

APRIL 25, 2019

REPLACEMENT OF BRIDGE NO. 06676
US ROUTE 1 OVER UNNAMED BROOK
FEDERAL AID PROJECT NO. 0001(356)

STATE PROJECT NO. 0044-0157
TOWN OF EAST LYME

ADDENDUM NO. 2

SPECIAL PROVISIONS
NEW SPECIAL PROVISIONS

The following Special Provisions are hereby added to the Contract:

- SECTION 1.03 - AWARD AND EXECUTION OF CONTRACT
- ITEM NO. 1111201A - TEMPORARY DETECTION (SITE NO. 1)
- ITEM NO. 1118051A - TEMPORARY SIGNALIZATION (SITE NO. 1)

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
- SECTION 1.08 – PROSECUTION AND PROGRESS
- ITEM NO. 0601158A – (10' X 5') PRECAST CONCRETE BOX CULVERT
- ITEM NO. 0601275A – PRECAST SUBSTRUCTURE ELEMENTS
- ITEM NO. 0904487A – METAL BRIDGE RAIL (HANDRAIL)
- ITEM NO. 0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

CONTRACT ITEMS
NEW CONTRACT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>
1111201A	TEMPORARY DETECTION (SITE NO. 1)	L.S.	1
1118051A	TEMPORARY SIGNALIZATION (SITE NO. 1)	L.S.	1
1209131	HOT-APPLIED PAINTED LEGEND , ARROWS AND MARKINGS	S.F.	50

REVISED CONTRACT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>ORIGINAL QUANTITY</u>	<u>REVISED QUANTITY</u>
0822001	TEMPORARY PRECAST CONCRETE BARRIER CURB	420 L.F.	260 L.F.
0822002	RELOCATED TEMPORARY PRECAST CONCRETE BARRIER CURB	300 L.F.	260 L.F.
1209124	HOT-APPLIED PAINTED PAVEMENT MARKINGS 4" WHITE	1060 L.F.	530 L.F.
1211001	REMOVAL OF PAVEMENT MARKINGS	1100 S.F.	1150 S.F.
1220027	CONSTRUCTION SIGNS	440 S.F.	480 S.F.
1802210.04	TEMPORARY SAND BARREL (400 LB)	4 EA.	2 EA.
1802210.07	TEMPORARY SAND BARREL (700 LB)	12 EA.	6 EA.
1802210.14	TEMPORARY SAND BARREL (1400 LB)	16 EA.	8 EA.
1802210.21	TEMPORARY SAND BARREL (2100 LB)	8 EA.	4 EA.
1802211.04	RELOCATION OF TEMPORARY SAND BARREL 400 LB	3 EA.	2 EA.
1802211.07	RELOCATION OF TEMPORARY SAND BARREL 700 LB	9 EA.	6 EA.
1802211.14	RELOCATION OF TEMPORARY SAND BARREL 1400 LB	12 EA.	8 EA.
1802211.21	RELOCATION OF TEMPORARY SAND BARREL 2100 LB	6 EA.	4 EA.

DELETED CONTRACT ITEMS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>UNIT</u>	<u>QUANTITY</u>
0601201	CLASS "F" CONCRETE	C.Y.	10
0602006	DEFORMED STEEL BARS – EPOXY COATED	LB.	1210
1209114	HOT-APPLIED PAINTED PAVEMENT MARKINGS 4" YELLOW	L.F.	900

PLANS

NEW PLANS

The following Plan Sheets are hereby added to the Contract:

03.20.A2, TR-1105_01 and TR-1114_01.

REVISED PLANS

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

02.01.A2, 03.10.A2, 03.12.A2, 03.18.A2, 03.19.A2, 04.02.A2, 04.03.A2, 04.07.A2, 04.08.A2,
and 04.10.A2.

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

The Detailed Estimate Sheet does not 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

There will be two assessments for liquidated damages and they will be addressed in the following manner:

1. One Hundred Thirty Nine (139) calendar days will be allowed for completion of the work on this Contract and the liquidated damages charge to apply will be One Thousand One Hundred Dollars (\$1,100.00) per calendar day.

2. Milestone Liquidated Damages:

In order to minimize the hazard, cost and inconvenience to the traveling public, pollution of the environment and the detriment to area businesses, it is necessary to limit the time of construction work for Stage 2, which includes a detour of Route 1 traffic as specified in Article 1.08.04 of the Special Provisions.

The time allowed for the completion of all construction work shall be based upon the allotted number of calendar days stated in the Contract. The Contractor shall develop construction schedules which allow completion of all required work within the time frame allowed.

There will be no additional time allotment for weekends or holidays. The Contractor will be allowed to work any time periods which are not specifically disallowed in the Contract. Traffic disruptions will be permitted only during periods which the specifications allow.

Milestone – 14 Day Detour of Route 1 Traffic

During Stage 2, the Contractor is allowed to detour Route 1 traffic starting no sooner than October 14, 2019, without prior approval of the Engineer, for a period no longer than 14 consecutive days. The following tasks shall be completed during the detour period: installation of any remaining temporary cofferdam not installed during the alternating one way traffic operation, installation of temporary water handling, removal of the existing culvert, installation of the precast concrete box culvert, headwalls, wingwalls, parapets, and metal bridge rail, backfilling, full depth roadway reconstruction, final paving and installation of metal beam railing and appurtenances. Route 1 shall not be reopened to traffic until all the tasks listed above are complete to the satisfaction of the Engineer.

Assessment of Milestone Liquidated Damages:

Prior to beginning physical work on the Project, the Contractor shall furnish to the Engineer for approval a Critical Path Method (CPM) schedule that details all of the day-to-

day operations necessary to complete the above tasks during the 14 Day Detour of Route 1 Traffic.

The schedule shall include:

- activity descriptions, activity durations and interdependence between activities, where applicable. The activities are to be described so that the work is readily identifiable and the progress on each activity can be readily measured and monitored during the noted timeframe.
- the anticipated number of shifts, the hours per shift, and the anticipated number of personnel staffed per shift
- anticipated submittal and approval dates
- anticipated material delivery dates

Accompanying the CPM schedule shall be the following, as applicable:

- description of any special resources, including back up equivalent resources
- Contingency plans for mechanical failure
- M&PT plans
- Quality Management Plans (QMP)

Milestone Liquidated Damages Terms and Conditions

If the Contractor fails to complete, to the satisfaction of the Engineer, the above-listed tasks and corresponding milestone within the 14 Day Detour of Route 1 Traffic timeframe as defined above, or by an adjusted Date, if the adjustment was warranted as defined below, the Contractor will be assessed a Milestone Liquidated Damage charge of \$29,600 (Twenty-Nine Thousand Six Hundred Dollars) on the first minute after the defined timeframe period has expired, and shall be assessed additional liquidated damage charges at the rate of \$29,600 (Twenty-Nine Thousand Six Hundred Dollars) per day thereafter until the tasks and corresponding milestone are complete and accepted by the Engineer. The maximum assessment of Milestone Liquidated Damages will not be capped and will be considered separate from any Liquidated Damages assessed to the Contractor for failure to complete the Project on time per Article 1.08.09 of the Standard Specifications including Supplemental Specifications Dated July 2018.

Any and all costs or detrimental effects incurred by the Contractor in accelerating the work in an attempt to meet the Milestone “14 Day Detour of Route 1 Traffic”, regardless of the effects of any delay, disruption, inefficiency or other detrimental effect including, but not limited to, the deletion of Contract work, the issuing of construction orders, the execution of supplemental agreements, the discovery of differing site conditions, the adding of extra work to the Contract, the emergence of right-of-way conflicts, problems with the obtaining or the terms of permits, action or inaction by persons or entities working on the project or by third parties, delays in the process of reviewing or approving shop drawings, expansion of the physical limits of the Project,

the effects of weather conditions on Project activities, the occurrence of weekends or holidays, the suspension of any Project operation, or other events, forces or factors that affect highway construction work, shall be solely the Contractor's responsibility, and may not be used as the basis for any claim by the Contractor for additional compensation.

The Contractor is directed to follow the procedures of Article 1.08.08 of the Standard Specifications including Supplemental Specifications Dated July 2018 for any request presented to the Engineer for an adjustment of the Milestone "14 Day Detour of Route 1 Traffic" Duration for any unforeseeable causes noted in Article 1.08.08 that have resulted in the need for adjusting these dates. There will be no adjustment to the Milestone "14 Day Detour of Route 1 Traffic" Duration for events, forces or factors, as noted above, that the Contractor was to have foreseen and included in the cost and schedule of the work.

SECTION 1.03 - AWARD AND EXECUTION OF CONTRACT

Article 1.03.02 - Award and Execution of Contract:

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

The successful bidder is hereby notified of the Department's intent to award this contract within **44** days of the bid opening.

Article 1.03.08 - Notice to Proceed and Commencement of Work:

Change the first paragraph to read as follows:

The Contractor shall commence and proceed with the Contract work on the date specified in a written Notice to Proceed issued by the Engineer to the Contractor. The date specified will be no later than 45 calendar days after the date of the execution of the Contract by the Department, however, the contractor is hereby put on notice that it is the Department's intent to issue the Notice to Proceed no later than **31** calendar days after the date of the execution of the Contract by the Department.

