resubmit the plan for review and approval.

Working points, working lines, and benchmark elevations shall be established prior to placement of all elements. The Contractor is responsible for field survey as necessary to complete the work. The District reserves the right to perform additional independent survey. This survey does not relieve the Contractor from performing survey for the construction. If discrepancies are found, the Contractor may be required to verify previous survey data.

The PBUs shall be placed in the sequence and according to the methods outlined in the Assembly Plan. The height of each element shall be adjusted to acceptable tolerances by means of leveling devices or shims. The Contractor shall ensure that the PBU is in the proper horizontal and vertical location prior to releasing from the crane and setting the next unit.

Bottom of PBU steel beam elevation must be measured within the Amtrak envelope and meet or exceed the minimum clearance requirements shown on the Contract Plans, after all dead loads have been applied. The suggested sequence of construction has dead loads due to: diaphragms, closure pours, parapets, sidewalk, protective fence, utilities and bituminous pavement being applied following the setting of the PBUs. Vertical tolerance between PBU's needs to be checked at the top surface of the PBU. Diaphragms may be used to control geometry; however, if the required setting tolerance cannot be met, the Contractor may be required to adjust or fabricate new diaphragms.

8. Erection Tolerances:

a. Plan Alignment: Location and Clearances

Note: the accumulation of maximum or minimum tolerances when multiple elements are joined may result in final overall dimensions that do not conform to the final dimensions shown on the contract plans. The Contractor must specifically design the element dimensions and tolerances to prevent this.

The Contractor shall adhere to the following tolerances for the final condition of the PBU after placement:

- i. Do not exceed 1/4 inch maximum deviation at each end of the span from overall longitudinal alignment after setting.
- ii. Do not exceed 1/4 inch maximum deviation from overall transverse location (i.e. longitudinal position) at each line of bearings.
- iii. Maximum deviation from alignment in both primary plan directions at each end of the span being set shall not exceed 1/4 inch or that required for the accommodation of manufactured expansion joint components or bearings, whichever is the less.
- iv. In the absence of other constraints, keep individual elements or surfaces within 1/4 inch of location with respect to similar matching surfaces.

b. Bridge Bearings: Elevation and Location

The Contractor shall keep the elevation of individual bridge bearings within plus or minus 1/8 inch of required elevations. The plan location of bridge bearings shall be within a tolerance of 1/8 inch and the alignment within plus or minus 1/16 inch across the bearing.

If tolerances are not met, submit for approval of Engineer, means to adjust elevations or to correct for or accommodate errors or unintended deviations from required tolerances. Submit proposals and seek approval of the Engineer for the use of shims, injection of high strength grout or other methods to accommodate differences from required tolerance. Do likewise, for the accommodation of anchor bolts or similar restraining devices.

- c. Reinforcing Steel: The development length/lap splice of reinforcing steel within the region of the closure pours must be maintained. Field cutting of reinforcing steel that protrudes from PBU elements to accommodate dimensional variations or the installation of field-placed reinforcing bars is strictly prohibited.

Method of Measurement: This work will be measured for payment as the square foot area of concrete deck cast on each PBU, calculated as the actual length and width of each PBU deck after it has been cured. Payment for work and materials described above or as noted on the plans as being incidental to the construction of the PBU shall be included in the unit price of the PBU.

Basis of Payment: This work will be paid for at the contract unit price per square foot for “Precast Concrete/Steel Composite Superstructure”, complete and accepted. Price shall include all tools, materials, equipment, labor and work incidental to the construction.

Payment for work and materials described above or as noted on the plans as being incidental to the construction of the PBU shall be included in the unit price of the PBU. There shall be no separate payment for: shear studs, concrete, reinforcing steel, structural steel and fasteners.

Coating of the PBU structural steel shall be paid for under the items “Metallizing Structural Steel (Site No. 1)” and “Galvanizing Structural Steel (Site No. 1)” as identified on the plans.

Concrete for transverse deck end closure pours shall be paid for under the item “High Early Strength Concrete”.

Ultra High Performance Concrete for longitudinal bridge deck closure pours shall be paid for under the item “Ultra High Performance Concrete”.

Pay Item	Pay Unit
Precast Concrete/Steel Composite Superstructure	SF

ITEM #0514271A

ITEM #0601054A – ULTRA HIGH PERFORMANCE CONCRETE

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

Materials: The materials for this work shall be as follows:

Ultra High Performance Concrete (UHPC): The UHPC shall be mixed on Site from pre-packaged components, pre-proportioned by the UHPC Supplier.

Components: The following materials shall be as recommended by the UHPC Supplier:

- (a) Fine Aggregate
- (b) Cementitious Material and any replacement materials, such as silica fume
- (c) Steel Fibers (must be in accordance with Article 1.06.01 – Buy America)
- (d) Liquid Admixtures (such as super plasticizers or accelerators)

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

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

Table 1: UHPC Material Properties (after 28 days or as noted)		
Description	Test Method	Acceptance Criteria
Compressive Strength	ASTM C39 (as modified by ASTM C1856)	≥ 14 ksi at 4 days ≥ 20 ksi at 28 days
Shrinkage	ASTM C157 (initial reading after set)	≤ 800 micro-strain
Chloride Ion Penetrability	ASTM C1202	≤ 250 coulombs
Freeze-Thaw Resistance	ASTM C666 Procedure A (300 cycles)	Relative Dynamic Modulus of Elasticity, RDM > 95%
Flow	ASTM C1437 (as modified by ASTM C1856)	7 to 10 inches

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

Construction Methods:**1. Contractor Submittals:**

- (a) Mix Design, including proportions of each component, water-to-cementitious materials ratio, mixing time, set time, compressive strength properties of the mix at ages of 2, 4, 7, 14, and 28 days, and Certified Test Reports addressing the material properties in Table 1, shall be submitted to the Engineer for approval at least 90 days in advance of the first UHPC placement.
- (b) UHPC Supplier and Technical Representatives: The Contractor shall obtain the

services of a Supplier experienced in designing, mixing, placing, curing and testing of UHPC. Technical representatives shall be certified or recognized by the UHPC Supplier in the mixing, and placing of UHPC in similar installations. The Supplier and Technical Representatives submittal shall be submitted to the Engineer for approval at least 90 days in advance of the first UHPC placement and shall include the following:

- i. Name and location of Supplier.
 - ii. Name of UHPC product and a list of bridge projects it was utilized on. For each bridge listed, provide a location, description, date of completion of work, the project owner's name, and the name, title and current contact information of a project owner representative.
 - iii. Identification of the potential Technical Representatives (minimum three).
 - iv. UHPC Supplier documentation that the Technical Representatives are qualified to oversee the UHPC operations.
 - v. Work experience of the Technical Representatives: For each Technical Representative, submit a list of projects they attended that included UHPC mixing and placing operations. For each project, provide a location, description, date of completion of work, the project owner's name, and contact information of a project owner representative.
- (c) Construction Work Plan: The Contractor shall submit a Construction Work Plan to the Engineer for review and comment at least 90 days in advance of the first UHPC placement, which shall include the following elements:
- i. Formwork
 1. Proposed formwork materials
 2. Procedure for installing, sealing and maintaining watertight formwork
 3. Procedure and schedule for installing top forms, chimneys and head pails
 4. Planned bulkhead locations
 5. Removal of formwork including tools and access to underside of deck
 - ii. Surface preparation
 1. Procedure to confirm precast concrete surfaces to be in contact with the UHPC are roughened and have exposed aggregate finish with average amplitude of 1/4 inch (at the precast plant or upon delivery to the Site)
 2. Procedures, including source of water, for ensuring saturated surface dry (SSD) connection interfaces prior to UHPC placement
 - iii. Mixing
 1. Storage plan for UHPC components
 2. Mixers and mixing setup including the type and number of mixers, mixing location, water source, and contingency plan if a mixer malfunctions
 3. Description of equipment for weighing UHPC components
 4. Procedure for controlling UHPC mix temperatures including methods of storing ice
 5. Sample batch identification sheet to be used during UHPC production
 - iv. Placement
 1. Placement sequence and schedule including all planned bulkheads
 2. Equipment for transportation and placement of UHPC
 3. Contingency plan if placement operations are interrupted by weather, equipment malfunctions or other issues
 - v. Protection and Curing

ITEM #0601054A

1. Procedure to protect joints from live loads during curing
 2. Cold weather protection plan, if required
 - vi. Grinding
 1. Proposed equipment
 2. Method of collecting and disposing of debris
 - vii. Trial placement plan, outlining procedures to be followed and a dimensioned drawing showing the proposed UHPC placement of a representative joint
- (d) Contractor Quality Control:**
- i. Quality Control Plan, including equipment list, testing setup, sampling methods, frequency and types of tests at least 90 days in advance of the first placement of UHPC.
 - ii. The proposed format for test reporting (or an example test report) shall be provided for the Engineer's review and comment at least 90 days in advance of the first placement of UHPC.
 - iii. The name and location of the Contractor's proposed AASHTO accredited testing laboratory shall be provided to the Engineer at least 90 days in advance of the first placement of UHPC. The laboratory must have equipment capable of preparing UHPC specimens for testing in accordance with ASTM C1856.
 - iv. Reports of test results shall be provided to the Engineer within 7 days of each test.

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

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

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

The Contractor shall perform the following workability procedure during the casting of joint trial placement:

ITEM #0601054A

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

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

The Contractor shall cast five sets of 3 cylinders, in accordance with ASTM C1856, during joint trial placement for determination of compressive strength and test them in accordance with ASTM C39 (as modified by ASTM C1856) at 2, 4, 14, and 28 days.

4. **Safety:** The Contractor shall make UHPC material safety data sheets (MSDS) available and shall provide a safety briefing to all on-site personnel prior to UHPC placement. Proper personal protective equipment shall be used (including but not limited to goggles, dust masks, and respirators) as recommended by the UHPC supplier and as required by the MSDS based on proximity to specific operations.
5. **Storage:** The Contractor shall assure the proper storage of dry premixed components, steel fibers and admixtures as recommended by the Supplier and the following:
 - (a) All dry premixed components shall be stored on raised pallets, with vapor barrier between the pallets and the ground surface to prevent moisture ingress, and shall be covered thoroughly.
 - (b) Steel fibers shall be stored with the same protection as the dry premixed components and rusted fibers shall not be used in mixing.
 - (c) Liquid admixtures shall be stored in sealed containers above freezing temperatures and shall be protected from direct sunlight.
6. **Formwork:** Formwork shall be non-absorbing, watertight and of sufficient rigidity and strength to safely support all loads imposed. The Contractor shall form the UHPC locations to be overfilled according to the Plans.

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

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

ITEM #0601054A

Representatives, as approved by the Engineer, to be on Site for the duration of the UHPC mixing and placement operations. One representative shall remain with the mixing operations and the other representative shall remain with the placement operations. Mixing or placement shall not begin until the Supplier's representative(s) are on-Site and have checked in with the Engineer.

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

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

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

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

13. **Contractor QC requirements:**
 - (a) Batch identification: For each batch of UHPC, record the date, start time and end time, amounts of water and ice, and admixtures used.
 - (b) Flow tests: The Contractor shall conduct one flow test per batch of UHPC in accordance with ASTM C1437 (as modified by ASTM C1856) to verify workability and time of setting. The flow shall be 7 to 10 inches.
 - (c) Mix temperature checks: The Contractor shall conduct one temperature check per batch of UHPC in accordance with ASTM C1064. The temperature of the mix at discharge shall be between 50 and 85°F.
 - (d) Compressive strength cylinder specimens: A minimum of 12 cylinders, 3 inches x 6 inches shall be cast for each day's production. One set (3 cylinders) shall be cast at the beginning and one set at the end of the day's production. Two intermediate sets of

ITEM #0601054A

cylinders shall be cast from the middle portion of the day's production.

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

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

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

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

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

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

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

ITEM #0601054A

Pay Item
Ultra High Performance Concrete

Pay Unit
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ITEM #0601054A

ITEM #0601275A – PRECAST SUBSTRUCTURE ELEMENTS

Work under this item shall be in accordance with the applicable provisions of Sections 6.01 and 6.02, and the provisions contained herein.

Description: Work under this item shall include the fabrication, delivery, temporary bracing/shimming and installation of precast concrete stem blocks, including all necessary materials and equipment to complete the work, as shown on the plans.

This item shall include the reinforcing steel, lifting and seating inserts, non-shrink grout, and all other necessary materials and equipment to complete the work.

Due to the accelerated nature of this project, the PBUs, backwalls, and stem block components shall be manufactured, preassembled (dry-fit) for verification, match marked for field assembly, and approved prior to the initiation of the full roadway closure at the site. The cost to dry-fit the precast substructure components shall be incidental to the Item “Precast Concrete/Steel Composite Superstructure”.

This item shall exclude the drilling and grouting of dowels required to connect precast stem blocks to the existing abutment bridge seat. This item shall also exclude the closed cell foam material between stem block and backwall.

The semi-integral abutment precast concrete backwall elements are included under Item No. 0601277A “Precast Concrete Bridge Components”. These backwalls are considered a superstructure element and are not a part of this item.

Fabrication of precast elements specified under this Item and under Item No. 0601277A “Precast Concrete Bridge Components” shall be completed by one Manufacturer.

Materials: The materials for precast stem blocks shall conform to the following requirements:

Concrete: Concrete shall be low permeability concrete that meets the requirements of Section M.03, for Class PCC05562, and shall have a minimum 28-day compressive strength of 5,500 psi. The use of calcium chloride or an admixture containing calcium chloride will not be permitted.

Reinforcing Steel: Reinforcing steel shall be galvanized and conform to the requirements of Article M.06.01.

Grout: Non-shrink grout shall conform to the requirements of Article M.03.05.

Lifting Hooks and Inserts: If used, lifting hooks and inserts shall be of a design satisfactory to the Engineer for the purpose intended and shall be galvanized in accordance with ASTM A153 or ASTM B695 Grade 50.

Miscellaneous Materials: Materials for leveling devices or non-metallic shims for setting the precast components to proper grade during installation shall comply with the applicable sections of Form 817, for the specific materials used.

Construction Methods:

I. Submittals:

1. **Shop Drawings and Working Drawings:** Prior to the fabrication of any components, the Contractor shall prepare and submit shop and working drawings in accordance with Article 1.05.02. Shop Drawings and Working Drawings shall be submitted a minimum of 60 days prior to fabrication. The Contractor shall coordinate the preparation of the separate shop drawings prepared for all precast concrete components and Prefabricated Bridge Units (PBUs) to ensure that there are no conflicting details. The distinction between Working Drawings for Permanent Construction and Working Drawings for Temporary Construction shall be clearly indicated on each submission. Acceptance of the shop drawings and working drawings will be required prior to the ordering of the materials and the fabrication of the precast concrete components.

For Reinforcing Steel, a complete set of shop drawings for the reinforcing steel cast within the components shall be prepared and submitted for review and approval in accordance with Subarticle 6.02.03-1. The size, type, coating and location of all cast-in-place inserts, along with catalog cuts and other Manufacturer information, shall also be shown as part of the working drawings.