SECTION 1.08 - PROSECUTION AND PROGRESS

Article 1.08.04 - Limitation of Operations - Add the following:

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

Route 1 (Boston Post Road)

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

The Contractor will be allowed to institute alternating one way traffic along Route 1 (Boston Post Road) controlled by temporary signalization as shown on the plans for a period of 40 consecutive days and may commence no sooner than September 4, 2019, for the purpose of relocation of the sanitary sewer and installation of the temporary cofferdam. During this time period, any work that produces loud noises, i.e. installation of sheeting and as determined by the Engineer; will be strictly prohibited between the hours of 10:00 pm and 7:00 am.

Immediately following the completion of the above described alternating one way traffic pattern, the Contractor will be allowed to close Route 1 (Boston Post Road) for a period of 14 consecutive days and detour traffic as shown on the Detour Plan contained in the contract plans. The detour shall commence no sooner than October 14, 2019 without prior approval of the Engineer. During this time period, the Contractor will be allowed to work 24 hours per day; however work that produces loud noises, i.e. installation of sheeting as determined by the Engineer; will be strictly prohibited between the hours of 10:00 pm and 7:00 am. The following tasks shall be completed during the detour period: installation of any remaining temporary cofferdam not installed during the alternating one way traffic operation, installation of temporary water handling, removal of the existing culvert, installation of the precast concrete box culvert, headwalls, wingwalls, parapets, and metal bridge rail, backfilling, full depth roadway reconstruction, final paving and installation of metal beam railing and appurtenances. Route 1 shall not be reopened to traffic until all the tasks listed above are complete to the satisfaction of the Engineer.

Following the completion of the Route 1 (Boston Post Road) closure, the Contractor will be allowed to institute alternating one way traffic as required during normal working hours for any ancillary work.

The Contractor shall notify the Engineer at least 14 days in advance of the Route 1 (Boston Post Road) 40 day alternating traffic pattern and roadway closure. The Engineer shall then notify the Towns of East Lyme and Old Lyme and all emergency services.

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.

The Contractor shall maintain a minimum of one lane in each direction on all other roadways within the project limits at all times. The Contractor shall maintain access to the sanitary sewer pump station which is located on Lovers Lane at all times.

Additional Lane Closure Restrictions

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

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

ITEM #0601158A - (10' X 5') PRECAST CONCRETE BOX CULVERT

Description:

Work under this item shall consist of fabrication, furnishing, and installation of a precast concrete box culvert(s) in accordance with the details shown on the plans and as ordered by the Engineer. This item includes all hardware, inserts and dowels for connections as shown on the plans and as required for a complete assembly.

This item also includes the evaluation of the box culvert sections for transportation data loads that include shipping length, height, width, and weight.

This item shall also include the development of a single Assembly Plan, which includes the required procedures and erection requirements associated with the work of this Item and the work associated with Item No. 0601275A Precast Substructure Elements.

Note that fabrication of precast elements specified under this Item and Item No. 0601275A Precast Substructure Elements shall be completed by one manufacturer.

This item also includes the shop casting of precast concrete headwalls and precast concrete parapet barriers above the precast concrete box culvert, and the required coordination of embedded anchorage and reinforcement associated with the work of Item No. 0904487A – Metal Bridge Rail (Handrail).

Not included in this item is the work associated with Item No. 0601275A Precast Concrete Substructure Elements.

Materials:

The precast concrete for the box culverts and headwalls shall meet the requirements of M.14.01-1. The concrete mix design shall be submitted to the Engineer and shall attain a minimum compressive strength (f'_c) of 5,000 psi and a minimum electrical resistivity of 29 $k\Omega$ -cm in accordance with AASHTO T 358 at 28 days.

The precast concrete for the precast concrete parapet barrier shall also meet the requirements specified in Item No. 0601275A Precast Concrete Substructure Elements.

All reinforcing steel, including dowel bar mechanical connectors, shall be epoxy coated and meet the requirements of M.06.01.

All threaded concrete inserts, lifting fixtures, and miscellaneous hardware cast into precast concrete components shall be galvanized in accordance with ASTM A153 or ASTM B695 Grade 50 as shown on the plans.

Prefomed expansion joint filler shall conform to the requirements of AASHTO M 153, Type I or Type II.

Non-shrink grout shall meet the requirements of M.03.05, except that the non-shrink grout shall attain a minimum compressive strength of 3,000 psi prior to the passage of flowing water over the grout.

Gaskets shall be flexible, expanded rubber meeting the requirements of ASTM D1056.

Construction Methods:

1. Submittals:

(a) Shop / Working Drawings: The Contractor shall submit a single packaged set of shop and working drawings for the precast box culvert / headwall / parapet barrier, and the precast concrete substructure elements to the Engineer for review in accordance with 1.05.02. Each package shall include drawings with all details and documents necessary for fabrication and erection, and shall address all unique culvert sections and loading conditions. The package shall include the following:

- Title sheet
- Table of contents
- Contact information for fabricator – contact information shall include name and address of the firm and the name of contact person with phone number and email address
- Precast concrete box culvert working drawings and supporting data

The drawings shall include complete details of the precast concrete box sections and connections for the headwalls, cutoff walls, and closure pours where shown on the plans. The drawings shall include, but not be limited to, the following:

- Project number, town and crossing
- Bridge number, when shown on the plans
- Layout plan of the precast concrete boxes, precast headwalls and precast concrete parapet barriers. The plan shall include the dimensions of each box culvert, headwall and parapet section. The Contractor shall determine that the length of each box culvert section, including all tolerances, satisfies the stages of construction, sequence of construction, and construction methodology shown on the plans.
- Plan indicating sequence of erection and stage construction of precast concrete box culvert sections.
- Plans and cross-sections of the box sections detailing the length, width, height and thickness of wall, floor and roof slabs.
- Type, size, location and spacing of steel reinforcing including location and length of all lap joints, mechanical connectors and concrete inserts for

- anchoring threaded deformed steel bars, bending diagrams, material lists and catalog cuts for mechanical connectors and inserts as applicable.
- Type, size and location of fixtures and lifting holes.
 - Location and size of all holes to be cast and additional reinforcement as required.
 - Type, size and location of joints, gaskets and additional steel reinforcement.
 - Material specification designations for all components.
 - Shop and working drawings shall be signed and sealed by a Professional Engineer licensed in the State of Connecticut.

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

- (a) **Test Cylinders:** During the casting of the sections, the Contractor shall make a minimum of four 4 inch x 6 inch test cylinders during each production run. Cylinders shall be cured under the requirements of ASTM C31 and shall be used to determine the 28 day compressive strength ($f'c$).

Note: Provide separate test cylinders for precast concrete parapet barriers, if barriers are poured separately from the box culvert/headwall.

- (b) **Finishing:** All fins, runs, or mortar shall be removed from the concrete surfaces which will remain exposed. Form marks on exposed surfaces shall be smoothed by grinding. All exposed, outside concrete surfaces shall be given a grout clean-down finish in accordance with 6.01.03-10.
- (c) **Handling and Storage:** Storage, transportation and handling of sections prior to final placement shall be performed without damage to the sections. Any damaged sections shall be repaired or replaced by the Contractor, at its own expense, as directed by the Engineer.
- (d) **Repairs:** The Contractor shall submit to the Engineer, for review, the proposed methods and materials to be used in the repair operation.

3. Fabrication and Erection Tolerances: The Contractor shall be responsible for ensuring the overall length of the box culvert meets the layout requirements of the plans. Tolerance of forming precast concrete box sections shall be as follows:

- (a) **Internal Dimensions:** The internal dimensions shall be within 1% of the design dimensions or within 1 1/2 inches, whichever is less.
- (b) **Slab and Wall Thickness:** the slab and wall thickness shall be within 1/4 inch of the thicknesses shown in the design.

(c) Laying Length of Opposite Surfaces: Variations in laying lengths of two opposite surfaces of the box section shall be less than 1/8 inch/ft of internal span.

(d) Length of Section: The length of a section shall not vary from the designed length by more than 1/2 inch in any box section.

(e) Position of Reinforcement: Concrete clear cover shall conform to Article 6.02.03-4(b).

(f) Area of Reinforcement: The areas of steel reinforcement shall be the design steel areas as shown in the manufacturer's working drawings.

4. Acceptance of Box Sections: Box sections shall conform to all dimensions within tolerances noted herein and shall be free of defects. A dry fit of complete precast element system including culvert parapets and walls is required. Adjacent sections shall be assembled without a gasket to ensure that all tolerances specified are met prior to shipping. All sections that will be joined with mechanical connectors shall be pre-assembled, complete with fasteners, to confirm alignment. The Department shall be given at least 1 week notice to inspect and evaluate the sections prior to shipping.