In addition to the specified standard detailing of shop drawings and minimum requirements for working drawing submittals, the Contractor shall include the following information:

- (a) The stamp of the registered Professional Engineer licensed in the State of Connecticut who has reviewed and certified the working drawings.
- (b) All lifting inserts, hardware, or devices and locations for Engineer's approval. All lifting devices shall be designed by the Contractor.
- (c) Locations and details of the lifting devices, including supporting calculations, type, and amount of any additional reinforcing required for lifting. All lifting devices shall be designed based on the no cracking criteria in Chapter 8 of the PCI Design Handbook (Seventh Edition).
- (d) Details and methods for accommodating the dimensional requirement of each precast concrete component, accounting for profile grade, cross slope and variations in the existing bridge elements that they are adjacent to.
- (e) The width of each individual component along with the width of the shear keys shall be determined by the Contractor such that, when pieces are laid together, the precast concrete stem blocks shall satisfy the required out-to-out width and cross slopes shown on the plans. Suggested precast substructure component widths are shown on the Contract Plans. Methods for controlling the accumulation of dimensional tolerances through the use of working points or working lines shall be included.
- (f) Field verified elevations of existing abutment elements interfacing with prefabricated concrete stem blocks. Confirm elevations from bridge seat through bearings, bolsters and top of PBU elements.
- (g) The minimum required compressive strength of the concrete component prior to handling the precast concrete stem blocks.

- 2. Assembly Plan:** The Assembly Plan is a document prepared by the Contractor and a qualified Professional Engineer with specific knowledge of the Contractor's equipment and "means and methods" for constructing the components required to complete the work on the project. The development of this Assembly Plan is closely linked to the schedule of operations and the interim material strengths necessary for the work to progress. The Contractor shall coordinate the development of the Assembly Plans with the development of the Shop Drawings to ensure consistent detailing. For example, if additional lifting hooks, grout ports, leveling devices, etc. are required, they should be added to the shop drawings prior to submittal.

The development of the Assembly Plan and Shop Drawings for the precast concrete stem blocks shall not be measured separately for payment and should be considered incidental to this Item.

The Assembly Plan shall be considered a Working Drawing for Temporary Construction. The development and approval of the Assembly Plan shall be according to Article 1.05.02. Approval of the Assembly Plan is required prior to the initiation of the full roadway closure.

Under no circumstances shall the fabrication of the precast concrete stem blocks commence prior to the approval of the Shop Drawings and the Assembly Plan unless written permission is given by the Engineer. The Department shall reject any components fabricated before receiving written approval or components that deviate from the approved drawings. Any expenses incidental to the revision of materials furnished, in accordance with the Shop Drawings and order lists, to make them comply with the plans and specifications, including costs incurred due to faulty detailing or fabrication, shall be borne by the Contractor.

At a minimum, the Assembly Plan shall include the following information:

- (a) Details and/or cut sheets of all equipment that will be employed for the assembly of the precast concrete stem blocks.
- (b) Details of all equipment to be used to lift the precast concrete stem blocks including cranes, excavators, lifting slings, sling hooks, and jacks. Crane locations, operation radii, and lifting calculations shall also be included. The factors of safety for the lifting of precast concrete stem blocks shall be achieved by using 125% of the weight of the precast concrete stem blocks being lifted. The Contractor is responsible for determining the center of gravity for all precast concrete stem blocks. Special care shall be used for precast concrete stem blocks that are not symmetrical. These components may require special lifting hardware to allow for installation to the grades shown on the plans.
- (c) The Assembly plan shall include a detailed transportation plan.
- (d) The Assembly plan shall address the potential for tension in the precast concrete stem blocks during shipping and handling. Allowable tension stresses in the concrete shall be according Chapter 8 of the PCI Design Handbook (seventh edition). Calculations

- shall be prepared for the lifting and handling in accordance with the no discernible cracking criteria. Lifting hook locations and hardware shall be coordinated with the Fabricator(s).
- (e) A statement of compliance with all requirements of applicable railroad and environmental permits.
 - (f) A statement of compliance with the construction timeframes specified in the “Maintenance and Protection of Traffic” and “Prosecution and Progress” specifications.
 - (g) A work area plan, depicting all affected utilities, drainage, and protective measures that will be employed throughout the construction activities.
 - (h) Precast concrete stem blocks drawings developed as full-size sheets depicting the assembly procedures for the precast concrete stem blocks.
 - (i) A detailed schedule with the timeline for all operations. In development of the schedule the Contractor shall account for setting and cure times for the grouting operations.
 - (j) Methods of adjusting and securing the components after placement. The adjustment of the precast concrete stem blocks must be closely coordinated with the assembly and allowable adjustments of the precast concrete backwalls.
 - (k) Procedures for controlling erection tolerances for both the horizontal and vertical direction.
 - (l) Methods of placing and curing the grout in accordance with Subarticle 6.01.03II-11. The Contractor shall include description of curing materials if placement is anticipated during times when wet weather can be anticipated.
 - (m) The Assembly Plan shall be bound into one complete document and shall be prepared and stamped by a registered Professional Engineer licensed in the State of Connecticut.

II. Quality Control:

1. Minimum Requirements: The following minimum requirements shall be met:

- (a) All precast substructure components shall be fabricated by a PCI certified Fabricator with a minimum certification of “B1”, that is also acceptable to the Department.
- (b) Cracking or damage of precast substructure components shall be prevented during handling and storage.
- (c) Defects and breakage of precast components shall be repaired or the stem block replaced, as follows:
 1. Members that sustain damage or surface defects during fabrication, handling, storage, hauling, or erection are subject to review or rejection.
 2. Approval shall be obtained before performing repairs.
 3. Repair work must re-establish the components’ structural integrity, durability, and aesthetics to the satisfaction of the Engineer.
 4. The cause shall be determined when damage occurs and corrective action shall be taken.
 5. Failure to take corrective action, leading to similar repetitive damage, can be cause for rejection of the damaged component.

6. Cracks that extend to the nearest reinforcement plane and fine surface cracks that do not extend to the nearest reinforcement plane but are numerous or extensive are subject to review and rejection. Full depth cracking and breakage greater than one foot are cause for rejection
- (d) Precast components shall be constructed to tolerances shown below, within this section. Where tolerances are not shown, follow tolerance limits in the PCI MNL116-99, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products, 4th Edition".
 1. Do not exceed 1/4 inch maximum deviation at each end of the fully assembled bridge element width from the overall transverse alignment after setting.
 2. Do not exceed 1/4 inch maximum deviation from overall longitudinal location at each construction joint.
 3. Maximum deviation from alignment in both primary plan directions shall not exceed 1/4 inch or that required for the accommodation of the construction joint width shown on plans, whichever is the less.
 4. In the absence of other constraints, keep individual components or surfaces within 1/4 inch of location with respect to similar matching surfaces.

2. Testing and Documentation:

- (a) The Contractor shall perform strength testing of materials prior to proceeding to the next stage of construction. The strength achieved at the time of testing shall meet the value in the approved Assembly Plan. The Contractor shall not rely solely on cylinder breaks by Department personnel as the schedules for testing by the Department will not be changed. The Contractor shall provide this testing at his own expense and shall take the required number of cylinders in the event that the material does not gain strength as anticipated. Final acceptance testing shall be performed in accordance with Subarticle 6.01.03II4, however no facilities are required at the Project Site.
- (b) Test Cylinders shall be in accordance with Subarticle 6.01.03II-5
- (c) The plant shall document all test results. The quality control file shall contain at least the following information:
 1. Component identification.
 2. Date and time of cast.
 3. Concrete cylinder test results.
 4. Quantity of concrete used and the batch printout.
 5. Form-stripping date and repairs, if applicable.
 6. Location/number of blockouts and lifting inserts.
 7. Temperature and moisture of curing period.
 8. Document lifting device details, requirements, and inserts.

III. Fabrication, Handling and Installation:

1. Fabrication:

- (a) Provide to the Engineer a tentative casting schedule at least two weeks in advance to make inspection and testing arrangements.

- (b) Permanently mark each precast substructure component with the date of casting and supplier identification. Stamp markings in fresh concrete.
- (c) Trowel-finish the top surface of all precast substructure components. Intentionally roughen grouted concrete surfaces. Formed surfaces shall not be finished in any specific manner except as noted below. All fins, runs, or mortar shall be removed from surfaces which will remain exposed. Form marks on exposed surfaces shall be smoothed by grinding.
- (d) The Engineer shall evaluate the acceptability and the cause of the defects and the service condition of the precast stem block component. No repairs shall be done by the Contractor unless permission has been granted by the Engineer. The Contractor shall submit to the Engineer for review, the proposed methods and materials to be used in the repair operation. All repairs shall be sound and properly finished and cured before the precast components are delivered to the job site. The Contractor shall bear the costs of all repair work.

2. Handling:

- (a) The precast components shall not be removed from their casting beds until the concrete has attained the minimum compressive strength determined by the Contractor and approved by the Engineer.
- (b) The precast stem blocks shall have minimum cure of 14 days prior to delivery to site. Test data such as slump, air content, or unit weight for fresh concrete and compressive strengths for the hardened concrete after 7, 14, and 28 days, shall be submitted to the Engineer.
- (c) Precast components shall not be shipped to the job site until the 28 day strength (f'c) has been attained. Provide to the Engineer a delivery schedule at least two weeks in advance of the shipment of precast components to the job site.
- (d) Prior to shipping to the site, all components shall be preassembled (dry-fit) with adjacent precast concrete components, including other precast concrete stem blocks and precast concrete backwalls, that have been attached to the PBUs.
- (e) Care shall be taken during storage, transporting, hoisting and handling of all precast components to prevent damage. Components damaged by improper storing, transporting or handling shall be repaired or replaced by the Contractor, as directed by the Engineer and at no cost to the State. All storage and handling operations shall be as directed by the Engineer.

3. Installation:

- (a) The installation of the precast substructure components shall proceed as required by the approved Assembly Plan and in accordance with the special provisions "Prosecution and Progress" and "Maintenance and Protection of Traffic". The stem block components shall be placed in a manner to best accommodate and facilitate the accelerated construction sequence.
- (b) The stem block components shall be set level as indicated on the plans. The following is the general procedure for installing the stem block:
 1. Review the approved Assembly Plan. If changes are warranted due to varying site conditions, resubmit the plan for review and approval.

2. Establish working points, working lines, and benchmark elevations prior to placement of all components.
3. Drill and grout bars for stem block attachment, to be paid for separately under the Items “Drilling Holes and Grouting Dowels” and “Deformed Steel Bars (Galvanized)”. Use template to match holes cast into stem blocks.
4. Lift stem block segments using lifting devices as shown on the shop drawings.
5. Set stem blocks in the proper horizontal location in the sequence and according to the methods outlined in the Assembly Plan.
6. Check for proper alignment and grade within specified tolerances. Survey the top elevation of the stem block. Adjust vertical leveling devices prior to full release of the stem block from the crane. This will reduce the amount of torque required to turn the bolts in the leveling devices. Check for proper grade within specified tolerances.
7. Place non-shrink grout below stem block per the Assembly Plan.
8. All fixtures or holes cast into the components for lifting, anchoring, or seating shall be neatly filled with non-shrink grout. The finished surface shall be flush and smooth with the adjacent concrete.

Method of Measurement: This work, 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 lump sum price for “Precast Substructure Elements”, complete and accepted in place, which price shall include all materials, equipment, tools, labor and work incidental to the fabrication, testing, transport and installation. There shall be no separate payment for: forms, leveling devices, shims, or any other component or material used for the work, as they are to be included in the contract unit price.

Grouting dowels into drilled holes shall be paid for under “Drilling Holes and Grouting Dowels” and “Deformed Steel Bars - Galvanized”.
Closed Cell Foam shall be paid for under Item No. 0601277A “Precast Concrete Bridge Components”.

Pay Item	Pay Unit
Precast Substructure Elements	L.S.

ITEM #0601277A – PRECAST CONCRETE BRIDGE COMPONENTS

Work under this item shall be in accordance with the applicable provisions of Sections 6.01 and 6.02, and the provisions contained herein.

Description: Work under this item shall include the fabrication, delivery, temporary bracing and connection of precast concrete backwall components to the Prefabricated Bridge Units (PBUs), including all necessary materials and equipment to complete the work, as shown on the plans.

This item shall include the reinforcing steel, embedded steel plates, connectors and fasteners, lifting and seating inserts, non-shrink grout, and all other necessary materials and equipment to complete the work.

Fabrication of precast elements specified under this Item and under Item No. 0601275A “Precast Substructure Elements” shall be completed by one Manufacturer.

Due to the accelerated nature of this project, the PBUs, backwalls, and stem block components shall be manufactured, preassembled (dry-fit) for verification, match marked for field assembly, and approved prior to the initiation of the full roadway closure at the site. The cost to dry-fit the precast concrete backwall components and substructure components shall be incidental to the Item “Precast Concrete/Steel Composite Superstructure”.

Materials: The materials for precast backwalls shall conform to the following requirements:

Concrete: Concrete shall be low permeability concrete that meets the requirements of Section M.03, for Class PCC05562, and shall have a minimum 28-day compressive strength of 5,500 psi. The use of calcium chloride or an admixture containing calcium chloride will not be permitted.

Reinforcing Steel: Reinforcing steel shall be galvanized and conform to the requirements of Article M.06.01.

Structural Steel: Structural steel materials for embedded plates shall conform to the requirements of Section M.06. All structural steel in the superstructure shall conform to the requirements of AASHTO M270, Grade 50T2.

Shear Connectors: Shear Connectors shall conform to Article M.06.02-4. Non-shrink grout shall conform to the requirements of Section M.03.05.

High Strength Bolts: High Strength Bolts, attached to embedded plates, shall conform to Article M.06.02-3.

Grout: Non-shrink grout shall conform to the requirements of Article M.03.05.

Lifting Hooks and Inserts: If used, lifting hooks and inserts shall be of a design satisfactory to the Engineer for the purpose intended and shall be galvanized in accordance with ASTM A153 or ASTM B695 Grade 50.

Joint filler: Expansion joint fillers for bridges shall conform to the requirements of Section M.03.08.

Miscellaneous Materials: Materials for leveling devices or non-metallic shims for setting the precast components to proper grade and bolt hole alignment during installation shall comply with the applicable sections of Form 817, for the specific materials used.

Construction Methods:

I. Submittals:

1. Shop Drawings and Working Drawings: Prior to the fabrication of any components, the Contractor shall prepare and submit shop and working drawings in accordance with Article 1.05.02. Shop Drawings and Working Drawings shall be submitted a minimum of 60 days prior to fabrication. The Contractor shall coordinate the preparation of the separate shop drawings prepared for all precast concrete components and Prefabricated Bridge Units (PBUs) to ensure that there are no conflicting details. The distinction between Working Drawings for Permanent Construction and Working Drawings for Temporary Construction shall be clearly indicated on each submission. Acceptance of the shop drawings and working drawings will be required prior to the ordering of the materials and the fabrication of the precast concrete components.

The width (transverse direction perpendicular to roadway baseline) of each backwall component shall be as shown on the plans or as approved by the Engineer. The Contractor may submit alternative component widths for acceptance.

For Reinforcing Steel, a complete set of shop drawings for the reinforcing steel cast within the components shall be prepared and submitted for review and approval in accordance with Subarticle 6.02.03-1. The size, type, coating and location of all cast-in-place inserts, along with catalog cuts and other Manufacturer information, shall also be shown as part of the working drawings.

In addition to the specified standard detailing of shop drawings and minimum requirements for working drawing submittals, the Contractor shall include the following information:

- (a) The stamp of the registered Professional Engineer licensed in the State of Connecticut who has reviewed and certified the working drawings.
- (b) All lifting inserts, hardware, or devices and locations for Engineer's approval. All lifting devices shall be designed by the Contractor.
- (c) Locations and details of the lifting devices, including supporting calculations, type, and amount of any additional reinforcing required for lifting. All lifting devices shall be designed based on the no cracking criteria in Chapter 8 of the PCI Design Handbook (Seventh Edition).
- (d) Details of leveling devices or vertical adjusting hardware.
- (e) Details and methods for accommodating the dimensional requirement of each precast concrete component, accounting for profile grade, cross slope and variations in the existing bridge elements that they are adjacent to.
- (f) The width of each individual component along with the width of the shear keys shall be determined by the Contractor such that, when pieces are connected in place on the

- PBUs together, the precast concrete backwalls shall satisfy the required out-to-out width and cross slopes shown on the plans. Methods for controlling the accumulation of dimensional tolerances through the use of working points or working lines shall be included. Dimensions from working points or working lines to prevent the cumulation of dimensional tolerances. The width of each individual backwall component along with the width of the shear keys shall be determined such that, when pieces are laid together, the backwall components shall satisfy the required backwall total width and cross slopes shown on the plans
- (g) Field verified elevations of installed precast concrete stem blocks interfacing with precast concrete backwall components. Confirm elevations from bridge seat through bearings, bolsters and top of PBU elements.
 - (h) The minimum required compressive strength of the concrete component prior to handling the precast concrete backwall component.

- 2. Assembly Plan:** The Assembly Plan is a document prepared by the Contractor and a qualified Professional Engineer with specific knowledge of the Contractor's equipment and "means and methods" for constructing the components required to complete the work on the project. The development of this Assembly Plan is closely linked to the schedule of operations and the interim material strengths necessary for the work to progress. The Contractor shall coordinate the development of the Assembly Plans with the development of the Shop Drawings to ensure consistent detailing. For example, if additional lifting hooks, grout ports, leveling devices, etc. are required, they should be added to the shop drawings prior to submittal.

The development of the Assembly Plan and Shop Drawings for the precast concrete back walls shall not be measured separately for payment and should be considered incidental to this Item.

The Assembly Plan shall be considered a Working Drawing for Temporary Construction. The development and approval of the Assembly Plan shall be according to Article 1.05.02. Approval of the Assembly Plan is required prior to the initiation of the full roadway closure.

Under no circumstances shall the fabrication of the precast concrete backwall components commence prior to the approval of the Shop Drawings and the Assembly Plan unless written permission is given by the Engineer. The Department shall reject any components fabricated before receiving written approval or components that deviate from the approved drawings. Any expenses incidental to the revision of materials furnished, in accordance with the Shop Drawings and order lists, to make them comply with the plans and specifications, including costs incurred due to faulty detailing or fabrication, shall be borne by the Contractor.

At a minimum, the Assembly Plan shall include the following information:

- (a) Details and/or cut sheets of all equipment that will be employed for the assembly of the precast concrete backwall component.

- (b) Details of all equipment to be used to lift the precast concrete backwall component including cranes, excavators, lifting slings, sling hooks, and jacks. Crane locations, operation radii, and lifting calculations shall also be included. The factors of safety for the lifting of precast concrete backwall components shall be achieved by using 125% of the weight of the precast concrete backwall component being lifted. The Contractor is responsible for determining the center of gravity for all precast concrete backwall components. Special care shall be used for precast concrete backwall components that are not symmetrical. These components may require special lifting hardware to allow for installation to the grades shown on the plans.
- (c) The Assembly plan shall include a detailed transportation plan.
- (d) The Assembly plan shall address the potential for tension in the precast concrete backwall components during shipping and handling. Allowable tension stresses in the concrete shall be according Chapter 8 of the PCI Design Handbook (seventh edition). Calculations shall be prepared for the lifting and handling in accordance with the no discernible cracking criteria. Lifting hook locations and hardware shall be coordinated with the Fabricator(s).
- (e) A statement of compliance with all requirements of applicable railroad and environmental permits.
- (f) A statement of compliance with the construction timeframes specified in the “Maintenance and Protection of Traffic” and “Prosecution and Progress” specifications.
- (g) A work area plan, depicting all affected utilities, drainage, and protective measures that will be employed throughout the construction activities.
- (h) Precast concrete backwall component drawings developed as full-size sheets depicting the assembly procedures for the precast concrete backwall components.
- (i) A detailed schedule with the timeline for all operations. In development of the schedule the Contractor shall account for bolting and torqueing, setting and cure times for the grouting operations.
- (j) Methods of temporary support, adjusting and securing the components. The adjustment of the precast concrete backwall components must be closely coordinated with the installed precast concrete stem blocks and PBUs.
- (k) Procedures for controlling erection tolerances for both the horizontal and vertical direction.
- (l) Methods of placing and curing the grout in accordance with Subarticle 6.01.03II-11. The Contractor shall include description of curing materials if placement is anticipated during times when wet weather can be anticipated.
- (m) The Assembly Plan shall be bound into one complete document and shall be prepared and stamped by a registered Professional Engineer licensed in the State of Connecticut.

II. Quality Control:

1. Minimum Requirements: The following minimum requirements shall be met:

- (a) All precast concrete backwall components shall be fabricated by a PCI certified Fabricator with a minimum certification of “B1”, that is also acceptable to the Department.

- (b) Cracking or damage of precast concrete backwall components shall be prevented during handling and storage.
- (c) Defects and breakage of precast concrete components shall be repaired or the component replaced, as follows:
 - 1. Members that sustain damage or surface defects during fabrication, handling, storage, hauling, or erection are subject to review or rejection.
 - 2. Approval shall be obtained before performing repairs.
 - 3. Repair work must re-establish the component's structural integrity, durability, and aesthetics to the satisfaction of the Engineer.
 - 4. The cause shall be determined when damage occurs and corrective action shall be taken.
 - 5. Failure to take corrective action, leading to similar repetitive damage, can be cause for rejection of the damaged component.
 - 6. Cracks that extend to the nearest reinforcement plane and fine surface cracks that do not extend to the nearest reinforcement plane but are numerous or extensive are subject to review and rejection. Full depth cracking and breakage greater than one foot are cause for rejection
- (d) Precast components shall be constructed to tolerances shown below, within this section. Where tolerances are not shown, follow tolerance limits in the PCI MNL116-99, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products, 4th Edition".
 - 1. Do not exceed 1/4 inch maximum deviation at each end of the fully assembled bridge element width from the overall transverse alignment after setting.
 - 2. Do not exceed 1/4 inch maximum deviation from overall longitudinal location at each construction joint.
 - 3. Maximum deviation from alignment in both primary plan directions shall not exceed 1/4 inch or that required for the accommodation of the construction joint width shown on plans, whichever is the less.
 - 4. In the absence of other constraints, keep individual components or surfaces within 1/4 inch of location with respect to similar matching surfaces.

2. Testing and Documentation:

- (a) The Contractor shall perform strength testing of materials prior to proceeding to the next stage of construction. The strength achieved at the time of testing shall meet the value in the approved Assembly Plan. The Contractor shall not rely solely on cylinder breaks by Department personnel as the schedules for testing by the Department will not be changed. The Contractor shall provide this testing at his own expense and shall take the required number of cylinders in the event that the material does not gain strength as anticipated. Final acceptance testing shall be performed in accordance with Subarticle 6.01.03II4, however no facilities are required at the Project Site.
- (b) Test Cylinders shall be in accordance with Subarticle 6.01.03II-5
- (c) The plant shall document all test results. The quality control file shall contain at least the following information:
 - 1. Component identification.

2. Date and time of cast.
3. Concrete cylinder test results.
4. Quantity of concrete used and the batch printout.
5. Form-stripping date and repairs, if applicable.
6. Location/number of blockouts and lifting inserts.
7. Temperature and moisture of curing period.
8. Document lifting device details, requirements, and inserts.

III. Fabrication, Handling and Installation:

1. Fabrication:

- (a) Provide to the Engineer a tentative casting schedule at least two weeks in advance to make inspection and testing arrangements.
- (b) Permanently mark each precast concrete backwall component with the date of casting and supplier identification. Stamp markings in fresh concrete.
- (c) Provide an exposed aggregate finish on the top surface of all precast concrete backwalls components. Intentionally roughen grouted concrete surfaces. Formed surfaces shall not be finished in any specific manner except as noted below. All fins, runs, or mortar shall be removed from surfaces which will remain exposed. Form marks on exposed surfaces shall be smoothed by grinding.
- (d) The Engineer shall evaluate the acceptability and the cause of the defects and the service condition of the precast backwall component. No repairs shall be done by the Contractor unless permission has been granted by the Engineer. The Contractor shall submit to the Engineer for review, the proposed methods and materials to be used in the repair operation. All repairs shall be sound and properly finished and cured before the precast components are delivered to the job site. The Contractor shall bear the costs of all repair work.

2. Handling:

- (a) The precast components shall not be removed from their casting beds until the concrete has attained the minimum compressive strength determined by the Contractor and approved by the Engineer.
- (b) The precast backwall components shall have minimum cure of 14 days prior to delivery to site. Test data such as slump, air content, or unit weight for fresh concrete and compressive strengths for the hardened concrete after 7, 14, and 28 days, shall be submitted to the Engineer.
- (c) Precast components shall not be shipped to the job site until the 28 day strength (f'c) has been attained. Provide to the Engineer a delivery schedule at least two weeks in advance of the shipment of precast components to the job site.
- (d) Prior to shipping to the site, all components shall be preassembled (dry-fit) with adjacent precast concrete components, including other precast concrete backwall components that have been attached to the PBUs and precast concrete stem blocks in the position they will be in the final structure relative to the other elements.
- (e) Care shall be taken during storage, transporting, hoisting and handling of all precast components to prevent damage. Components damaged by improper storing,

transporting or handling shall be repaired or replaced by the Contractor, as directed by the Engineer and at no cost to the State. All storage and handling operations shall be as directed by the Engineer.

3. Installation:

- (a) The installation of the precast concrete backwall components shall proceed as required by the approved Assembly Plan and in accordance with the special provisions “Prosecution and Progress” and “Maintenance and Protection of Traffic”. The backwall components shall be placed in a manner to best accommodate and facilitate the accelerated construction sequence.
- (b) The backwall components shall be bolted to the ends of the PBUs. Adjustments shall be made to accommodate the required grade and the top surface of the installed precast concrete stem blocks. The following is the general procedure for installing the precast concrete backwall components:
 - 1. Review the approved Assembly Plan. If changes are warranted due to varying site conditions, resubmit the plan for review and approval.
 - 2. Establish working points, working lines, and benchmark elevations prior to placement of all components.
 - 3. Lift backwall components using lifting devices as shown on the shop drawings.
 - 4. Set backwall components into their proper transverse location as shown on the approved Assembly Plan. Align anchor bolts with holes in PBU end plates. Do not tighten anchor bolt nuts until final elevation has been verified.
 - 5. Check for proper alignment and grade within specified tolerances. Survey the top elevation of the backwall. Adjust vertical leveling devices prior to full release of the backwall component from the crane. Check for proper grade within specified tolerances.
 - 6. Fully torque anchor bolt nuts to secure backwall component in place and release crane.
 - 7. Set adjacent backwall component using same procedure until all components are in place.
 - 8. Fill vertical shear keys with non-shrink grout.
 - 9. All fixtures or holes cast into the components for lifting, anchoring, or seating shall be neatly filled with non-shrink grout. The finished surface shall be flush and smooth with the adjacent concrete.
 - 10. After all components are in place and grouted, the deck end closure pour, using “High Early Strength Concrete” may be completed

Method of Measurement: This work, 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 lump sum price for “Precast Concrete Bridge Components”, complete and accepted in place, which price shall include all materials, equipment, tools, labor and work incidental to the fabrication, testing, transport and installation. There shall be no separate payment for: forms, leveling devices, shims, or any other component or material used for the work, as they are to be included in the contract unit price.

Pay Item
Precast Concrete Bridge Components

Pay Unit
L.S.

ITEM #0603233A – GALVANIZING STRUCTURAL STEEL (SITE NO. 1)

Description: Work under this item shall consist of the surface preparation, galvanizing, shipping and storage, and repair of structural steel members and components as shown on the plans or as directed by the Engineer.

Materials: All new structural steel shall meet the requirements of M.06.02 and M.06.03 prior to galvanizing.

Submit a Certified Test Report for the molten zinc material composition and a Materials Certificate to confirm that the hot-dip galvanized coating meets or exceeds the requirements of ASTM A123.

Construction Methods:

Submittals: A Quality Control Plan outlining the Galvanizer's proposed procedures to assure compliance with ASTM A123 shall be submitted at least 30 days prior to the start of work for the Engineer's review and comment.

Notification: Contact the Division of Materials Testing at DOT.Steel@ct.gov a minimum of 72 hours prior to the start of galvanizing work.

Fabricator Responsibilities:

1. Where construction requires matching specific pieces, piece marks with metal tags shall be used to ensure identification of members after galvanizing.
2. All fins, scabs, or other surface/edge anomalies shall be ground or repaired as specified in ASTM A6.
3. When required, the Fabricator shall provide venting and drainage for free flow of the galvanizing. The number, size and location of vent and drain holes shall be coordinated with the Galvanizer prior to the submission of the Structural Steel shop drawings. Edges of holes shall be deburred and uniform and all sharp edges shall be broken. Torch cutting of holes shall be strictly prohibited.
4. The Fabricator shall notify the Galvanizer if further coating work is to be performed after galvanizing.

Structural Steel Preparation:

1. The Galvanizer shall ensure proper removal of grease, paint, and other deleterious materials prior to galvanizing. If rust, dirt, oil, grease, or other foreign substances have accumulated prior to galvanizing, steel surfaces shall be cleaned.
2. Special attention shall be given to the cleaning of corners and re-entrant angles.
3. Any surfaces that will receive field-installed stud shear connectors shall not be galvanized.
4. The following steel surfaces of bearings shall not be galvanized: stainless steel surfaces, surfaces that will be machined, and surfaces that have PTFE, elastomer, or stainless steel bonded to them.

Application of Hot Dip Galvanized Coating:

1. Before hot dip galvanizing, the galvanizing tanks shall be cleaned to remove surface and bottom contamination.
2. Steel members, fabrications, and assemblies shall be galvanized by the hot dip process in the shop in accordance with ASTM A385 and ASTM A123.
3. The structural steel members and components shall be single dip hot dip galvanized by completely submerging them in the galvanizing tank.
4. All steel shall be safeguarded against embrittlement in accordance with ASTM A143.
5. All galvanized steel work shall be handled in such manner as to avoid any mechanical damage and to minimize distortion in accordance with ASTM A384.
6. All bolt holes shall be reamed or drilled to their specific diameters after galvanizing. All bolts shall be installed after galvanizing.