5. Quality Assurance:

1. All precast concrete box culvert sections shall be fabricated by a ConnDOT approved PCI certified fabricator with a minimum certification of "B1".
2. Permanently mark each precast concrete box culvert section with date of casting and supplier identification Stamp markings in fresh concrete.
3. Prevent cracking or damage of precast concrete box culvert sections during handling and storage.
4. Replace defects and breakage of precast concrete box culvert sections:
 - a. Members that sustain damage or surface defects during fabrication, handling, storage, hauling, or erection are subject to review or rejection.
 - b. Obtain approval before performing repairs.
 - c. Repair work must reestablish the elements' structural integrity, durability, and aesthetics to the satisfaction of the Engineer.
 - d. Determine the cause when damage occurs and take corrective action.
 - e. Failure to take corrective action, leading to similar repetitive damage, can be cause for rejection of the damaged element.
 - f. 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.
 - g. Full depth cracking and breakage greater than one foot are cause for rejection.

5. Construct precast concrete box culvert sections to tolerances shown on the plans. 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".
6. The plant will document all test results. The quality control file will contain at least the following information:
 - a. Element identification.
 - b. Date and time of cast.
 - c. Concrete cylinder test results.
 - d. Quantity of used concrete and the batch printout.
 - e. Form-stripping date and repairs if applicable.
 - f. Location/number of blockouts and lifting inserts.
 - g. Temperature and moisture of curing period.
 - h. Document lifting device details, requirements, and inserts.
7. The concrete strengths required for various operations shall be indicated on the Assembly Plan. The Contractor shall demonstrate that these minimum strengths have been met through the use of material testing. As such, the Contractor will be required to perform strength testing at the Contractor's own expense and shall be responsible for taking a sufficient number of concrete cylinders to meet this requirement. The Contractor shall not rely solely on compressive tests conducted by ConnDOT, as the ConnDOT testing schedule may not be changed to accommodate Contractor's scheduling requirements for interim testing.
8. Dry fit adjacent elements. The fabricator shall dry fit elements in the shop prior to shipping. The Engineer shall be given at least 1 week notice to inspect and evaluate the sections prior to shipping.

6. Installation: The installation of the precast concrete box sections, headwalls and parapet barriers where applicable, shall be in accordance with the final working drawings and the following:

All box culvert joints shall be sealed with rubber gaskets and must provide a silt-tight fit. The gasket shall be compressed to a minimum of 1/2 of its uncompressed width. The gasket shall be uniformly compressed along all vertical and horizontal surfaces. A positive means, through the use of seating devices, shall be used for pulling each section against the adjacent section to assure an adequate silt-tight joint.

Details for the seating method shall be submitted to the Engineer for review. The lap joints shall be seated such that they make a continuous line of box sections with a smooth interior, free from irregularities in the invert line. The top portions of the horizontal lap joints for the roof and floor slabs and the outside face of the vertical lap joints (full height on each side) shall be neatly filled with non-shrink grout after seating the sections. The exposed portions of the lap joints

within the haunches or fillets shall also be neatly filled with non-shrink grout. The finished surface shall be smooth and level with the adjacent concrete.

After its installation, any box section, as determined by the Engineer, not acceptable in vertical or horizontal alignment for any reason, including but not limited to settlement, displacement, excess camber or misfit, shall be removed by the Contractor and correctly installed, as directed by the Engineer and at the Contractor's expense.

All fixtures or holes cast into the sections for lifting or seating shall be neatly filled with non-shrink grout. The finished surface shall be smooth and level with the adjacent concrete.

The surface preparation, mixing, placing, curing, and finishing of the non-shrink grout shall follow the written instructions provided by the manufacturer of the grout. The Contractor shall furnish the Engineer with copies of the instructions. The grout shall be cured at least 3 days unless determined otherwise by the Engineer.

Method of Measurement:

This work will be measured along the structure centerline for payment by the number of linear feet of precast concrete box culvert completed and accepted.

Basis of Payment:

This work will be paid for at the Contract unit price per linear foot for "(Size) Precast Concrete Box Culvert," complete in place, which price shall include all equipment, materials, tools and labor incidental to the design, manufacture, shipping, repair and installation of the precast concrete box culvert of the specified size(s) at the locations specified on the plans.

Payment for all work associated with precast concrete headwalls and precast concrete parapet barriers will be considered incidental to this Item.

Pay Item	Pay Unit
10' x 5' Precast Concrete Box Culvert	l.f.

ITEM #0601275A – PRECAST SUBSTRUCTURE ELEMENTS

Description:

Work under this item shall consist of fabricating, furnishing, erecting, and installing all precast concrete wingwall elements for bridge substructure and precast concrete barrier for bridge superstructure, and precast concrete cutoff and return walls under the precast concrete box culvert. This item shall also include all necessary materials and equipment to complete the work as shown on the plans.

Precast concrete headwalls and parapet barriers above the precast concrete box culvert are to be shop cast with the Precast Concrete Box Culvert and are not a part of this Item.

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

This item shall also include the development of a single Assembly Plan, which includes the required procedures and erection requirements associated with the work of this Item and the work associated with Item No. 0601275A Precast Substructure Elements.

Note that fabrication of precast elements specified under this Item and Item No. 0601275A Precast Substructure Elements shall be completed by one manufacturer.

Prior to the initiation of the Route1 detour:

- The Assembly Plan shall be approved by the Engineer;
- Precast concrete elements shall be cast and approved; and
- Off-site dry fit of adjoining precast concrete elements cast under this Item and Item No. 0601158A Precast Concrete Box Culvert shall be conducted and successfully completed.

This item also includes the required coordination of embedded anchorage and reinforcement associated with the work of Item No. 0904487A – Metal Bridge Rail (Handrail) and Item No. 091074 – R-B 350 Bridge Attachment – Jersey Shaped Parapet.

Not included in this item is the work associated with Item #0601158A 10' x 5' Precast Concrete Box Culvert.

Materials:

Precast concrete shall conform to the requirements of M.14.01-1, amended as follows:

- a. Concrete shall have a minimum 28-day compressive strength (f'c) of 5,000 psi.
- b. Coarse aggregate shall meet the requirements of M.03.01-1.
- c. The entrained air content shall not be less than 5%, or greater than 7%.

- d. The minimum mass of cementitious materials per cubic yard of concrete shall be 660 pounds.
- e. The addition to the mix of Calcium Chloride or admixtures containing calcium chloride will not be permitted.

All reinforcement shall be epoxy coated and conform to the requirements of Article M.06.01.

Lifting hooks, keys, threaded concrete inserts, bolts, devices, and attachments 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.

High early strength non-shrink grout shall conform to one of the following and have a minimum compressive strength, $f'c = 5,000$ psi.

- a. Section M.03.05.
- b. ASTM C1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (nonshrink)
- c. CRD-C 621 - Corps of Engineers Specification for Non-Shrink Grout

Grouted Splice Coupler: Use grouted splice couplers to join precast concrete elements as shown on the plans. The grouted splice coupler shall be specifically designed to join reinforcing steel from within a precast concrete element to dowel bars from an adjacent precast concrete element. The grouted splice couplers shall use cementitious grout placed inside a steel casting to develop the strength of the connection. The following grouted splice couplers are acceptable for use provided that the requirements of this specification are met and approved of by the Engineer:

- a. NMB Splice-Sleeve
38777 West Six Mile Road, Suite 205
Livonia, MI 48152
(877) 880-3230
www.splicesleeve.com
- b. Lenton Interlok
Pentair USA
34600 Solon Road
Solon, OH 44139
(800) 753-9221
www.erico.com/lenton.asp
- c. Sleeve-Lock Grout Sleeve
Dayton Superior Corporation
1125 Byers Road
Miamisburg, OH 45342
(800) 745-3700
www.daytonsuperior.com

The grouted splice couplers shall provide 125 percent of the specified yield strength of the connected bar. The grout used for the inside of the couplers shall be supplied by the coupler manufacturer. The grout shall be matched with the coupler and be the same grout as the certified test report for the coupler. No other grout shall be substituted in the couplers unless additional certified test reports are submitted for the grout/coupler system.

Coated bars shall not be field cut, unless permitted by the Engineer. Field cutting of coated bars should be performed using hydraulic-powered cutters or friction cutting tools to minimize coating damage and field touch-up. Flame cutting of coated bars will not be permitted. Field cut bars shall be repaired immediately. See Form 817, Section 6.02.03 4.(e) Repair of Coated Reinforcing Steel for repair requirements.

Construction Methods:

1. Submittals:

- (a) **Shop / Working Drawings:** Prior to fabrication, the Contractor shall submit a single packaged set of shop and working drawings for the precast box culvert and the precast substructure elements to the Engineer for approval in accordance with Article 1.05.02-3, and as follows:
- a. Prepare and submit shop drawings for all precast substructure elements to be fabricated.
 - b. Shop drawings shall be signed and sealed by a Professional Engineer licensed in the State of Connecticut.
 - c. Prepare and submit working drawings for erection of all precast substructure elements to be fabricated.
 - d. Working drawings shall be signed and sealed by a Professional Engineer licensed in the State of Connecticut.
 - e. Dimension pieces on shop drawings from working points or working lines to prevent accumulation of dimensional tolerances.
 - f. Show all lifting inserts, hardware, or devices and locations on the shop drawings for Engineer's approval.
 - g. Show locations and details of the lifting devices, including supporting calculations, type, and amount of any additional reinforcing required for lifting. Design all lifting devices based on the no cracking criteria in Chapter 5 of the PCI Design Handbook.
 - h. Supporting calculations shall be signed and sealed by a Professional Engineer licensed in the State of Connecticut.
 - i. Show minimum compressive strength attained prior to handling the precast elements.
 - j. Do not order materials or begin work until receiving final approval of the shop drawings.
 - k. The Department will reject any elements fabricated before receiving written approval, or any elements that deviate from the approved shop drawings. The Contractor is responsible for costs incurred due to faulty detailing or fabrication.