Hot Dip Galvanizing Coating Requirements:

1. The Galvanizer shall verify that coating weight, surface finish, appearance, and adhesion meet the requirements of ASTM A123.
2. Any high spots of zinc coating left in the galvanizing process in areas that are to be field connected, such as metal drip lines or rough edges, shall be removed by cleaning as specified in SSPC-SP2 (Hand Tool Cleaning) or SSPC-SP3 (Power Tool Cleaning). The zinc shall be removed until it is level with the surrounding area, leaving at least the minimum required zinc thickness.
3. Galvanized articles shall be free from uncoated areas, blisters, flux deposits, acid and black spots, and dross inclusions. Lumps, projections, globules, or heavy deposits of zinc will not be permitted. All holes shall be clean and free of excess zinc.

Testing and Inspection of Galvanized Coating:

1. The Galvanizer shall conduct tests for coating thickness of the galvanized coating by the methods in ASTM A123-8. The coating thickness shall meet the requirements outlined in the tables in ASTM A123-6.
2. The material shall be inspected in accordance with ASTM A123-9.

Repair of Hot Dip Galvanized Coating:

1. 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 grey zinc rich coating shall be permitted. No aerosol products shall be permitted for use.
2. 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.
3. Damage that occurs in the shop shall be repaired in the shop.
4. Damage that occurs during transport or in the field shall be submitted and reviewed by the Engineer to determine the repair requirements.

Construction Requirements: If white rust is visible on the contact surfaces for any field connection, the steel surface shall be hand wire brushed or cleaned per SSPC-SP7 (Brush-Off Blast Cleaning). Power wire brushing is not allowed.

Shipping and Storage:

1. The members and components shall be handled so that after galvanizing they will not freeze together on cooling.
2. The galvanized members and components shall be stored at the Fabricator, Galvanizer and at the construction Site off the ground, with adequate spacers to promote ventilation between pieces and at a slight inclination to promote drainage. They shall be kept free from dirt, grease and other contaminants and shall be reasonably protected from corrosion.

Method of Measurement: 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 "Galvanizing Structural Steel (Site No. 1)," complete and accepted, which price shall include all materials, equipment, tools, and labor incidental thereto.

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

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

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

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

Abrasives:

Abrasives shall conform to the following:

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

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

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

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

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

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

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

Construction Methods: The Contractor shall implement procedures that comply with this specification. If a state or local regulation is more restrictive than the requirements of this specification, the more restrictive requirements shall prevail. The Contractor must comply with

all local OSHA and EPA standards and regulations, even if the regulation or standard is not specifically referenced herein.

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

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

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

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

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

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

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

Metallizing Quality Control (QC) Plan, including:

A. Written procedures for the preparation of surfaces and the application of the metallizing, the

sealer, and topcoat in the shop; and procedures for the repair and touch up of any damage that occurs to the newly applied metallizing or coatings. Shop and field repair procedures must be clearly identified.

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

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

Surface Preparation:

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

Engineer. All surfaces that are rejected shall be re-cleaned to the satisfaction of the Engineer at no additional cost to the State.

G. Pre-Production Test Section and Bend Tests:

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

Metallizing Application:

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

F. Quality Control of Metallizing Operation:

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

G. Bolted Connections and Other Areas:

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

Sealer and Topcoat Application:

A. The sealer shall be applied in a single mist coat followed by a full topcoat.

1. The Metallizing Contractor shall apply the sealer in accordance with the manufacturer's recommendations, unless otherwise specified.
2. The sealer shall be applied no more than 8 hours after application of the metallizing, and in no case shall the sealer be applied over dust, rust that may have bled through (if there was not enough thickness), loose oxides or other visible contaminants that would interfere with the sealer.
3. When conventional spray equipment is used, the Contractor shall verify that the

- compressed air supply is clean and dry as determined by the blotter test (ASTM D4285).
4. The topcoat shall be applied to achieve a 4 to 6 mils dry film thickness and shall be applied after the seal coat has been allowed to dry as required by the recoat time in the manufacturer's written instructions, but in no case shall a coat remain exposed for longer than ten (10) calendar days prior to overcoating.
- B. Coverage and Continuity: All surfaces shall be completely coated and free of voids, runs, sags or other defects. Special attention shall be given to hard-to-reach or inaccessible areas and irregular surfaces. Some configurations may require spraying from multiple directions to assure complete coverage.
- C. Sealer and Topcoat Adhesion to Metallized Surfaces:
1. The Metallizing Contractor shall apply the sealer and topcoat in such a manner to assure adherence to the underlying surface. Any lifting of an underlying coat, or poor adhesion between coats or to the substrate, will require removal of the coating in the affected area to adjacent intact, adherent, coating, and reapplication of the material.
 2. Topcoat adhesion shall be verified using adhesion tests in accordance with ASTM D4541 as directed by the Engineer.
- D. Coating Thickness
1. Wet Film Thickness: The Contractor shall verify and document the thickness of each liquid coat at the time of application using wet film thickness gages in accordance with ASTM D4414.
 2. Dry Film Thickness: The dry film thicknesses of the completed coating shall be:

Metallizing	8 to 12 mils
Topcoat	<u>4 to 6 mils</u>
TOTAL SYSTEM	12 to 18 mils

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

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

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

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

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

with the topcoat and shall be approved by the Engineer prior to application of the stenciled information.

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

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

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

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

ITEM #0712021A – GRS ABUTMENT AND WINGWALL
ITEM #0712023A – REINFORCED SOIL FOUNDATION (RSF)
ITEM #0712024A – REINFORCED INTEGRATED APPROACH

DESCRIPTION:

This work consists of furnishing materials and constructing geosynthetic reinforced soil (GRS) walls in the locations and to the dimensions and details shown on the plans, and in accordance with these Specifications.

Where called for on the plans or as ordered by the Engineer, this work shall also include furnishing and constructing a geosynthetic reinforced soil foundation (RSF).

The following are definitions of key elements in the GRS specification and details:

Reinforced Integrated Approach: The portion of the system that is placed under the roadway approach pavement behind the rear face of the superstructure.

GRS Wall: The portion of the system that makes up the reinforced soil mass of the system, including the No. 8 gradation crushed stone and the geotextile reinforcement.

GRS Foundation: The portion of the system that is below the reinforced soil mass of the GRS Abutment. It is used to properly seat the system on the substrate.

MATERIALS:

1. **Reinforced Soil Foundation (RSF) Backfill:** The material used in the Reinforced Soil Foundation (RSF) backfill shall meet the requirements of Article M.01.02, No. 8 Gradation.
2. **GRS Walls Backfill:** The material used in the Abutment Backfill shall meet the requirements of Article M.01.02 of the Standard Specifications, No. 8 Gradation.
3. **Reinforced Integrated Approach Backfill:** The materials used for the Integrated Approach Backfill shall meet the requirements of Article M.01.02 of the Standard Specifications, No. 8 Gradation and Article M.05.01 of the Standard Specifications, Processed Aggregate Base.

ITEM NO. 0712021A
ITEM NO. 0712023A
ITEM NO. 0712924A

4. **Geotextile:** The material shall be a biaxial, polypropylene geotextile. The Geotextile is required to have a minimum ultimate tensile strength of 4,800 lbs/ft and the reinforcement strength at 2% strain shall be greater than 960 lbs/ft in both the cross-machine and machine directions, in accordance with ASTM 4595-11 or ASTM D 6637-11.

The geosynthetic reinforcement Manufacturer is responsible for establishing and maintaining a quality control (QC) program to ensure compliance with the requirements of these Specifications.

Conformance testing shall be performed as part of the manufacturing process and may vary for each type of product. Sampling and conformance testing shall be in accordance with ASTM D-4354, with conformance testing procedures established as noted in the specification. Geotextile product acceptance shall be based on ASTM D-4759.

The quality control certificate shall include roll number and identification, sampling procedures, and results of control test (including a description of test methods used).

SHOP DRAWINGS:

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

- a. PDF documents prepared on full size 22" x 34".
- b. Full plan view of each GRS wall drawn to scale. The plan view must illustrate the reinforcement lengths the Contractor plans on using for each lift height in accordance with the minimum lengths provided. Beginning and ending stations/offsets of each GRS wall, all utilities, signs, fence posts, etc. located within the footprint of the reinforcement layers.
- c. Full elevation view of the GRS wall face drawn to scale. Elevation views shall indicate the elevation at the top and bottom of the GRS walls and the location of finished grade.
- d. Typical cross sections drawn to scale including all appurtenances. Detailed cross sections shall be provided at significant reinforcement transitions.
- e. Material designations for all materials to be used, including temporary formwork.
- f. Detailed construction methods including a quality control plan, which shall cover the following:
 - i. Methods of delivery and placement of backfill materials including the proposed equipment. Accommodation of limited vertical and horizontal clearances and their impact on the equipment shall be addressed.

ITEM NO. 0712021A
ITEM NO. 0712023A
ITEM NO. 0712924A

- ii. Methods and materials to temporarily support and form the wrapped face walls.
 - iii. Methods to control horizontal line and 0 degree batter of the front face of the wall including methods to adjust the line and batter as the wall layers are set.
 - iv. Methods for making final grade adjustments at the top of the wall.
 - v. Methods of accommodating stage construction joints. This may require the use of temporary wall sections that are left in place in the backfill material.
- g. Details of sloping top of GRS walls where required.
 - h. Details of corner treatments where required.
 - i. Details of Temporary Earth Retaining Systems where required.
 - j. Details of wall treatment where the wall abuts other structures.

The preliminary submission shall be treated as a shop drawing in accordance with Section 1.05 amended as follows:

- a. Four (4) sets of each submission shall be supplied to the Department along with an electronic pdf copy.
- b. The Contractor shall allow 21 days for the review of each submission. If subsequent submissions are required as a result of the review process, 21 days shall be allowed for review of each submission. No extensions in contract time will be allowed for the review of these submissions.

Final Submissions:

- a. Once a construction package has been reviewed and accepted by the Department, the Contractor shall submit the final plans electronically in pdf form. The final submission shall also include two (2) sets of full size (22" x 34") plans and four (4) sets of half size (11" x 17") plans.
- b. The final submission shall be made within 14 days of acceptance by the Department. No work shall be performed on the GRS walls until the final submission has been received and accepted.
- c. Acceptance of the final design shall not relieve the Contractor of his responsibility under the contract for the successful completion of the work.

CONSTRUCTION METHODS:

1. **Pre-Installation Field Meeting:** A pre-installation field meeting will be scheduled by the Engineer and held prior to the start of any GRS wall construction. The Engineer, Contractor and all Subcontractors involved in the construction of the GRS wall. Attendance is mandatory. The pre-installation field meeting will be conducted to clarify the construction requirements for the work, to coordinate the construction schedule and activities, to identify contractual relationships, and to delineate responsibilities amongst the Engineer, the Contractor and the various Subcontractors. The meeting will be held, after approval of the shop drawings, on a date to be determined by the Engineer.
2. **Excavation:** Excavation shall be accomplished and maintained in accordance with Article 2.03. Any backfilling of the excavation outside the limits of the GRS Wall and RSF shall be in accordance with Section 2.02.
3. **GRS Foundation:** The GRS Foundation shall consist of either: in-situ soil, Granular Fill, a Reinforced Soil Foundation (RSF), a concrete leveling pad or another foundation system as called for on the plans.

GRS Foundations placed on in-situ soil shall be prepared in conformance with Section 2.03.

GRS Foundations placed on Granular Fill shall be prepared in conformance with Section 2.13.

GRS Foundations placed on a RSF shall meet the requirements of the plans and this specification. The base shall be level-graded plus 1 foot on all sides or to the limits shown on the plans. The RSF shall be constructed with backfill placed from the face of wall to the back, in order to roll folds or wrinkles to the free end of the reinforcement layer. It shall be compacted in nominal 6-inch lifts, and it shall be graded, leveled and compacted before encapsulating the RSF. A minimum of 4 passes of the compaction equipment will be required per lift. The Engineer will visually inspect the RSF to confirm proper placement and compaction. The RSF shall be encapsulated in the geotextile reinforcement and placed perpendicular to the abutment face to protect it from possible erosion. The geotextile shall be large enough to fully enclose the RSF on the face and wingwall sides. The wrapped corners of the RSF shall be tight and without exposed soil within the RSF to complete the encapsulation. Further, 'Section 7.4 RSF' of the "Design and Construction Guidelines for Geosynthetic Reinforced Soil Abutments and Integrated Bridge Systems", FHWA-HRT-17-080, June 2018, may be referenced for construction methods of the RSF only.

ITEM NO. 0712021A
 ITEM NO. 0712023A
 ITEM NO. 0712924A

GRS Foundations placed on a concrete leveling pad shall be prepared in conformance with Section 3.03.

4. **GRS Abutment and Wingwalls:** The GRS Abutment and Wingwalls shall be constructed using compacted lifts with lift heights equal to the vertical spacing of reinforcement, as shown on the plans, or a nominal 6 inches, whichever is less. Compaction shall be performed using vibratory roller compaction equipment or other similar methods. A minimum of 4 passes will be required per lift. Within 3 feet of the front of the wall face, hand operated equipment such as lightweight mechanical tampers, plates or rollers shall be used to avoid damage or displacement of facing elements. The Engineer will visually inspect the lifts to confirm proper placement and compaction. All compaction equipment shall be selected to perform the appropriate compaction effort.

Geotextile reinforcement shall be installed in accordance with the manufacturer's recommendations and these Specifications and to the extent on the plans or as directed by the Engineer. The Geotextile shall be placed so that the strongest direction is perpendicular to the abutment facing and coverage shall be 100% of the embedment area unless otherwise shown on the plans. Adjacent sections of the Geotextile shall not be overlapped, except when exposed in the wrap-around facing system.

The Geotextile shall be laid so that it is taut and free of wrinkles prior to backfilling. Any seams in the geosynthetic shall be staggered with each successive layer of the GRS wall. All seams between adjacent sheets of geosynthetic located in the area beneath the footprint of the bridge seat shall be perpendicular to the abutment wall face.

No equipment shall be placed on the geotextile until at least 6-inches of material is placed on it and tracked equipment shall use caution while turning on the backfill to avoid damaging the Geotextile.

5. **Superstructure Placement:** A crane used for placement of the superstructure can be positioned on the GRS abutment provided the outrigger pads are positioned within the capacity of the GRS mass. The outrigger pads shall be sized for a maximum pressure of 4,000 psf near the GRS wall face with greater loads able to be supported with increasing distance from the abutment face. The lower section of the GRS Wall shall define the "front face" of the wall and no crane loads should be applied to the temporary section of the integrated approach zone. See the plan sheets for GRS wall layout details.

ITEM NO. 0712021A
ITEM NO. 0712023A
ITEM NO. 0712924A

6. **Reinforced Integrated Approach:** The Reinforced Integrated Approach includes sections constructed both before and after superstructure placement.

Advanced Stage Construction:

The approach sections constructed prior to superstructure placement, including the temporary approach section adjacent to the existing backwall, shall be constructed per the requirements of Section 4 “GRS Abutment and Wingwall” above, and as noted below.

The wrapped Geotextile reinforcement spacing shall be 12 inches, with intermediate Geotextile reinforcement layers spaced at 6 inches. The advanced stage reinforced integrated approach sections shall be constructed using compacted lifts of No. 8 crushed stone backfill with lift heights equal to the vertical spacing of intermediate reinforcement, as shown on the plans, or a nominal 6 inches, whichever is less. The top layer of Geotextile reinforcement shall be kept at least 2 inches below the pavement structure base course.

Final (Stage 5) Construction:

The temporary advanced stage integrated approach section shall be removed during existing bridge demolition and new superstructure placement. After placement of the superstructure, the permanent Reinforced Integrated Approach shall be constructed against the new backwall. This Reinforced Integrated Approach section shall consist of reinforced Processed Aggregate Base placed and compacted per Section 3.04, with the exception of lift dimensions.

The wrapped Geotextile reinforcement spacing shall be 12 inches, with intermediate reinforcement layers spaced at 6 inches. The processed Aggregate Base shall be placed and compacted in 6-inch lifts. The top wrap fold shall increase in length with each successive wrapped layer. The top layer of Geotextile reinforcement shall be kept at least 2 inches below the bottom of the pavement structure base course.

The top elevation of the Reinforced Integrated Approach shall consider the pavement structure depth in all stages of construction. The top layer of reinforcement shall always be a minimum of 2 inches below the bottom of the pavement structure base course. This limit shall be maintained at all locations along the top surface of the Reinforced Integrated Approach zone including the point of reinforcement termination at the rear of the zone.

Roadway profile and cross slope shall be taken into account at all locations and during all stages.

7. **Site Drainage:** The GRS construction area shall be protected from surface runoff during the Project. The Site shall be graded at the end of the work shift in anticipation of precipitation to avoid saturation of soil. An alternative to grading by placing diversion trenches around the perimeter to divert water would be acceptable. Any loose soil placed to construct GRS shall be graded and compacted before stoppage of work for the day. Onsite stockpiles of fill material containing fines shall be protected from excess precipitation.
8. **Miscellaneous:** Where fencing, wood post or metal beam rail is called for within the limits of the reinforced soil mass, the posts shall be installed mechanically using a metal driving cap to puncture the layers of geotextile cleanly prior to post installation. Pre-formed concrete fence post foundations may be installed as the GRS is constructed. Wood posts shall not be driven through the geotextile to avoid negative effects to the reinforced soil mass. No holes shall be drilled through the geotextile at any stage of construction.

Water utilities are not permitted to be installed through the footprint of the reinforced soil mass.

Where plantings are called for, they shall be installed outside the limits of the GRS soil mass to avoid root growth through the reinforced soil mass.

METHOD OF MEASUREMENT:

1. **GRS Abutment and Wingwall:** The GRS wall structures, including geotextile fabric, will be measured for payment by the cubic yards of No.8 Crushed Stone measured in place after compaction within the payment lines as shown on the plans or as specified by the Engineer. The Geotextile reinforcement is considered to be part of the GRS wall structures and will not be measured for payment. All required excavation shall be measured separately and paid for under Item “Structure Excavation – Earth (Complete)”.
2. **Reinforced Soil Foundation (RSF):** The Reinforced Soil Foundation including geotextile fabric will be measured for payment by the cubic yards of No. 8 crushed stone measured in place after compaction within the payment lines as shown on the plans or as specified by the Engineer. The Geotextile reinforcement is considered to be part of the Reinforced Soil Foundation and will not be measured for payment. All required excavation shall be measured separately and paid for under Item “Structure Excavation – Earth (Complete)”.

ITEM NO. 0712021A
ITEM NO. 0712023A
ITEM NO. 0712924A

3. **Reinforced Integrated Approach:** The Reinforced Integrated Approach including geotextile fabric will be measured for payment by the cubic yards of No. 8 crushed stone and Processed Aggregate Base measured in place after compaction within the payment lines as shown on the plans or as specified by the Engineer. The Geotextile reinforcement is considered to be part of the Reinforced Integrated Approach and will not be measured for payment. All required excavation shall be measured separately and paid for under Item “Structure Excavation – Earth (Complete)”. The Reinforced Integrated Approach is constructed in stages and shall be measured for payment at the completion of each stage.

BASIS OF PAYMENT:

1. **GRS Abutment and Wingwall:** “GRS Abutment and Wingwall” will be paid at the Contract unit price per cubic yard. Such payment shall include the cost of furnishing and installing No. 8 Crushed Stone, and Geotextile used within the backfill behind the GRS wall face. Such payment also includes all labor, materials and equipment necessary to complete the work in an acceptable fashion.
2. **Reinforced Soil Foundation (RSF):** “Reinforced Soil Foundation (RSF)” will be paid at the Contract unit price per cubic yard. Such payment shall include the cost of furnishing and installing No. 8 Crushed Stone, Geotextile within the RSF, and all labor, materials and equipment necessary to complete the work in acceptable fashion.
3. **Reinforced Integrated Approach:** “Reinforced Integrated Approach” will be paid at the Contract unit price per cubic yard. Such payment shall include the cost of furnishing and installing No. 8 Crushed Stone, Processed Aggregate Base, Geotextile within the reinforced integrated approach, and all labor, materials and equipment necessary to complete the work in an acceptable fashion.

<u>Pay Items</u>	<u>Pay Units</u>
GRS Abutment and Wingwall	C.Y.
Reinforced Soil Foundation (RSF)	C.Y.
Reinforced Integrated Approach	C.Y.

ITEM NO. 0712021A
 ITEM NO. 0712023A
 ITEM NO. 0712924A

ITEM #0822017A – TEMPORARY PRECAST CONCRETE BARRIER CURB WITH CHAIN LINK FENCE

Description: Work under this item shall consist of furnishing, installing, and removing temporary concrete barrier with chain link fence for use on structures, as shown on the plans, to separate traffic from opposing traffic or work areas. This work shall also include furnishing and installing anchor bolts and the later removal of anchor bolts.

Materials:

1. The barrier shall be precast concrete conforming to Article 8.21.02-1.
2. Manufacturer identification and casting date shall be permanently marked on each barrier unit by means of a non-corrosive metal or plastic tag in the location shown on the plan. When used barrier is furnished, the Contractor shall provide documentation stating from where the material came, what project it will be used on, the casting dates, and certification that the barrier conforms to all State requirements.
3. Reinforcing steel shall conform to the requirements of ASTM A615M, Grade 420.
4. Lifting hooks, keys, bolts, devices and attachments shall be of the size indicated on the plans or of a design satisfactory for the purpose intended as approved by the Engineer.
5. Anchor bolts shall conform to ASTM F1554, Grade 36 (248 MPa). Heavy hex nuts shall conform to AASHTO M291. The plate washers shall conform to AASHTO M270M, Grade 345. The anchor bolts, nuts, and plate washers shall be hot-dip galvanized in accordance with AASHTO M232M and M111M as applicable.

Anchor bolts shall be stainless steel and shall conform to ASTM A193M, Grade B6. Heavy hex nuts shall conform to ASTM A194M, Grade 6. The plate washers shall conform to ASTM A167.

6. Loop bars shall be bent from smooth bar steel conforming to AISI 1018 (Hot-rolled). Ends shall be hot-dip galvanized in accordance with AASHTO M111.
7. Threaded connection rods shall be steel conforming to AASHTO M 314 (ASTM F1554) Grade 55 except that threads and nominal diameters shall conform to ANSI B1.13M for Class 6g threads. The rod shall be threaded for a minimum of 4" (100mm) at each end. Plain steel washers shall be manufactured in accordance with ANSI B18.22M. Heavy hex nuts shall conform to AASHTO M 291M for Class 10S and shall conform to the geometry defined in ANSI B18.2.4.6M. The threaded connection rods, washers, and nuts shall be hot-

ITEM #0822017A

dip galvanized after fabrication in accordance with the requirements of Class C of AASHTO M232.

8. The chemical anchor material shall be a resin compound specially formulated to secure bolts in concrete against tension pullout. The Contractor shall select the chemical anchor material in accordance with Article M.03.07.
9. Non-shrink grout shall conform to Article M.03.05.
10. Barrier shall be accepted on the basis of the manufacturer's certification, as defined in Article M.08.02-4.
11. Sealant for patching holes in bituminous overlays shall be a cold-applied bituminous sealer conforming to M.08.01-15.
12. Anchor Bolts/Threaded Connection Rods-Certified Test Reports: The Contractor shall submit a Certified Test Report and a Materials Certificate in conformance with Article 1.06.07 and a sample of all anchor bolts, threaded connection rods, nuts, and washers for testing prior to their installation. The Contractor shall not install any anchor bolts or threaded connection rods prior to receipt of the approved test results and approval by the Engineer.
13. Delineators shall conform to Article 8.22.02.
14. Chain Link Fence materials shall conform to the requirements of Article M.10.05.

Construction Methods:

1. Fabrication: The barrier shall be precast concrete in conformance with the pertinent requirements of Article 8.21.03 and the plans, except that penetrating sealer protective compound is not required.
2. Installation: The barrier shall be placed as shown on the plans or as directed by the Engineer.

The barriers shall be anchored to the concrete deck or approach slab in accordance with the plans and the following:

- a.) Prefabricated Bridge Units: Threaded inserts with matching anchor bolts shall be used for securing the barrier to precast deck units. The threaded inserts shall be cast into the deck units during fabrication as necessary to accommodate stage construction.
3. Connection of Barrier Units: The barrier shall be joined together with threaded connection rods, washers, and heavy hex nuts in accordance with the plans.

4. Cutting of Anchor Bolts: Where ordered by the Engineer, protruding anchor bolts shall be cut off flush with the surface of the concrete deck. The bolts shall then be ground down ½” (13mm) below the surface of the deck and the space filled in with non-shrink grout. The surface of the concrete deck shall be considered to start just below the bituminous or latex modified concrete wearing course. At the Contractor’s option, the anchor bolts may be pre-coated with a material, recommended by the manufacturer of the chemical anchoring material, which will allow for complete removal of the anchor bolts.
5. Patching with Non-Shrink Grout: After removal of the barrier, threaded inserts and holes in newly constructed concrete decks or approach slabs shall be blown clean with an air jet and filled in with non-shrink grout. The non-shrink grout shall be mixed and placed in strict accordance with the manufacturer's directions. The non-shrink grout shall be finished flush with the deck surface. Allow grout to cure a minimum of 24 hours before placing sealant in any remaining hole in the bituminous wearing surface.
6. Delineators: Delineators shall be installed on top of the barrier in accordance with Article 8.22.03-3 and the plans.
7. General: The barrier shall be kept in good condition at all times by the Contractor during all stages of construction. Any damaged material shall be replaced by the Contractor at his expense.

When the barrier is no longer required, it shall be removed from the work site and become the property of the Contractor.

8. Relocation of Barrier: If called for on the plans, the Contractor shall relocate the barrier and its appurtenances to locations within the project limits as shown on the plans or as ordered by the Engineer.
9. Chain Link Fence shall conform to the requirements of Section 9.13.

Fence posts shall be attached perpendicular to the barrier curb top surface. The fence posts shall be securely bolted or drilled and grouted to the concrete barrier curb. The Contractor shall provide shop drawings for the method of attaching the chain link fence to the barrier curb and for the material and methods proposed to close gaps in the chain link fence between barrier curb sections. The final production shop drawings shall be approved and signed by a licensed engineer registered in the State of Connecticut.

Method of Measurement:

Temporary structure barrier will be measured for payment along the centerline at the top of the barrier and will be the actual number of feet of temporary structure barrier furnished, installed, and accepted.

Basis of Payment:

This work will be paid for at the contract unit price per linear foot for "Temporary Precast Concrete Barrier Curb with Chain Link Fence", complete in place, which price shall include all furnishing, transportation, storage, materials, including concrete, reinforcing steel, connection rods, initial installation, and final removal, and which price shall also include hardware and materials, equipment, tools, and labor incidental thereto. The cost of furnishing, installing and removing of anchor bolts, as well as patching of any holes shall also be included for payment under this item. Each temporary structure barrier will be paid for once regardless of the number of times it is used on the project. Any temporary barrier units that become lost, damaged or defaced shall be replaced by the Contractor at no cost to the State.

Delineators will be paid for in accordance with Article 12.05.05.

Pay Item	Pay Unit
Temporary Precast Concrete Barrier Curb with Chain Link Fence	l.f.

ITEM #0900000A – NOISE MITIGATION

Description: Work under this item is for additional noise reduction methods beyond what is specified as below. If the Contractor has satisfied the source level noise requirements as described in Section 1.10 (Article 1.10.05), and has also implemented all noise reduction materials and methods as described in Section 1.10 (Article 1.10.05), as amended in these Special Provisions and approved by the Engineer, the Engineer will direct the Contractor to implement the use of **additional** temporary construction barriers (TCNB), noise control curtain systems or other methods to reduce the noise levels or to alleviate the nuisance conditions. The Contractor may be required to prepare working drawings, stockpile noise reduction materials, construct, deploy, maintain and remove noise pollution control devices when and as directed by the Engineer.

Materials: Noise reduction materials used for noise TCNB and noise control curtains may be new or used. Used materials shall be of a quality and condition to perform their designed function. TCNB and noise control curtains shall have a Sound Transmission Class of STC-30 or greater, based on certified sound transmission loss data taken according to ASTM Test Method E90. They shall also have a Noise Reduction Coefficient rating of NRC-0.85 or greater, based on certified sound absorption coefficient data taken according to ASTM Test Method C423.

TCNB shall use materials as follows:

TCNB shall be constructed of 3/4-inch Medium Density Overlay (MDO) plywood sheeting, or other material of equivalent utility and appearance having a surface weight of 9.8 kilograms per square meter (2 lbs/sq.ft.) or greater.

The MDO TCNB shall be lined on one side with glass fiber, mineral wool, or other similar noise curtain type noise-absorbing material at least 50 mm (2-inches) thick.

Prefabricated acoustic barriers are available from various vendors. An equivalent barrier design can be submitted for approval in lieu of the plywood barrier described above.

Noise control curtains using materials consistent with those as follows:

Noise control curtains shall consist of durable, flexible composite material featuring a noise barrier layer bonded to sound-absorptive material on one side. The curtains noise barrier layer shall consist of a rugged, impervious material with a surface weight of at least 4.9 kilograms per square meter (1 lbs/sq.ft). The sound absorptive material shall include a protective face and be securely attached to one side of the flexible barrier over the entire face.

The noise curtain material used shall be weather and abuse resistant, and exhibit superior hanging and tear strength during construction. The curtain's noise barrier layer material shall have a minimum breaking strength of 21.2 KN/m (120 lb/in.) per FTMS 191 A-M5102 and

minimum tear strength of 5.25 KN/m (30 lb/in.) per ASTM D117. Based on the same test procedures, the noise curtain absorptive material facing shall have a minimum breaking strength of 17.5 KN/m (100 lb/in.) and minimum tear strength of 1.23 KN/m (7 lb/in.). The noise curtain material shall be corrosion resistant to most acids, mild alkalies, road salts, oils, and grease. It also shall be mildew resistant, vermin proof, and non-hygroscopic. The noise curtain material shall be fire retardant and shall be subject to the review and approval of the Engineer, prior to procurement.

Construction Details: Noise barrier panels and noise curtains shall be attached to support frames constructed in sections to provide a moveable barrier designed to withstand 129 kph (80 mph) wind loads plus a 30 percent gust factor.

The noise curtain acoustical material shall be installed in vertical and horizontal segments with the vertical segments extending the full enclosure height. All seams and joints shall have a minimum overlap of 50 mm (2-inches) and be sealed using double grommets. Construction details shall be performed according to the manufacturer's recommendations.