Prior to erection, the Contractor shall submit an Assembly Plan to the Engineer for review in accordance with Article 1.05.02-3, and the following:

- a. Follow the requirements of the PCI Design Handbook for handling and erection bracing requirements.
- b. Comply with all requirements of applicable environmental permits.
- c. Comply with the construction timeframes specified in the Maintenance and Protection of Traffic Specification.
- d. Submit full size 22 inch x 34 inch sheets depicting the assembly procedures for the precast substructure elements.
- e. Include a work area plan, depicting items such as utilities overhead and below the work area, drainage inlet structures, and protective measures.
- f. Include details of all equipment that will be employed for the assembly of the substructure elements.
- g. Include details of all equipment to be used to lift substructure elements, including cranes, excavators, lifting slings, sling hooks, and jacks. Include crane locations, operation radii, and lifting calculations. Elements to be lifted shall include an additional 25% of the calculated load when sizing all lifting equipment. This increase shall be in addition to lifting equipment manufacturer's typical factors of safety.
- h. Include a detailed sequence of construction and a timeline for all operations. Account for setting and cure time for grouts, shear key concrete, void concrete, and concrete closure pours.
- i. Include methods of providing temporary support of the elements. Include methods of adjusting and securing the element after placement.
- j. Include procedures for controlling tolerance limits both horizontal and vertical.
- k. The Assembly Plan shall be bound into one complete document and shall be prepared, signed, and sealed by a Professional Engineer licensed in the State of Connecticut.

2. Fabrication and Manufacture: The fabrication and manufacture of the precast substructure elements shall conform to the AASHTO LRFD Bridge Design Specifications (Seventh Edition, 2014 with 2016 interim revisions). Provide the Engineer a tentative casting schedule at least two (2) weeks in advance to make inspection and testing arrangements. A similar notification is required for the shipment of precast elements to the job site. Do not place concrete in the forms until the Engineer has inspected the form and has approved the placement of all materials in the precast elements. Finish the precast elements according to Section 6.01. Trowel-finish the top surface of all precast concrete elements.

The fabrication and manufacture of the precast concrete elements shall meet the requirements of M.08.02-4 as supplemented by the following:

- (a) **Test Cylinders:** During the casting of the elements, the Contractor shall make a minimum of four 4 inch x 6 inch test cylinders during each production run. Cylinders shall be cured under the requirements of ASTM C31 and shall be used to determine the 28-day compressive strength (f'c).

Note: Provide separate test cylinders for precast concrete barriers, if barriers are poured separately from the wingwall elements.

- (b) **Finishing:** All fins, runs, or mortar shall be removed from the concrete surfaces which will remain exposed. Form marks on exposed surfaces shall be smoothed by grinding. All exposed, outside concrete surfaces shall be given a grout clean-down finish in accordance with 6.01.03-10.
- (c) **Handling and Storage:** Storage, transportation and handling of the elements prior to final placement shall be performed without damage to the elements. Any damaged elements shall be repaired or replaced by the Contractor, at its own expense, as directed by the Engineer.
- (d) **Repairs:** The Contractor shall submit to the Engineer, for review, the proposed methods and materials to be used in the repair operation.

3. Fabrication and Erection Tolerances: The length of each substructure element measured along its longitudinal axes shall be equal to that shown on the plans plus or minus 1/8". The thickness of each substructure element shall be equal to that shown on the plans plus or minus 1/8". The height of each substructure element, measured from the top of the footing to the top of the substructure element, shall be equal to that shown on the plans plus or minus 1/8". The top of the substructure element elevation shall be equal to that shown on the plans plus or minus 1/8". The squareness and plumbness shall not exceed plus or minus 1/8".

4. Acceptance of Precast Substructure Elements: Precast Substructure Elements shall conform to all dimensions within tolerances noted herein and shall be free of defects. All tolerances shall be met prior to shipping. The Department shall be given at least 1 week notice to inspect and evaluate the sections prior to shipping.

5. Quality Assurance:

- 1. All precast concrete elements shall be fabricated by a ConnDOT approved PCI certified fabricator with a minimum certification of "B1".
- 2. Permanently mark each precast concrete element with date of casting and supplier identification Stamp markings in fresh concrete.
- 3. Prevent cracking or damage of precast concrete elements during handling and storage.
- 4. Replace defects and breakage of precast concrete elements:
 - a. Members that sustain damage or surface defects during fabrication, handling, storage, hauling, or erection are subject to review or rejection.
 - b. Obtain approval before performing repairs.

- c. Repair work must reestablish the elements' structural integrity, durability, and aesthetics to the satisfaction of the Engineer.
 - d. Determine the cause when damage occurs and take corrective action.
 - e. Failure to take corrective action, leading to similar repetitive damage, can be cause for rejection of the damaged element.
 - f. 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.
 - g. Full depth cracking and breakage greater than one foot are cause for rejection.
5. Construct precast elements to tolerances shown on the plans. 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".
 6. The plant will document all test results. The quality control file will contain at least the following information:
 - a. Element identification.
 - b. Date and time of cast.
 - c. Concrete cylinder test results.
 - d. Quantity of used concrete and the batch printout.
 - e. Form-stripping date and repairs if applicable.
 - f. Location/number of blockouts and lifting inserts.
 - g. Temperature and moisture of curing period.
 - h. Document lifting device details, requirements, and inserts.
 7. The concrete strengths required for various operations shall be indicated on the Assembly Plan. The Contractor shall demonstrate that these minimum strengths have been met through the use of material testing. As such, the Contractor will be required to perform strength testing at the Contractor's own expense and shall be responsible for taking a sufficient number of concrete cylinders to meet this requirement. The Contractor shall not rely solely on compressive tests conducted by ConnDOT, as the ConnDOT testing schedule may not be changed to accommodate Contractor's scheduling requirements for interim testing.
 8. Dry fit adjacent elements. Verify fit of all element anchors. The fabricator shall dry fit elements in the shop prior to shipping. The Engineer shall be given at least 1 week notice to inspect and evaluate the sections prior to shipping.

6. Installation: Procedure for installation of elements:

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 elements.

3. Check the condition of the receiving bonding surface prior to connecting elements and take any necessary measures to remove items such as dust, rust, and debris to provide the satisfactory bonding required between the protruding reinforcing bars element and the grouted couplers.
4. Precast Concrete Footing Installation:
 - a. Lift and place the footing elements as shown in the assembly plan using lifting devices as shown on the shop drawings.
 - b. Set footing in the proper horizontal location. Check for proper alignment within specified tolerances. For U-Type wingwalls the alignment and spacing of grouted splice couplers and projecting dowels that are to be inserted into grouted splice couplers takes precedence over the alignment of the footing edges.
 - c. Check the spacing of dowels or grouted splice couplers between adjacent footings that are to support common elements in future stages of construction. The use of bi-level templates and jigs is recommended. Adjust the location of the footing if required.
5. Wingwall Panel Installation.
 - a. Lift and place wall panel element as shown in the Assembly Plan using lifting devices shown on the shop drawings. Survey the elevation of the footing directly below the panel. Provide shims to bring the bottom of the panel to the required elevation. Measure the elevation of the top of the shim stack.
 - b. For wall stems connected using grouted splice couplers, it is recommended that the projecting reinforcing bars from the adjacent element be cast longer than required and cut to length in the field after the top of shims have been set. Follow the manufacturer's recommendations for the projection length of the bars measured from the top of the shims to the top of the bars. Verify that the elevations and dowel extensions are within specified tolerances.
 - c. Dry fit panel in the proper horizontal location. Check for proper horizontal and vertical alignment within specified tolerances. Remove and adjust the shims and reset the panel if the panel is not within tolerance.
 - d. Set the panel and install the couplers per Connection Procedures described below, once the connection geometry is established and checked.
 - e. Install peel and stick rubber membrane.
6. Connection Procedures Using Grouted Splice Couplers
 - a. Remove and clean all debris from the joints prior to application of non-shrink grout. Keep bonding surfaces free from laitance, dirt, dust, paint, grease oil, or any contaminants other than water.
 - b. Saturate Surface Dry (SSD) all joint surfaces prior to connecting the elements.
 - c. Use heaters in freezing temperatures to maintain a minimum temperature of 50 degrees F.
 - d. Monitor the temperature of the covered sleeves until the temporary bracing is removed.
 - e. Follow the recommendations of the manufacturer for the installation and grouting of the couplers. Follow the manufacturer's recommendations for the projection length of the bars measured from the top of the shims to the top of the bars.