The noise barrier panel/noise curtain height shall be designed to break the line-of-sight and provide at least a 5 dBA insertion loss between the noise producing equipment and the upper- most story of the receptor(s) requiring noise mitigation. If for practicality or feasibility reasons, which are subject to the review and approval of the Engineer, a barrier panel/curtain system can not be built to provide noise relief to all stories, then it must be built to the tallest achievable height.

When barrier units/curtain systems are joined together, the mating surfaces of the barrier sides shall be flush with each other. Gaps between barrier units/curtain systems, and between the bottom edge of the barrier panels/curtain systems and the ground, shall be closed with material that will completely fill the gaps, and be dense enough to attenuate noise.

The Contractor shall submit Working drawings for the design and details for the acoustical noise barrier/noise curtain enclosure framework and supports in accordance with Section 1.05.02 of the standard specifications.

Method of Measurement: The sum of the money shown on the estimate and in the itemized proposal as "Estimated Cost" for this work will be considered the bid price even though payment will be made only for the actual costs incurred to implement the use of **additional** TCNB, noise control curtain systems or other methods to reduce the noise levels or to alleviate the nuisance conditions which may include preparing working drawings, stockpiling noise reduction materials, constructing, deploying, maintaining and removing additional noise pollution control devices when and as directed by the Engineer. The estimated cost figure is not to be altered in any manner by the bidder. Should the bidder alter the amount shown, the altered figures will be disregarded, and the original price will be used to determine the total bid for the contract.

Basis of Payment: The item "Noise Mitigation" shall be paid for in accordance with Section 1.09.

Pay Item

Noise Mitigation

Pay Unit

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ITEM #0913068A – TEMPORARY 6' CHAIN LINK FENCE

Description: Work under this item shall consist of furnishing and installing temporary 6' high chain link fence, of the type and size as indicated on the Plans, and at the locations shown on the Plans or as ordered by the Engineer. Also included in this item is the final removal and disposal following the completion of construction. Fence gates are not required.

The temporary chain link fences shall be installed outside of the Amtrak Right of Way on the approach roadway as shown on the plans.

Materials: The material for the temporary chain link fence and gates, including all hardware and appurtenances, shall conform to the requirements of Article 9.13.02, except that polyvinyl chloride-coated fabric, posts and/or hardware will not be allowed.

The materials used shall be new or in good condition, if previously used. Previously used materials require the approval of the Engineer prior to installation.

Concrete footings shall be Portland cement concrete, minimum compressive strength of 3,300 psi, as defined in M.03.02. Where posts are to be grouted into rock, the grout shall meet the requirements of M.03.05.

Construction Methods: Temporary chain link fence and gates shall be installed in accordance with the Plans and Section 9.13.03 of the specifications.

The Contractor shall maintain the fencing in good condition during the construction phase and shall immediately repair any damaged sections. Any temporary chain link fence and/or gates damaged by the Contractor, either during normal construction operations or the resetting process, shall be replaced at the Contractor's expense and at no cost to the State.

The Contractor shall remove the temporary fencing, including concrete anchorages if used, when no longer required for the work, as directed by the Engineer. The Contractor shall backfill all holes with granular material.

Method of Measurement: "Temporary 6' Chain Link Fence" will be measured for payment by the number of linear feet of temporary fence installed and accepted, measured from outside to outside of terminal posts, as shown on the Plans or as ordered by the Engineer.

Temporary chain link gates, within the line of the temporary chain link fence will be considered part of the temporary chain link fence and measured for payment by the linear foot as noted above.

The resetting of the temporary protective fence for the Contractor to complete the work shown on the plans, to facilitate his needs, or the installation of additional temporary protective fence or gates for the Contractor's convenience 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 6’ Chain Link Fence”, which price shall include excavation, backfill, fabrication, concrete, disposal of surplus material, resetting, final removal and all materials, equipment, tools, and labor incidental to installing, maintaining, resetting where required and removal.

Pay Item	Pay Unit
Temporary 6’ Chain Link Fence	l.f.

ITEM #0913069A – TEMPORARY 8' CHAIN LINK FENCE

Description: Work under this item shall consist of furnishing and installing temporary 8' high chain link fence, of the type and size as indicated on the Plans, and at the locations shown on the Plans or as ordered by the Engineer. Also included in this item is the final removal and disposal following the completion of construction. Fence gates are not required.

The temporary chain link fences shall be installed between the tracks and abutments, as shown on the Plans or as ordered by the Engineer. It shall be used to separate the Contractor's work areas from railway operations.

Materials: The material for the temporary chain link fence and gates, including all hardware and appurtenances, shall conform to the requirements of Article 9.13.02, except that polyvinyl chloride-coated fabric, posts and/or hardware will not be allowed.

The materials used shall be new or in good condition, if previously used. Previously used materials require the approval of the Engineer prior to installation.

Concrete footings shall be Portland cement concrete, minimum compressive strength of 3,300 psi, as defined in M.03.02. Where posts are to be grouted into rock, the grout shall meet the requirements of M.03.05.

Construction Methods: Temporary chain link fence and gates shall be installed in accordance with the Plans and Section 9.13.03 of the specifications.

The Contractor shall maintain the fencing in good condition during the construction phase and shall immediately repair any damaged sections. Any temporary chain link fence and/or gates damaged by the Contractor, either during normal construction operations or the resetting process, shall be replaced at the Contractor's expense and at no cost to the State.

The Contractor shall remove the temporary fencing, including concrete anchorages if used, when no longer required for the work, as directed by the Engineer. The Contractor shall backfill all holes with granular material.

The temporary chain-link fencing must always be grounded and bonded throughout the construction project, according to the plans.

Method of Measurement: "Temporary 8' Chain Link Fence" will be measured for payment by the number of linear feet of temporary fence installed and accepted, measured from outside to outside of terminal posts, as shown on the Plans or as ordered by the Engineer.

Temporary chain link gates, within the line of the temporary chain link fence will be considered part of the temporary chain link fence and measured for payment by the linear foot as noted above.

The resetting of the temporary protective fence for the Contractor to complete the work shown on the plans, to facilitate his needs, or the installation of additional temporary protective fence or gates for the Contractor's convenience 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 8' Chain Link Fence", which price shall include excavation, backfill, fabrication, concrete, disposal of surplus material, resetting, final removal and all materials, equipment, tools, and labor incidental to installing, maintaining, resetting where required and removal.

Pay Item	Pay Unit
Temporary 8' Chain Link Fence	l.f.

ITEM #0921011A – CONCRETE DRIVEWAY

Description: This item shall consist of concrete driveway area constructed on a granular fill base as shown on the contract plans, or as directed by the Engineer. This item shall include all joint work and resetting the existing trench drain and pipe to the proposed elevation.

Materials:

- 1. Portland Cement: Concrete shall meet the requirements of Section M.03 for Class PCC04460 Concrete.
- 2. Granular Fill: This material shall meet the requirements of M.02.01.
- 3. Joints: Shall meet the requirements of Article M.03.08.
- 4. Trench Drain and Pipe: Shall meet the requirements of Article M.08.

Construction Methods: Construction methods shall meet the requirements of Article 9.21.03. The surface shall be finished and marked off as directed by the Engineer.

During excavation activities, the contractor shall remove the existing roof drain pipe that runs underneath the driveway to an existing metal grate within the driveway. The contractor is directed to remove the existing pipe and reset it within the new driveway, along with the existing metal grate. If not possible, the existing pipe shall be cut at the concrete driveway limit and a new pipe shall be attached to the existing at the joint and replaced in kind. The existing grate shall be reused.

Method of Measurement:

- 1. Concrete Driveway: This work will be measured for payment by the actual number of square footage of completed and accepted concrete driveway.
- 2. Granular Fill: This work will not be measured for payment, but the cost shall be included in the Contract price for Concrete Driveway.
- 3. Joints: This work will not be measured for payment, but the cost shall be included in the Contract price for Concrete Driveway.
- 4. Trench Drain and Pipe: This work will not be measured for payment, but the cost shall be included in the Contract price for Concrete Driveway.

Basis of Payment: Construction of the concrete driveway will be paid for at the Contract unit price per square foot for “Concrete Driveway” complete in place, which price shall backfill, disposal of surplus materials, joint materials, trench drain materials, and all equipment, tools, materials and labor incidental thereto.

Pay Item	Pay Unit
Concrete Driveway	s.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 CTDOT forces and others who may be engaged to augment CTDOT forces with relation to the Contract. The office quarters shall be located convenient to the work site and installed in accordance with Article 1.08.02. This office shall be separated from any office occupied by the Contractor. Ownership and liability of the office quarters shall remain with the Contractor.

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

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

Description \ Office Size	Med.
Minimum Sq. Ft. of floor space with a minimum ceiling height of 7 ft.	400
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.

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

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

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

Lighting: The Contractor shall equip the office interior with electric lighting that provides a minimum illumination level of 100 foot-candles at desk level height, and electric outlets for each desk and

drafting table. The Contractor shall also provide exterior lighting that provides a minimum illumination level of 2 foot-candles throughout the parking area and for a minimum distance of 10 ft. on each side of the field office.

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

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

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

- A. 120/240 volt, 1 phase, 3 wire
- B. Ampacity necessary to serve all equipment. Service shall be a minimum 100 amp dedicated to the construction field office.
- C. The electrical panel shall include a main circuit breaker and branch circuit breakers of the size and quantity required.
- D. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed at each desk and personal computer table (workstation) location.
- E. Additional 120 volt, single phase, 20 amp, isolated ground dedicated power circuit with dual NEMA 5-20 receptacles will be installed, for use by the Telephone Company.
- F. Additional 120-volt circuits and duplex outlets as required meeting National Electric Code requirements.
- G. One exterior (outside) wall mounted GFI receptacle, duplex, isolated ground, 120 volt, straight blade.
- H. After work is complete and prior to energizing, the State's CTDOT electrical inspector, must be contacted at 860-594-2240. (Do Not Call Local Town Officials)
- I. Prior to field office removal, the CTDOT Office of Information Systems (CTDOT OIS) must be notified to deactivate the communications equipment.

Heating, Ventilation and Air Conditioning (HVAC): The field office shall be equipped with sufficient heating, air conditioning and ventilation equipment to maintain a temperature range of 68°-80° Fahrenheit within the field office.

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.

Data Communications Facility Wiring: Contractor shall install a Category 6 568B patch panel in a central wiring location and Cat 6 cable from the patch panel to each PC station, Smart Board location, Multifunction Laser Printer/Copier/Scanner/Fax, terminating in a (Category 6 568B) wall or surface mount data jack. The central wiring location shall also house either the data circuit with appropriate power requirements or a category 5 cable run to the location of the installed data circuit. The central wiring location will be determined by the CTDOT OIS staff in coordination with the designated field office personnel as soon as the facility is in place.

For Small, Medium and Large field offices the Contractor shall run a CAT 6 LAN cable a minimum length of 25 feet for each CTDOT networked device (including but not limited to: smartboards and Multi-Function Laser Printer/Copier/Scanner/Fax) to LAN switch area leaving an additional 10 feet of cable length on each side with terminated RJ45 connectors. For an Extra-Large field office the Contractor shall run CAT 6 LAN cables from workstations, install patch panel in data circuit demark area and terminate runs with RJ45 jacks at each device location. Terminate runs to patch panel in LAN switch area. Each run / jack shall be clearly labeled with an identifying Jack Number.

The Contractor shall supply cables to connect the Wi-Fi printer to the Contractor supplied internet router and to workstations/devices as needed. These cables shall be separate from the LAN cables and data Jacks detailed above for the CTDOT network.

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

The installation of a data communication circuit between the field office and the CTDOT OIS in Newington will be coordinated between the CTDOT District staff, CTDOT OIS staff and the local utility company once the Contractor supplies the field office phone numbers and anticipated installation date. The Contractor shall provide the field office telephone number(s) to the CTDOT Project Engineer within 10 calendar days after the signing of the Contract as required by Article 1.08.02. This is required to facilitate data line and computer installations.

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

ITEM #0969062A

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 drafters 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.	-
Telephone.	1
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,	*

ITEM #0969062A

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 <u>Computer Related Hardware and Software</u> .	1
Digital Camera as specified below under <u>Computer Related Hardware and Software</u> .	1
Video Projector as specified below under <u>Computer Related Hardware and Software</u> .	-
Smart Board as specified below under <u>Computer Related Hardware and Software</u> .	-
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
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 CTDOT will supply by its own means the actual Personal Computers for the CTDOT 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) as well as associated hardware and

ITEM #0969062A

software, must meet 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 Administering CTDOT District 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 CTDOT District personnel. The Multifunction Laser Printer/Copier/Scanner/Fax will be reviewed by the CTDOT OIS. The Contractor shall not purchase the hardware, software, or services until the Administering CTDOT District informs them that the proposed equipment, software, and services are approved. The Contractor will be solely responsible for the costs of any hardware, software, or services purchased without approval.

The Contractor and/or their internet service provider shall be responsible for the installation and setup of the field office Wi-Fi, Wi-Fi printer, and the configuration of the wireless router as directed by the CTDOT. Installation will be coordinated with CTDOT District and Project personnel.

After the approval of the hardware and software, the Contractor shall contact the designated representatives of the CTDOT administering District, a minimum of 2 working days in advance of the proposed delivery or installation of the 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 a 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 rain water 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.

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

Maintenance: During the occupancy by the CTDOT, the Contractor shall maintain all facilities and furnishings provided under the above requirements, and shall maintain and keep the office quarters clean through the use of weekly professional cleaning to include, but not limited to, washing & waxing floors, cleaning restrooms, removal of trash, etc. Exterior areas shall be mowed and clean of debris. A trash receptacle (dumpster) with weekly pickup (trash removal) shall be provided. Snow removal, sanding and salting of all parking, walkway, and entrance ways areas shall be accomplished during a storm if on a workday during work hours, immediately after a storm and prior to the start of a workday. If snow removal, salting and sanding are not completed by the specified time, the State will provide the service and all costs incurred will be deducted from the next payment estimate.

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

ITEM #0970007A – TRAFFICPERSON (UNIFORMED FLAGGER)

Work under this item shall conform to the requirements of Section 9.70, amended as follows:

9.70.01 – Description: Add the following:

Uniformed Flaggers utilizing radios shall be used to direct traffic along the detour route when large trucks need to pass. It is anticipated that large trucks will need to travel in the opposite direction of one-way detour traffic, over part of the detour, due to tight corners along the detour.

It is anticipated that an average of eight (8) trucks per day during the detours will require Uniformed Flaggers. The Contractor shall coordinate with Noank Village businesses per Section 1.08, “Prosecution and Progress”.

9.70.03 - Construction Methods: Add the following:

At the end of each week, prior to a week where the detour is to be in service, the Engineer will submit to the Contractor a schedule indicating when Uniformed Flagger services are anticipated to be needed due to scheduled deliveries using large trucks. The Contractor is hereby notified that this schedule may not be complete and is subject to change. The Contractor shall use the delivery schedule in order to plan his scheduling of Uniformed Flaggers.

During the course of the week, when new deliveries using large trucks are added or already scheduled deliveries change, the Engineer will immediately notify the Contractor, when he becomes aware of the change.

The Contractor shall have Uniformed Flaggers on site, at the intersection of Main Street and Ward Avenue and the intersection of Marsh Road and Terrace Avenue, along the detour route 30 minutes prior to the scheduled delivery for large trucks entering the village. The Uniformed Flaggers shall use radios to provide communication for the coordination of traffic control. The location of the flaggers may be modified by the Engineer.

The Contractor shall provide and post a sign along the detour route notifying trucks of a phone number to call for flagging assistance on the detour per the Contract plans. Location of the sign shall be approved by the Engineer. Cost of the sign shall be paid for under Item No. 1220027 “Construction Signs”. For unexpected deliveries entering the village that need assistance from Uniformed Flaggers along the detour route, the Engineer shall notify the Contractor, immediately after becoming aware of the truck requiring assistance. The Uniformed Flaggers shall be on site within 1 hour of the notification.

Uniformed Flaggers shall not be on site 24 hour each day, during each detour period, and shall only be used when needed, with approval of the Engineer.

9.70.04 – Method of Measurement: Add the following:

Each hour, or half-hour portion thereof, that the Uniformed Flagger is on site, whether actively directing traffic or waiting for large trucks to pass, will be measured for payment, as approved by the Engineer. The hourly rate will not be adjusted due to time periods outside of normal working hours.

<u>Pay Item</u>	<u>Pay Unit</u>
Trafficperson (Uniformed Flagger)	Hour

ITEM #1300005A – RELOCATION OF WATER MAINS

Description:

Work under this item shall consist of furnishing and installing water mains, fittings, valves, hydrant relocation, new hydrant installation, air/vacuum release assemblies and manholes, and thrust blocks as shown on the plans and in accordance with the specifications.

Work under this Item shall consist of all tools, labor, equipment, disposal of spoils, and acceptance testing necessary for installing the proposed water main (in its final configuration) as shown on the plans or as directed by the Engineer. Work under this item includes trenching, excavation, and backfilling as required.

The work to lift the water main and casing pipe and secure it in place on the structural supports shall be included under this Item. Structural supports and pipe roller saddles shall be included under Item “Structural Steel (Site No. 1)”.

Work performed under this item shall conform to the Noank Fire District – Water Department [herein as Noank Water Company] “Regulations and Specifications for Installation of Water Mains and Appurtenances in Subdivision Tracts” [herein as Regulations and Specifications] dated June of 1973, supplemented by this special provision, unless otherwise directed by the Engineer.

Water main service shall be maintained during all phases of construction to provide fire protection. At no time shall service be interrupted for greater than 12 hours.

Work over Amtrak Right of Way shall be in accordance with the Railroad Specifications. Coordinate all activities over Amtrak Property with Amtrak.

Materials:

The Contractor shall submit to the Engineer manufacturer's specifications, data, catalogue cuts, etc., for all water distribution system materials and products incorporated into the work. The District reserves the right to inspect and approve all materials furnished by the Contractor at the manufacturer's plant. All pipe and appurtenances shall be subject to inspection by the District at the point of delivery.

Material found to be defective due to manufacture or damage in shipment shall be rejected, recorded on the bill of lading and removed from the job site. The District may perform tests as specified in the applicable AWWA standard to ensure conformance with the standard. In case of failure of the pipe or appurtenance to comply with such specifications, the replacement of the defective materials shall become the responsibility of the Contractor.

All pipe, fittings, valves, hydrants and accessories shall be loaded and unloaded by lifting with hoists or skidding in order to avoid shock or damage. Under no circumstances shall such material be

dropped. Pipe handled on skidways shall not be rolled or skidded against pipe on the ground. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior surface or internal lining of the pipe. If pre-insulated pipe is used, care shall be taken during loading, unloading, storage, and installation to ensure that the insulation is not damaged. All Materials shall be kept safe from damage. The interior of all pipes, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves and hydrants shall be drained and stored in such a manner to protect them from damage by freezing. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each in order to prevent movement. The timbers shall be large enough to prevent contact between the pipes in adjacent tiers.

All Gaskets for mechanical and push-on joints shall be stored in a cool location protected from direct sunlight. Gaskets shall NOT come into contact with petroleum products. Gaskets shall be used on a first-in, first out basis. Mechanical-joint bolts shall be handled and stored in such a manner to ensure proper use with respect to types and sizes.

Ductile Iron Pipe:

Pipe used for the water main shall be ductile iron, double cement mortar lined on the inside, Zinc coated on the outside, Class 52 or 54 thickness, and in accordance with ANSI/AWWA A21.5/C151 Standards, latest revision. Cement mortar shall conform to ANSI/AWWA A21.5/C104 Standards, latest revision. Zinc coating shall conform to ISO 8179-1, latest revision. All joints shall be push-on type, unless otherwise specified. All pipe shall be marked with Class, Manufacturer, Weight, and Date of Manufacture.

Restrained Push-on Joint Pipe and Fittings:

Restrained joint pipe shall be Ductile Iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11 "Rubber-Gasket Joints for Ductile-Iron Pipe and Fittings." Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50 "Thickness Design of Ductile-Iron Pressure Pipe," and shall be based on laying conditions and internal pressures as stated in the project plans and specifications.

Restrained joint fittings and the restraining components shall be Ductile Iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 and/or C153/A21.53 with the exception of the manufacturer's proprietary design dimensions. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11.

Restrained joint pipe and fittings shall be U.S. Pipe's TR FLEX Pipe and Fittings or approved equal. Restraint of field cut pipe shall be provided with U.S. Pipe's TR FLEX GRIPPER® Ring, TR FLEX Pipe field weldments or approved equal.

Cement mortar lining and seal coating for pipe and fittings, where applicable, shall be in accordance with ANSI/AWWA C104/A21.4. Asphaltic outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 for fittings.

All pipe shall be marked with Class, Manufacturer, Weight, and Date of Manufacture.

Insulation:

Insulation shall be rigid polyurethane foam 2-inches thick having a maximum thermal conductivity, k, value of 0.19 Btu x in/ft² x hr x °F, or approved equivalent.

Pre-insulated Pipe:

Where the water main requires insulation, Pre-insulated Pipe may be used for the water main as an alternative to insulating the water main in the field. If so, the pipe itself must meet the requirements for “Ductile Iron Pipe” noted earlier in the specification. Insulation shall be a factory applied, 2-inch-thick extruded black high-density polyethylene copolymer or approved equal. Pre-insulated pipe shall be Urecon U.I.P. or an approved equal.

Casing Pipe:

Steel casing pipe shall meet the requirements of ASTM A106, Type S, Class B, STD. The casing pipe shall be galvanized in accordance with ASTM A123.

Fittings:

Fittings include but are not limited to: Bends, couplings, caps, and plugs.

All fittings shall be ductile iron, double cement mortar lined on the inside, Zinc coated on the outside, and conform to ANSI/AWWA A21.10/C110 Standards, latest revision. Cement mortar shall conform to ANSI/AWWA A21.5/C104 Standards, latest revision. Zinc coating shall conform to ISO 8179-1, latest revision.

Hardware/Joints:

All hardware shall be stainless steel. All bolts shall be standard T-Bolts with anti-rotation in accordance with AWWA C111 Standards, latest revision. All joints shall be restrained. Mechanical joint restraints shall be Megalug Series 1100 or approved equal. Restrained push-on joints shall be TR Flex or approved equal.

Hydrants:

Fire hydrants shall conform to the requirements of AWWA C502. Hydrants shall have breakaway mountings, set a maximum of 4 inches above grade. If the hydrant nozzles are blocked by guardrail or another obstruction, the hydrant shall be mounted on a riser such that the nozzles are no longer obstructed. Hydrants shall be painted lemon yellow, or an approved alternate color.

Gate Valves:

Buried Gate Valves shall conform to AWWA C500, latest revision.

Concrete:

Concrete for thrust blocks shall conform to the provisions of Section 6.01.

Warning Tape:

Warning tape shall be alkali and acid resistant polyethylene plastic with a 6-inch minimum width, 0.003-inch minimum thickness, and color-coded in blue (for water systems) with warning and identification imprinted in black bold letters continuously over the length of the tape. Warning and identification shall read “CAUTION – BURIED WATER LINE BELOW” or similar warning. The tape shall have a minimum lengthwise strength of 1,500 psi, minimum crosswise

ITEM #1300005A

strength of 1,250 psi, and a maximum elongation of 350%.

Other Materials:

All other materials used for this work shall conform to those specified by the Noank Water Company's Regulations and Specifications or as directed by the Engineer.

Construction Methods:

Pipe Cutting:

Cutting pipe for insertion of valves, fittings, or closure pieces shall be done in conformance with all safety recommendations of the manufacturer of the cutting equipment. Field cutting of ductile iron pipe shall only be done on "gauged" pipe (pipe so marked at the factory as to be within the proper O.D. Diameter and out of round tolerance for proper jointing at any position along the length). Cutting shall not damage the pipe or its linings. Ductile-iron pipe may be cut using an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, or milling wheel saw. Cut ends and rough edges shall be ground smooth, and for push-on joint connections, the cut end shall be beveled.

Water Main Installation:

Proper implements, tools and facilities shall be provided and used for the safe and convenient performance of the work. All pipe, fittings, valves and hydrants shall be lowered carefully into the trench by means of derrick, ropes or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

All pipes, fittings, valves, hydrants and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.

All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit or any foreign materials before the pipe is laid.

Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.

As each length of the pipe is placed in the trench, the joint shall be assembled, and the pipe brought to correct line and grade. Three brass wedges shall be installed at each pipe and fitting joint. The pipe shall be secured in place with approved backfill material.

At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer. The plug shall be fitted with a means for venting. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation should the trench fill with water. Prior to removal of the plug for extending the line or any other reason, air and/or water pressure in the line shall be released.

Special attention is called to the existing concrete sidewalk and curbing on streets where required for construction, the contractor shall saw cut sidewalk and curbing at existing construction/scored joints. Following installation, backfill, and compaction of subgrade, sidewalk and curbing shall be replaced to match preconstruction thickness, dimensions, and finish. Concrete driveways and other pads shall be addressed in the same manner.

Installation of the casing pipe requires lifting elements above the Amtrak Right-Of-Way. Work over Amtrak Right of Way shall be in accordance with the Railroad Specifications. Coordinate all activities over Amtrak Property with Amtrak.

Water Main Joint Assembly:

Push-On Joints:

Thoroughly clean the groove and bell socket and insert the gasket, making sure that it faces the proper direction and that it is correctly seated.

After cleaning dirt or foreign material from the plain end, apply lubricant in accordance with the pipe manufacturer's recommendations. The lubricant is supplied in sterile cans. Contaminated lubricant shall be discarded.

The Contractor shall ensure that the plain end is beveled; square or sharp edges may damage or dislodge the gasket and cause a leak. Field cutting of ductile iron pipe shall only be done on "gauged" pipe, that is, pipe so marked at the factory as to be within proper O.D. diameter and out of round tolerance for proper jointing at any position along the length. Push the plain end into the bell of the pipe. Keep the joint straight while pushing. Make deflection after the joint is assembled. Small pipe can be pushed into the bell socket with a long bar. Large pipe requires additional power, such as a jack, lever puller or backhoe. A timber header should be used between the pipe and jack or backhoe bucket to avoid damage to the pipe.

Assemble TR Flex pipe or approved equal push-on joint in accordance with the manufacturer specifications.

Mechanical Joints:

The Contractor shall wipe clean the socket and the plain end. The plain end, socket and gasket should be washed with a soap solution to improve gasket seating. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end. Use EBAA Series 1100 Megalug or an approved equal mechanical joint restraint system when the joint is at a fitting, valve, hydrant, plug end, or when requested by the Engineer. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly. Make deflection after joint assembly but before tightening bolts. Push the gland toward the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand-tighten nuts. Tighten the bolts to the normal range of bolt torque while (at all times) maintaining approximately the same distance between the gland and the face of the flange at all points around the socket.

This can be accomplished by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, finally the remaining bolts. Repeat the process until all bolts are within the appropriate range of torque.

Hydrostatic Testing:

Perform pressure and leakage tests of new water main to meet the requirements of the Noank Water Company. Test shall be conducted between valved sections. When, in the opinion of the Engineer, local conditions require that trenches be backfilled immediately after pipe has been laid, the pressure test may be made after backfilling has been completed, but before permanent pavement replacement. A test shall be made only after part or all backfilling has been completed, and at least 36 hours after the last concrete thrust block has been cast with high early strength concrete; or at least 7 days after the last concrete thrust block has been cast with standard concrete.

Equipment for Testing:

The Contractor shall make all necessary arrangements to obtain, supply, furnish all pumps, piping, hose, gauges, installing corporation cocks, if necessary, etc., and remove same, except corporation cocks, when work is completed.

The meter equipment and gauges shall be tested for accuracy by the manufacturer prior to shipping and written certification shall be given to the Engineer.

Disinfection of Water Main:

After the water main installation has been accepted, the mains shall be flushed and disinfected in accordance with AWWA C651 and as follows:

1. Disinfection solution shall be prepared using calcium hypochlorite in granular form; tablets are not permitted.
2. The Continuous Feed Method shall be used.
3. Flushing and disinfection shall be conducted only at times approved by the Engineer.
4. Water for flushing and disinfection shall be introduced into the main only at locations and methods approved by the Engineer.
5. Flushing water shall be drained only at locations approved by the Engineer. The Contractor shall neutralize residual chlorine in flush water in accordance with AWWA C651 – Appendix B.
6. Disinfection solution shall be introduced into the water main through a tap no more than 10-feet downstream from the beginning of the new water main. The solution shall be introduced by a chemical feed pump designed for this purpose.
7. Taps installed for bleeding air at dead ends and other points shall be tightly plugged after disinfection and testing is complete.
8. Chlorine residual measurements shall be made at location and times required by the Engineer.
9. After the main has been flushed and the chlorine concentration of the water leaving the main is no greater than that generally prevailing in the system or is acceptable for domestic use, samples shall be taken by the District for bacteriological and physical tests.

The water main shall be placed in service only if the aforementioned tests meet the DOHS standards for potable water. Failing tests will require the Contractor to repeat the entire disinfection process.

Abandon Existing Water Main:

Abandon existing water main in place by disconnecting and plugging the main/tee as designated
ITEM #1300005A

on the contract documents and/or designated by the Engineer.

For all other Sub-Items:

All other means of construction (including but not limited to pipe installation and installation of thrust blocks) shall conform to the Noank Water Company Regulations and Specifications, unless otherwise directed by the Engineer.

Method of Measurement:

This work shall not be measured for payment, as it is being paid for on a lump sum basis.

Basis of Payment:

This work shall be paid for at the contract lump sum price for "Relocation of Water Mains". Price shall include concrete for thrust blocks, ductile iron pipe and all appropriate fittings, steel casing pipe, lifting and installation of casing pipe, casing pipe inserts, risers, and end seals, insulation for water main, polyvinyl chloride (PVC) vent pipes, gate valves, installation and relocation of fire hydrants, as well as all materials, equipment, tools, and labor incidental thereto.

The Contractor shall submit to the Department a schedule of payment values for review prior to payment.

ITEM #1301019A – TEMPORARY RELOCATION OF WATER MAINS

Description:

Work under this item shall include all labor, tools, equipment, materials, disposal of spoils, and acceptance testing necessary for the installation of the temporary water mains as shown on the plans or as directed by the Engineer. Work under this item includes trenching, excavation, and backfilling as required.