- f. Mix the non-shrink grout according to the supplier’s recommendations including preparation and application.
 - g. Place non-shrink grout on the interface between the two elements being joined prior to setting the element. Crown the thickness of the grout toward the center of the joint so that the grout can be displaced outward as the element is lowered onto the joint. Take precautions to prevent the non-shrink grout from entering the coupler above (e.g. grout dams or seals).
 - h. Set the element in place. Engage all couplers in the joint. Allow the non-shrink grout to seep out of the joint.
 - i. Install temporary bracing if specified in the Assembly Plan.
7. Allow the grout in the coupler to cure until the coupler can resist 125 percent of the specified yield strength of the bar prior to removing bracing, proceeding with installation of components above the panel and backfilling wingwalls. The required strength of the grout for this is based on the certified test report. Verify the strength of the grout by testing cube samples according to AASHTO T 106.

Method of Measurement:

The work under this item shall not be measured for payment, but shall be included under a lump sum cost to construct the precast substructure elements placed in accordance with the plans or as ordered by the Engineer.

Items considered incidental to the construction and included in the lump sum price shall include, Development of Assembly Plan, backer rods, preformed and premolded filler, peel and stick rubber membrane, grout ports, leveling devices, reinforcing steel, grouted splice couplers, lifting hardware, non-shrink grouts, and all other work involved in furnishing and placing the precast concrete elements. Reinforcing steel cast with and/or within the precast concrete elements, leveling devices, and grouted splice couplers, and work required for the fabrication, transportation, erection and installation of precast concrete elements will not be measured for payment, but shall be included in the cost of the item "Precast Substructure Elements".

Payment for drilling holes within the precast concrete cutoff walls, non-shrink grout, and #6 x 1’-6” long anchor bars are not part of the work of this Item, but will be measured under Item No. 0602910A - Drilling Holes and Grouting Dowels.

Basis of Payment:

This work shall be paid for at the lump sum basis for “Precast Substructure Elements”, complete and accepted. Price shall include all material, tools, equipment, labor, and work incidental to the construction.

Pay Item	Pay Unit
Precast Substructure Elements	L.S.

ITEM #0904487A - METAL BRIDGE RAIL (HANDRAIL)

Description:

Work under this item shall consist of fabricating and installing a metal bridge railing, consisting of extruded aluminum posts and rails connected to preset anchorages, as shown on the plans, as directed by the Engineer, and in accordance with this specification.

Work under this item shall also include required coordination with Item No. 0601158A – (10' x 5') Precast Concrete Box Culvert and Item No. 0601275A – Precast Concrete Substructure Elements for the supplying of preset metal bridge rail anchorages along the top of the culvert precast concrete parapet barrier and the wingwall precast barrier.

Materials:

Materials for this work shall conform to the following requirements:

1. Metal Bridge Rail:

The railing posts, bases, post connection devices, splicing bars, and rails shall be extruded aluminum and conform to the requirements of ASTM B221, aluminum alloy 6061-T6 or 6005-T5.

All bolts and socket head cap screws shall be stainless steel and conform to the requirements of ASTM A193, Class 1 or Class 2, Grade B8 (AISI Type 304). Washers shall be stainless steel and conform to the requirements of ASTM A167, Types 302 through 305.

Cone-point rivets shall conform to the requirements of ASTM B316, aluminum alloy 6061-T6 or ASTM B221, aluminum alloy 6061-T6.

2. Preset Anchorage:

The preset anchorage shall be fabricated as detailed on the contract plans. Preset anchorages configured differently from these detailed on the plans may be used provided they utilize the same materials described below and are approved by the Engineer prior to fabrication.

The wire struts should be cold-drawn and conform to ASTM A510, Grade 1030 with minimum tensile strength of 100,000 psi. These wire struts shall be securely welded to the ferrules with the welds capable of developing the tensile strength of the struts and the ferrules.

The ferrules, either open end or closed end, shall conform to the ASTM A108, Grade 12L14. A plastic cap shall be provided for sealing the bottom of each open-end ferrule before placing concrete. Closed end ferrules shall provide the minimum full thread length on the plans.

Removable plastic washers of the same diameter as the ferrules and approximately 3/32" in thickness shall be provided for the top of each ferrule and shall be left in place until the temporary supporting bolts are removed. Removable plastic caps shall be provided for sealing the top of each ferrule until the erection of railing posts.

After fabrication, the preset anchorages shall be hot-dip galvanized in accordance with ASTM A153. The bolts shall be "free running" in the ferrules after galvanization.

Bolts for the preset anchorage shall conform to the requirements of ASTM A193, Class 1 or Class 2, Grade B8 (AISI Type 304). The manufacturer's symbol and the grade shall be clearly marked on the bolt heads. All washers shall be standard size and conform to ASTM A167, Types 302 through 305.

3. Molded Pads:

Molded pads shall be manufactured from new unvulcanized elastomer and unused synthetic fibers, with a weight proportion of fiber content equal to approximately one-half of the total weight of the pad. The pads shall be formed into single sheets of 1/8-inch minimum thickness, with a tolerance of plus or minus 10 percent. Pads shall have a Shore "A" Durometer hardness within the range of 70 to 90, and shall have a minimum compressive breakdown of 7,000 psi.

The Contractor shall furnish a Materials Certificate and a Certificate of Compliance in conformance with the requirements of Article 1.06.07 for the following materials: rail posts, rails, post connection devices, rail splices, preset anchorages, bolts, washers, and molded pads.

A sample preset anchorage, and samples of all sizes of bolts and washers used with the metal bridge rail, shall be submitted to the Engineer for approval prior to incorporation into the project.

Construction Methods:

Before fabricating any materials, the Contractor shall submit shop drawings to the Engineer for approval in accordance with Article 1.05.02 (3). These drawings shall include but not be limited to the following information: The layout plan showing all railing post spacing, attachment details, expansion joint locations, and material designations.

Aluminum welding shall be in accordance with the American Welding Society "Structural Welding Code - Aluminum", ANSI/AWS D1.2.

Riveting shall be done in accordance with Article 6.5 - Riveting, of the "AASHTO Specifications for Aluminum Structures."

The preset anchorages shall be fabricated for installation perpendicular to the grade of the parapet. The anchorages shall be firmly and accurately held in position prior to and during the placement of concrete.

The railings shall be accurately fabricated and installed as shown on the plans. Lengths of rail elements shall be continuous over a minimum of four rail posts wherever possible and in no case less than two. Welding of two or more rails to form an element will not be allowed. Rail splices shall be located in rail panels over open joints in parapets. Splice bars shall have a sliding fit in the rail sections.

For structures having railings with a radius of 400 feet or more, the railing may be sprung into place. For structures having railings with a radius of less than 400 feet, the railing shall be curved. Curving may be done by cold bending or by hot bending. Hot bending shall be done in accordance with Article 6.3 - Heating, of the "AASHTO Specifications for Aluminum Structures."

Aluminum railings shall be carefully adjusted prior to fixing in place to insure proper matching at abutting joints and correct alignment and curvature throughout their length. After installation, all rails and posts shall be free of burrs, sharp edges, and irregularities.

Method of Measurement:

This work will be measured for payment by the actual number of linear feet of metal bridge rail completed and accepted, measured along the rail from one rail end anchorage to the other rail end anchorage.

Basis of Payment:

This work will be paid for at the contract unit price per linear foot for "Metal Bridge Rail (Handrail)", complete and accepted in place, which price shall include all materials, equipment, tools, labor, and work incidental thereto.

Pay Item	Pay Unit
Metal Bridge Rail (Handrail)	L.F.

ITEM #0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

Article 9.71.01 – Description is supplemented by the following:

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

Route 1 (Boston Post Road)

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

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

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is relocating the sanitary sewer and installing the temporary cofferdam, at which time the Contractor will be allowed to maintain and protect a continuous alternating one-way traffic operation controlled by temporary signalization as shown in the plans.

The Contractor will be allowed to close Route 1 (Boston Post Road) for a period of 14 consecutive days immediately following the alternating one way traffic operation controlled by temporary signals and detour traffic as shown on the Detour Plan contained in the Contract plans.

All Other Roadways

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

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

Commercial and Residential Driveways

The Contractor shall maintain access to and egress from all commercial and residential driveways throughout the project limits. The Contractor will be allowed to close said driveways

to perform the required work during those periods when the businesses are closed, unless permission is granted from the business owner to close the driveway during business hours. If a temporary closure of a residential driveway is necessary, the Contractor shall coordinate with the owner to determine the time period of the closure.

Article 9.71.03 - Construction Methods is supplemented as follows:

General

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

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

Longitudinal dropdowns greater than 3 inches will not be allowed during those periods when the maximum number of lanes of through traffic are required. The Contractor shall temporarily provide a 4:1 traversable slope of suitable material in those areas where a longitudinal dropdown exists. The cost of furnishing, installing and removing this material shall be included in the contract lump sum for "Maintenance and Protection of Traffic."

The Contractor shall schedule operations so that pavement removal and roadway resurfacing shall be completed full width across a roadway (bridge) section by the end of a workday (work night). All transverse height differentials on all roadway surfaces shall be tapered to negate any "bump" to traffic as specified elsewhere in this contract or as approved by the Engineer. Material for this taper shall be as approved by the Engineer.

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

All temporary concrete barriers, other protective systems and traffic control devices as called for by the contract or ordered by the Engineer must be on-hand and available in sufficient quantity for immediate installation prior to any stage change.