This item shall also include all labor, tools, equipment, and materials necessary for removing and/or abandoning the existing and temporary water mains as shown on the plans or as directed by the Engineer.

For the existing water main on the South fascia of existing Bridge #03903, the removal of the water main between the existing bridge abutments shall not be governed by this item, it shall instead be governed by the provisions of Section 5.03 – Removal of Superstructure.

Work performed for the support system of the temporary water main at the South fascia of existing Bridge #03903 shall not be governed by this item, it shall instead be governed by the provisions of Item No. 1504010A – Temporary Support of Utilities.

Work performed and materials used under this item shall conform to the Noank Fire District – Water Department [herein as Noank Water Company] “Regulations and Specifications for Installation of Water Mains and Appurtenances in Subdivision Tracts” [herein as Regulations and Specifications] dated June of 1973, supplemented by this special provision, unless otherwise directed by the Engineer.

Water main service shall be maintained during all phases of construction to provide fire protection. At no time shall service be interrupted for greater than 12 hours.

Work over Amtrak Right of Way shall be in accordance with the Railroad Specifications. Coordinate all activities over Amtrak Property with Amtrak.

Materials:

The Contractor shall submit to the Engineer manufacturer's specifications, data, catalogue cuts, etc., for all water distribution system materials and products incorporated into the work. The District reserves the right to inspect and approve all materials furnished by the Contractor at the manufacturer's plant. All pipe and appurtenances shall be subject to inspection by the District at the point of delivery.

Material found to be defective due to manufacture or damage in shipment shall be rejected, recorded on the bill of lading and removed from the job site. The District may perform tests as specified in the applicable AWWA standard to ensure conformance with the standard. In case of failure of the pipe or appurtenance to comply with such specifications, the replacement of the

ITEM #1301019A

defective materials shall become the responsibility of the Contractor.

All pipe, fittings, valves, hydrants and accessories shall be loaded and unloaded by lifting with hoists or skidding in order to avoid shock or damage. Under no circumstances shall such material be dropped. Pipe handled on skidways shall not be rolled or skidded against pipe on the ground. Slings, hooks or pipe tongs shall be padded and used in such a manner as to prevent damage to the exterior surface or internal lining of the pipe. If pre-insulated pipe is used, care shall be taken during loading, unloading, storage, and installation to ensure that the insulation is not damaged. All Materials shall be kept safe from damage. The interior of all pipes, fittings and other appurtenances shall always be kept free from dirt or foreign matter. Valves and hydrants shall be drained and stored in such a manner to protect them from damage by freezing. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each in order to prevent movement. The timbers shall be large enough to prevent contact between the pipes in adjacent tiers.

All Gaskets for mechanical and push-on joints shall be stored in a cool location protected from direct sunlight. Gaskets shall NOT come into contact with petroleum products. Gaskets shall be used on a first-in, first out basis. Mechanical-joint bolts shall be handled and stored in such a manner to ensure proper use with respect to types and sizes.

Temporary Water Main At-Grade:

The temporary water main at-grade shall consist of polyvinyl chloride (PVC) pipe and shall be at least 10-inches in diameter. Temporary at-grade water main shall be placed along the existing bridge structure sidewalk and shall not exceed 12 inches in diameter in order to satisfy ADA compliance requirements. The pipe and all appropriate fittings shall be of sufficient strength, construction, and pressure rating as to withstand the forces of the waterflow within. The contractor is responsible for protecting the water main from damage as a result of external sources (vehicular traffic, inclement weather, etc.).

Ductile Iron Pipe:

Pipe used for the water main shall be ductile iron, double cement mortar lined on the inside, double-bituminous seal coated on the outside, Class 52 or 54 thickness, and in accordance with ANSI/AWWA A21.5/C151 Standards, latest revision. Cement mortar shall conform to ANSI/AWWA A21.5/C104 Standards, latest revision. All joints shall be push-on type, unless otherwise specified, using a single elongated rubber gasket and conform to ANSI/AWWA A21.11/C111 Standards, latest revision. All pipe shall be marked with Class, Manufacturer, Weight, and Date of Manufacture.

Restrained Push-on Joint Pipe and Fittings:

Restrained joint pipe shall be Ductile Iron manufactured in accordance with the requirements of ANSI/AWWA C151/A21.51. Push-on joints for such pipe shall be in accordance with ANSI/AWWA C111/A21.11 "Rubber-Gasket Joints for Ductile-Iron Pipe and Fittings." Pipe thickness shall be designed in accordance with ANSI/AWWA C150/A21.50 "Thickness Design of Ductile-Iron Pressure Pipe," and shall be based on laying conditions and internal pressures as stated in the project plans and specifications.

Restrained joint fittings and the restraining components shall be Ductile Iron in accordance with applicable requirements of ANSI/AWWA C110/A21.10 and/or C153/A21.53 with the exception of the manufacturer's proprietary design dimensions. Push-on joints for such fittings shall be in accordance with ANSI/AWWA C111/A21.11.

Restrained joint pipe and fittings shall be U.S. Pipe's TR FLEX Pipe and Fittings or approved equal. Restraint of field cut pipe shall be provided with U.S. Pipe's TR FLEX GRIPPER® Ring, TR FLEX Pipe field weldments or approved equal.

Cement mortar lining and seal coating for pipe and fittings, where applicable, shall be in accordance with ANSI/AWWA C104/A21.4. Asphaltic outside coating shall be in accordance with ANSI/AWWA C151/A21.51 for pipe and ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53 for fittings.

All pipe shall be marked with Class, Manufacturer, Weight, and Date of Manufacture.

Insulation:

Insulation shall be rigid polyurethane foam 2-inches thick having a maximum thermal conductivity, k, value of 0.19 Btu x in/ft² x hr x °F, or approved equivalent.

Pre-insulated Pipe:

Where the water main requires insulation, Pre-insulated Pipe may be used for the water main as an alternative to insulating the water main in the field. If so, the pipe itself must meet the requirements for "Ductile Iron Pipe" noted earlier in the specification. Insulation shall be a factory applied, 2-inch-thick extruded black high-density polyethylene copolymer, or approved equal. Pre-insulated pipe shall be Urecon U.I.P. or an approved equal.

Casing Pipe:

Steel casing pipe shall meet the requirements of ASTM A106, Type S, Class B, STD.

Fittings:

Fittings include but are not limited to: Bends, couplings, caps, and plugs. All fittings shall be ductile iron, double cement mortar lined on the inside, double-bituminous seal coated on the outside, and conform to ANSI/AWWA A21.10/C110 Standards, latest revision. Cement mortar shall conform to ANSI/AWWA A21.5/C104-08 Standards, latest revision.

Hardware/Joints:

All hardware shall be stainless steel. All bolts shall be standard T-Bolts with anti-rotation in accordance with AWWA C111 Standards, latest revision. All joints shall be restrained. Mechanical joint restraints shall be Megalug Series 1100 or approved equal. Restrained push-on joints shall be TR Flex or approved equal.

Gate Valves:

Buried Gate Valves shall conform to AWWA C500, latest revision.

Concrete:

Concrete for thrust blocks shall conform to the provisions of Section 6.01.

Warning Tape:

Warning tape shall be alkali and acid resistant polyethylene plastic with a 6-inch minimum width, 0.003-inch minimum thickness, and color-coded in blue (for water systems) with warning and identification imprinted in black bold letters continuously over the length of the tape. Warning and identification shall read “CAUTION – BURIED WATER LINE BELOW” or similar warning. The tape shall have a minimum lengthwise strength of 1,500psi, minimum crosswise strength of 1,250psi, and a maximum elongation of 350%.

Other Materials:

All other materials used for this work shall conform to those specified by the Noank Water Company’s Regulations and Specifications or as directed by the Engineer.

Construction Methods:

For Removal of Water Main:

The Contractor shall only remove the portions of existing and/or temporary water main called for on the plans or as directed by the Engineer. Portions of existing and/or temporary water main within the proposed areas of Soil Stabilization (GRS) shall be removed. Under no circumstances shall portions of abandoned water main remain within the GRS Area after the completion of construction. Contractor shall remove the sections of water main in their entirety including any valves, fittings, thrust blocks, or other incidental appurtenances. Removal of existing water main below grade shall be paid for as incidental to “Structure Excavation”.

Pipe Cutting:

Cutting pipe for insertion of valves, fittings, or closure pieces shall be done in conformance with all safety recommendations of the manufacturer of the cutting equipment. Field cutting of ductile iron pipe shall only be done on “gauged” pipe (pipe so marked at the factory as to be within the proper O.D. Diameter and out of round tolerance for proper jointing at any position along the length). Cutting shall not damage the pipe or its linings. Ductile-iron pipe may be cut using an abrasive pipe saw, rotary wheel cutter, guillotine pipe saw, or milling wheel saw. Cut ends and rough edges shall be ground smooth, and for push-on joint connections, the cut end shall be beveled.

Water Main Installation:

Proper implements, tools and facilities shall be provided and used for the safe and convenient performance of the work. All pipe, fittings, valves and hydrants shall be lowered carefully into the trench by means of derrick, ropes or other suitable tools or equipment in such a manner as to prevent damage to water main materials and protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench.

All pipes, fittings, valves, hydrants and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.

All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit or any foreign materials before the pipe is laid.

Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.

As each length of the pipe is placed in the trench, the joint shall be assembled, and the pipe brought to correct line and grade. Three brass wedges shall be installed at each pipe and fitting joint. The pipe shall be secured in place with approved backfill material.

At times when pipe laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer. The plug shall be fitted with a means for venting. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation should the trench fill with water. Prior to removal of the plug for extending the line or any other reason, air and/or water pressure in the line shall be released.

Special attention is called to the existing concrete sidewalk and curbing on streets where required for construction, the contractor shall saw cut sidewalk and curbing at existing construction/scored joints. Following installation, backfill, and compaction of subgrade, sidewalk and curbing shall be replaced to match preconstruction thickness, dimensions, and finish. Concrete driveways and other pads shall be addressed in the same manner.

Installation of the casing pipe requires lifting elements above the Amtrak Right-Of-Way. Work over Amtrak Right of Way shall be in accordance with the Railroad Specifications. Coordinate all activities over Amtrak Property with Amtrak.

Water Main Joint Assembly:

Push-On Joints:

Thoroughly clean the groove and bell socket and insert the gasket, making sure that it faces the proper direction and that it is correctly seated.

After cleaning dirt or foreign material from the plain end, apply lubricant in accordance with the pipe manufacturer's recommendations. The lubricant is supplied in sterile cans. Contaminated lubricant shall be discarded.

The Contractor shall ensure that the plain end is beveled; square or sharp edges may damage or dislodge the gasket and cause a leak. Field cutting of ductile iron pipe shall only be done on "gauged" pipe, that is, pipe so marked at the factory as to be within proper O.D. diameter and out of round tolerance for proper jointing at any position along the length. Push the plain end into the bell of the pipe. Keep the joint straight while pushing. Make deflection after the joint is assembled. Small pipe can be pushed into the bell socket with a long bar. Large pipe requires additional power, such as a jack, lever puller or backhoe. A timber header should be used between the pipe and jack or backhoe bucket to avoid damage to the pipe.

Assemble TR Flex pipe or approved equal push-on joint in accordance with the manufacturer specifications.

Mechanical Joints:

The Contractor shall wipe clean the socket and the plain end. The plain end, socket and gasket should be washed with a soap solution to improve gasket seating. Place the gland on the plain end with the lip extension toward the plain end, followed by the gasket with the narrow edge of the gasket toward the plain end. Use EBAA Series 1100 Megalug or an approved equal mechanical joint restraint system when the joint is at a fitting, valve, hydrant, plug end, or when requested by the Engineer. Insert the pipe into the socket and press the gasket firmly and evenly into the gasket recess. Keep the joint straight during assembly. Make deflection after joint assembly but before tightening bolts. Push the gland toward the socket and center it around the pipe with the gland lip against the gasket. Insert bolts and hand-tighten nuts. Tighten the bolts to the normal range of bolt torque while maintaining (at all times) approximately the same distance between the gland and the face of the flange at all points around the socket.

This can be accomplished by partially tightening the bottom bolt first, then the top bolt, next the bolts at either side, finally the remaining bolts. Repeat the process until all bolts are within the appropriate range of torque.

Hydrostatic Testing:

Perform pressure and leakage tests of new water main to meet the requirements of the Noank Water Company. Test shall be conducted between valved sections. When, in the opinion of the Engineer, local conditions require that trenches be backfilled immediately after pipe has been laid, the pressure test may be made after backfilling has been completed, but before permanent pavement replacement. A test shall be made only after part or all backfilling has been completed, and at least 36 hours after the last concrete thrust block has been cast with high early strength concrete; or at least 7 days after the last concrete thrust block has been cast with standard concrete.

Equipment for Testing:

The Contractor shall make all necessary arrangements to obtain, supply, furnish all pumps, piping, hose, gauges, installing corporation cocks, if necessary, etc., and remove same, except corporation cocks, when work is completed.

The meter equipment and gauges shall be tested for accuracy by the manufacturer prior to shipping and written certification shall be given to the Engineer.

Disinfection of Water Main:

After the water main installation has been accepted, the mains shall be flushed and disinfected in accordance with AWWA C651 and as follows:

1. Disinfection solution shall be prepared using calcium hypochlorite in granular form; tablets are not permitted.
2. The Continuous Feed Method shall be used.
3. Flushing and disinfection shall be conducted only at times approved by the Engineer.
4. Water for flushing and disinfection shall be introduced into the main only at locations and

methods approved by the Engineer.

5. Flushing water shall be drained only at locations approved by the Engineer. The Contractor shall neutralize residual chlorine in flush water in accordance with AWWA C651 – Appendix B.
6. Disinfection solution shall be introduced into the water main through a tap no more than 10-feet downstream from the beginning of the new water main. The solution shall be introduced by a chemical feed pump designed for this purpose.
7. Taps installed for bleeding air at dead ends and other points shall be tightly plugged after disinfection and testing is complete.
8. Chlorine residual measurements shall be made at location and times required by the Engineer.
9. After the main has been flushed and the chlorine concentration of the water leaving the main is no greater than that generally prevailing in the system or is acceptable for domestic use, samples shall be taken by the District for bacteriological and physical tests.

The water main shall be placed in service only if the aforementioned tests meet the DOHS standards for potable water. Failing tests will require the Contractor to repeat the entire disinfection process.

For all other Sub-Items:

All other means of construction (including but not limited to pipe installation, valve installation, hydrant relocation, installation of thrust blocks, and pressure/leak testing) shall conform to the Noank Water Company Regulations and Specifications, unless otherwise directed by the Engineer.

Method of Measurement:

This work shall not be measured for payment, as it is being paid for on a lump sum basis.

Basis of Payment:

This work shall be paid for at the contract lump sum price for “Temporary Relocation of Water Mains”. Price shall include concrete for thrust blocks, ductile iron pipe and all appropriate fittings, steel casing pipe, lifting and installation of casing pipe casing pipe inserts, risers, and end seals, insulation for water main, polyvinyl chloride (PVC) vent pipes, PVC pipe for water main at grade, gate valves, supports necessary on grade beyond the limits paid for under Item No. 1504010A, as well as all materials, equipment, tools, and labor incidental thereto.

The Contractor shall submit to the Department a schedule of payment values for review prior to payment.