Existing Signing

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

Requirements for Winter

The Contractor shall schedule a meeting with representatives from the Department including the offices of Maintenance and Traffic, and the Town/City to determine what interim traffic control

measures the Contractor shall accomplish for the winter to provide safety to the motorists and permit adequate snow removal procedures. This meeting shall be held prior to October 31 of each year and will include, but not be limited to, discussion of the status and schedule of the following items: lane and shoulder widths, pavement restoration, traffic signal work, pavement markings, and signing.

Signing Patterns

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

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

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

Interim Pavement Markings

The Contractor shall install painted pavement markings, which shall include centerlines, edge lines, lane lines (broken lines), lane-use arrows, and stop bars, on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work day/night. If the next course of bituminous concrete pavement will be placed within seven days, edge lines are not required. The painted pavement markings will be paid under the appropriate items.

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

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

Final Pavement Markings

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

be installed as described above and the painted pavement markings shall be installed by the end of the work day/night on Friday of that week.

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

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

TRAFFIC CONTROL DURING CONSTRUCTION OPERATIONS

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

TRAFFIC CONTROL PATTERNS

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

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

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

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

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

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

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

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

Traffic control patterns will not be required when vehicles are on an emergency patrol type activity or when a short duration stop is made and the equipment can be contained within the shoulder. Flashing lights and appropriate trafficperson shall be used when required.

Although each situation must be dealt with individually, conformity with the typical traffic control plans contained herein is required. In a situation not adequately covered by the typical traffic control plans, the Contractor must contact the Engineer for assistance prior to setting up a traffic control pattern.

PLACEMENT OF SIGNS

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

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

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

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

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

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

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

TABLE I – MINIMUM TAPER LENGTHS

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

SECTION 1. WORK ZONE SAFETY MEETINGS

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

SECTION 2. GENERAL

- 2.a) If the required minimum number of signs and equipment (i.e. one High Mounted Internally Illuminated Flashing Arrow for each lane closed, two TMAs, Changeable Message Sign, etc.) are not available; the traffic control pattern shall not be installed.

- 2.b) The Contractor shall have back-up equipment (TMAs, High Mounted Internally Illuminated Flashing Arrow, Changeable Message Sign, construction signs, cones/drums, etc.) available at all times in case of mechanical failures, etc. The only exception to this is in the case of sudden equipment breakdowns in which the pattern may be installed but the Contractor must provide replacement equipment within 24 hours.
- 2.c) Failure of the Contractor to have the required minimum number of signs, personnel and equipment, which results in the pattern not being installed, shall not be a reason for a time extension or claim for loss time.
- 2.d) In cases of legitimate differences of opinion between the Contractor and the Inspection staff, the Inspection staff shall err on the side of safety. The matter shall be brought to the District Office for resolution immediately or, in the case of work after regular business hours, on the next business day.

SECTION 3. INSTALLING AND REMOVING TRAFFIC CONTROL PATTERNS

- 3.a) Lane Closures shall be installed beginning with the advance warning signs and proceeding forward toward the work area.
- 3.b) Lane Closures shall be removed in the reverse order, beginning at the work area, or end of the traffic control pattern, and proceeding back toward the advance warning signs.
- 3.c) Stopping traffic may be allowed:
 - As per the contract for such activities as blasting, steel erection, etc.
 - During paving, milling operations, etc. where, in the middle of the operation, it is necessary to flip the pattern to complete the operation on the other half of the roadway and traffic should not travel across the longitudinal joint or difference in roadway elevation.
 - To move slow moving equipment across live traffic lanes into the work area.
- 3.d) Temporary road closures using Rolling Road Blocks (RRB) may be allowed on limited access highways for operations associated with the installation and removal of temporary lane closures. RRB may be allowed for the installation and removal of lead signs and lane tapers only and shall meet the following requirements:
 - RRB may not start prior to the time allowed in the contract Limitations of Operation for sign pattern installation. Sign pattern removal must be complete prior to the time indicated in the Limitations of Operation for restoring the lanes to traffic.
 - On limited access highways with 4 lanes or more, a RRB may not start until the Limitations of Operation Chart allows a 2 lane closure. In areas with good sight lines and full shoulders, opposite side lead signs should be installed in a separate operation.

- Truck-Mounted Impact Attenuators (TMAs) equipped with arrow boards shall be used to slow traffic to implement the RRB. State Police Officers in marked vehicles may be used to support the implementation of the RRB. The RRB shall start by having all vehicles, including Truck-Mounted Impact Attenuators TMAs and police vehicles leave the shoulder or on-ramp and accelerate to a normal roadway speeds in each lane, then the vehicles will position themselves side by side and decelerate to the RRB speed on the highway.
 - An additional Truck-Mounted Impact Attenuator TMAs equipped with a Portable Changeable Message Sign shall be utilized to advise the motorists that sign pattern installation / removal is underway. The Pre-Warning Vehicle (PWV) should be initially positioned in the right shoulder ½ mile prior to the RRB operation. If a traffic queue reaches the PWV's initial location, the contractor shall slowly reverse the PWV along the shoulder to position itself prior to the new back of queue. A Pre-Warning Vehicle, as specified elsewhere in the contract, shall be utilized to advise the motorists that sign pattern installation / removal is underway.
 - The RRB duration shall not exceed 15 minutes from start of the traffic block until all lanes are opened as designated in the Limitation of Operation chart. If the RRB duration exceeds 15 minutes on 2 successive shifts, no further RRB will be allowed until the Contractor obtains approval for a revised installation procedure from the respective construction District.
 - RRB should not be utilized to expand a lane closure pattern to an additional lane during the shift. The workers and equipment required to implement the additional lane closure should be staged from within the closed lane. Attenuator trucks (and State Police if available) should be used to protect the workers installing the taper in the additional lane.
 - Exceptions to these work procedures may be submitted to the District Office for consideration. A minimum of 2 business days should be allowed for review and approval by the District.
 - The RRB procedures (including any approved exceptions) will be reviewed and discussed by the inspection team and the Contractor in advance of the work. The implementation of the agreed upon plan will be reviewed with the State Police during the Work Zone Safety meeting held before each shift involving temporary lane closures. If the State Police determine that alternative procedures should be implemented for traffic control during the work shift, the Department and Contractor will attempt to resolve any discrepancies with the duty sergeant at the Troop. If the discrepancies are unable to be resolved prior to the start of the shift, the work will proceed as recommended by the Department Trooper. Any unresolved issues will be addressed the following day.
- 3.e) The Contractor must adhere to using the proper signs, placing the signs correctly, and ensuring the proper spacing of signs.
- 3.f) Additional devices are required on entrance ramps, exit ramps, and intersecting roads to warn and/or move traffic into the proper travel path prior to merging/exiting with/from the

main line traffic. This shall be completed before installing the mainline pattern past the ramp or intersecting roadway.

- 3.g) Prior to installing a pattern, any conflicting existing signs shall be covered with an opaque material. Once the pattern is removed, the existing signs shall be uncovered.
- 3.h) On limited access roadways, workers are prohibited from crossing the travel lanes to install and remove signs or other devices on the opposite side of the roadway. Any signs or devices on the opposite side of the roadway shall be installed and removed separately.

SECTION 4. USE OF HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

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

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

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

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

SECTION 6. USE OF TRAFFIC DRUMS AND TRAFFIC CONES

- 6.a) Traffic drums shall be used for taper channelization on limited-access roadways, ramps, and turning roadways and to delineate raised catch basins and other hazards.

- 6.b) Traffic drums shall be used in place of traffic cones in traffic control patterns that are in effect for more than a 36-hour duration.
- 6.c) Traffic Cones less than 42 inches in height shall not be used on limited-access roadways or on non-limited access roadways with a posted speed limit of 45 mph and above.
- 6.d) Typical spacing of traffic drums and/or cones shown on the Traffic Control Plans in the Contract are maximum spacings and may be reduced to meet actual field conditions as required.

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

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

coordinate with the Office of Construction and the Division of Traffic Engineering for the proper layout/dimensions required.

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

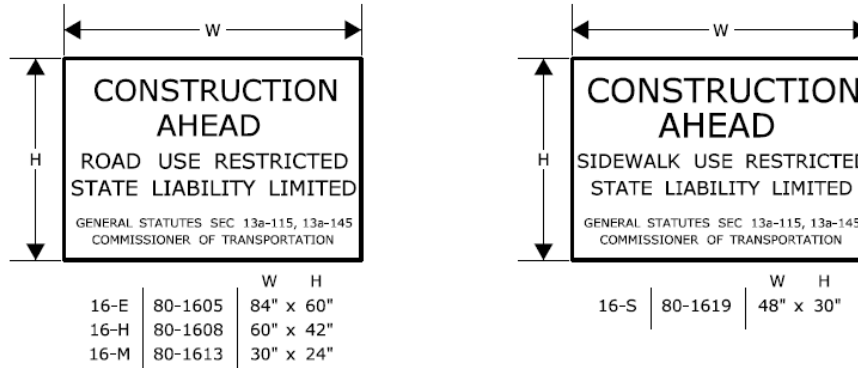
<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>	<u>Message No.</u>	<u>Frame 1</u>	<u>Frame 2</u>
1	LEFT LANE CLOSED	MERGE RIGHT	9	LANES CLOSED AHEAD	REDUCE SPEED
2	2 LEFT LANES CLOSED	MERGE RIGHT	10	LANES CLOSED AHEAD	USE CAUTION
3	LEFT LANE CLOSED	REDUCE SPEED	11	WORKERS ON ROAD	REDUCE SPEED
4	2 LEFT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

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

SECTION 8. USE OF STATE POLICE OFFICERS

- 8.a) State Police may be utilized only on limited access highways and secondary roadways under their primary jurisdiction. One Officer may be used per critical sign pattern. Shoulder closures and right lane closures can generally be implemented without the presence of a State Police Officer. Likewise in areas with moderate traffic and wide, unobstructed medians, left lane closures can be implemented without State Police presence. Under some situations it may be desirable to have State Police presence, when one is available. Examples of this include: nighttime lane closures; left lane closures with minimal width for setting up advance signs and staging; lane and shoulder closures on turning roadways/ramps or mainline where sight distance is minimal; and closures where extensive turning movements or traffic congestion regularly occur, however they are not required.
- 8.b) Once the pattern is in place, the State Police Officer should be positioned in a non-hazardous location in advance of the pattern. If traffic backs up beyond the beginning of the pattern, then the State Police Officer shall be repositioned prior to the backup to give warning to the oncoming motorists. The State Police Officer and TMA should not be in proximity to each other.
- 8.c) Other functions of the State Police Officer(s) may include:
- Assisting entering/exiting construction vehicles within the work area.
 - Enforcement of speed and other motor vehicle laws within the work area, if specifically requested by the project.
- 8.d) State Police Officers assigned to a work site are to only take direction from the Engineer.

SERIES 16 SIGNS



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

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

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

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

SIGN 16-E SHALL BE USED ON ALL EXPRESSWAYS.

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

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

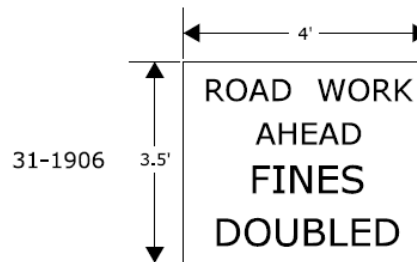
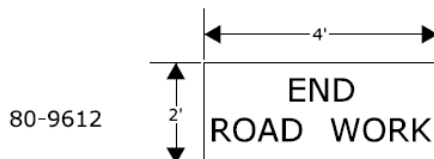
REGULATORY SIGN "ROAD WORK AHEAD, FINES DOUBLED"

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

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

"END ROAD WORK" SIGN

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



SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
REQUIRED SIGNS

NOTES FOR TRAFFIC CONTROL PLANS

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

TABLE 1 - MINIMUM TAPER LENGTHS

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

METRIC CONVERSION CHART (1" = 25mm)

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



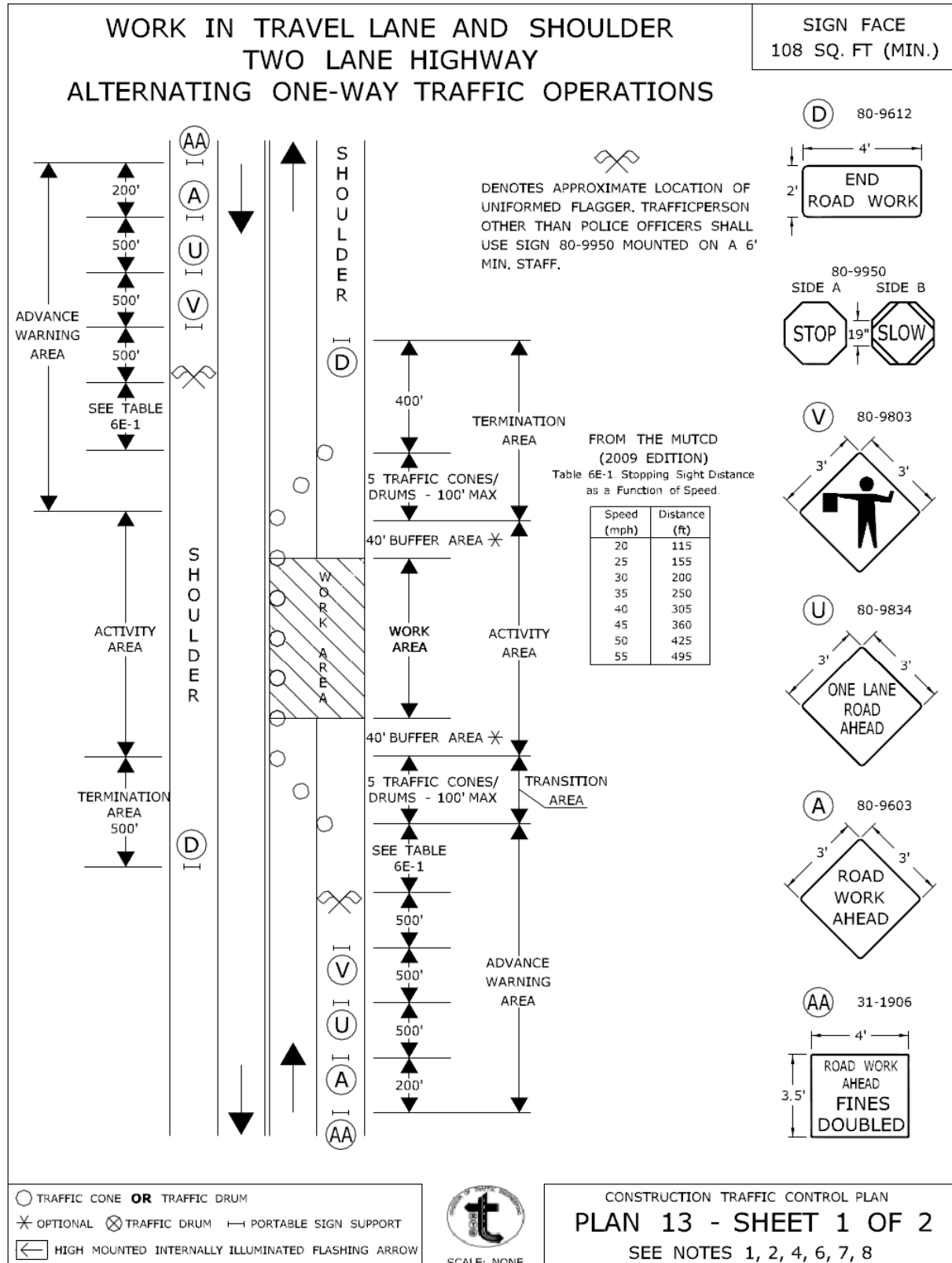
SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN NOTES

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED

Charles S. Harlow
2012.06.05 15:50:35-0400
PRINCIPAL ENGINEER



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

SIGN FACE
108 SQ. FT (MIN.)

HAND SIGNAL METHODS TO BE USED BY UNIFORMED FLAGGERS

THE FOLLOWING METHODS FROM SECTION 6E.07, FLAGGER PROCEDURES, IN THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES," SHALL BE USED BY UNIFORMED FLAGGERS WHEN DIRECTING TRAFFIC THROUGH A WORK AREA. THE STOP/SLOW SIGN PADDLE (SIGN NO. 80-9950) SHOWN ON THE TRAFFIC STANDARD SHEET TR-1220 01 ENTITLED, "SIGNS FOR CONSTRUCTION AND PERMIT OPERATIONS" SHALL BE USED.

A. TO STOP TRAFFIC

TO STOP ROAD USERS, THE FLAGGER SHALL FACE ROAD USERS AND AIM THE STOP PADDLE FACE TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. THE FREE ARM SHALL BE HELD WITH THE PALM OF THE HAND ABOVE SHOULDER LEVEL TOWARD APPROACHING TRAFFIC.



B. TO DIRECT TRAFFIC TO PROCEED

TO DIRECT STOPPED ROAD USERS TO PROCEED, THE FLAGGER SHALL FACE ROAD USERS WITH THE SLOW PADDLE FACE AIMED TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. THE FLAGGER SHALL MOTION WITH THE FREE HAND FOR ROAD USERS TO PROCEED.



C. TO ALERT OR SLOW TRAFFIC

TO ALERT OR SLOW TRAFFIC, THE FLAGGER SHALL FACE ROAD USERS WITH THE SLOW PADDLE FACE AIMED TOWARD ROAD USERS IN A STATIONARY POSITION WITH THE ARM EXTENDED HORIZONTALLY AWAY FROM THE BODY. TO FURTHER ALERT OR SLOW TRAFFIC, THE FLAGGER HOLDING THE SLOW PADDLE FACE TOWARD ROAD USERS MAY MOTION UP AND DOWN WITH THE FREE HAND, PALM DOWN.



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

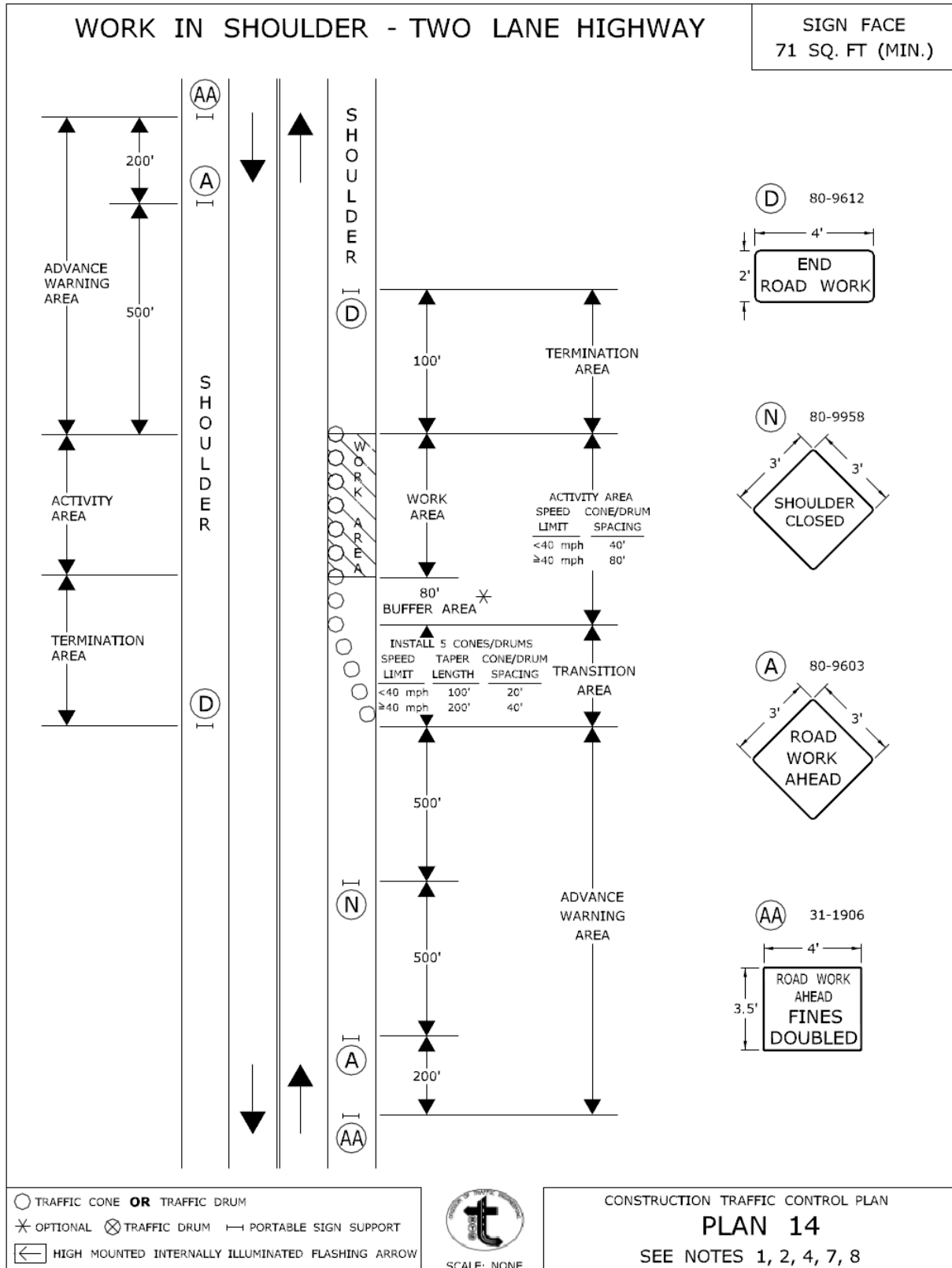


SCALE: NONE

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

CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow* Charles S. Harlow
2012.06.05 15:55:45-04'00'
PRINCIPAL ENGINEER



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

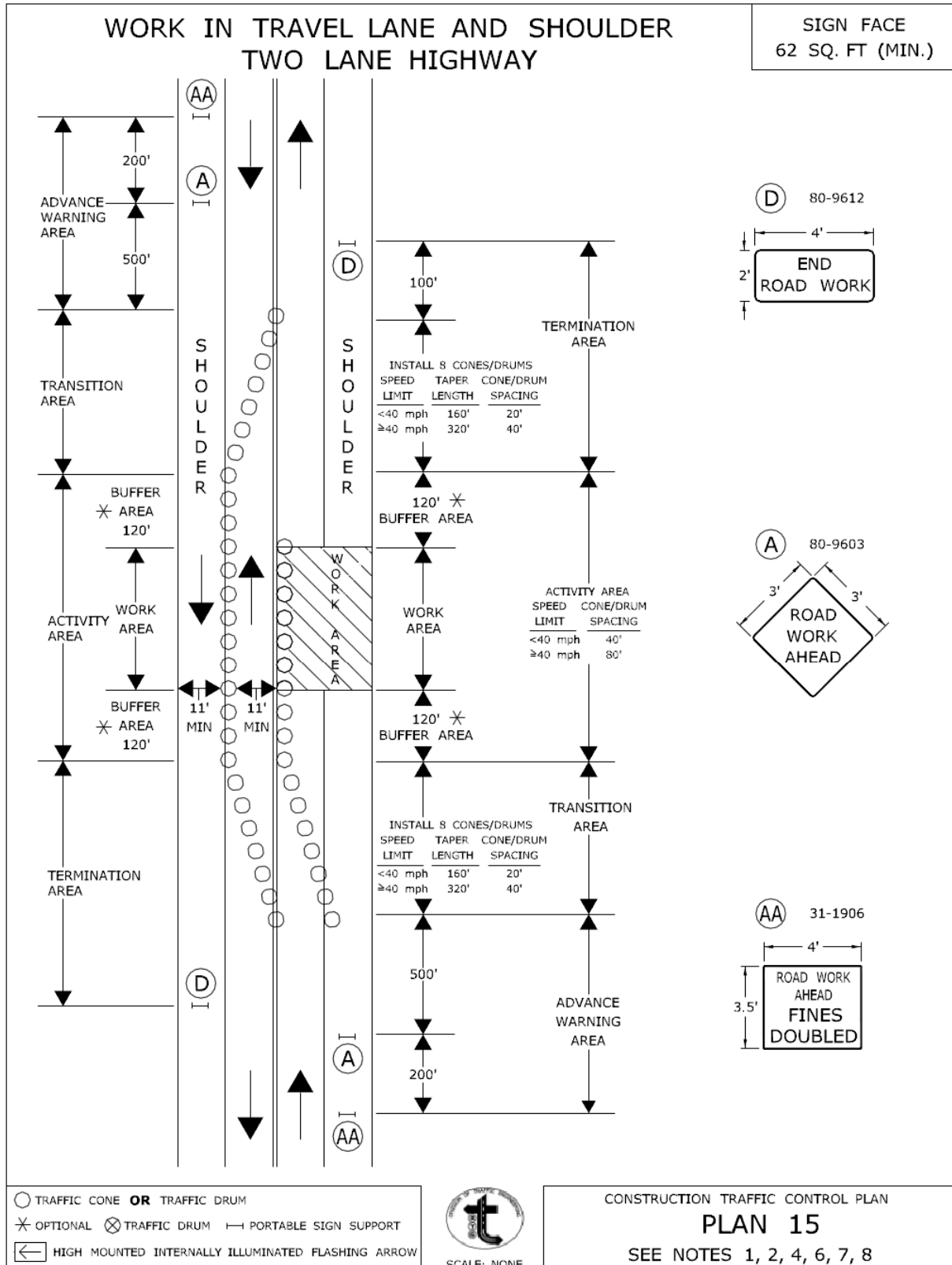


SCALE: NONE

CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 14
 SEE NOTES 1, 2, 4, 7, 8

CONNECTICUT DEPARTMENT OF TRANSPORTATION
 BUREAU OF ENGINEERING & CONSTRUCTION

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 PRINCIPAL ENGINEER
 Charles S. Harlow
 2012.08.05 15:56:09-04'00'



CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & CONSTRUCTION

APPROVED *Charles S. Harlow*
PRINCIPAL ENGINEER
Charles S. Harlow
2012.06.05 15:56:29-04'00"

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

The contract lump sum price for “Maintenance and Protection of Traffic” shall also include temporary relocating existing signs and sign supports as many times as deemed necessary and furnishing, installing and removing temporary sign supports and foundation if necessary during the construction of this project.

ITEM #1111201A – TEMPORARY DETECTION (SITE NO. 1)

Description:

Provide a Temporary Detection (TD) system at the temporary signalized intersections throughout the duration of construction, as noted on the contract plans or directed by the Engineer. TD is intended to provide an efficient traffic-responsive operation which will reduce unused time for motorists travelling through the intersection. A TD system shall consist of all material, such as pedestrian pushbutton, accessible pedestrian signal, conduit, handholes, cable, messenger, sawcut, loop amplifier, microwave detector, Video Image Detection System (VIDS), Self-Powered Vehicle Detector (SPVD), and any additional components needed to achieve an actuated traffic signal operation.

Materials:

Material used for TD is owned by the Contractor and in good working condition that will be removed upon completion of the contract.

Construction Methods:

The work for this item includes furnishing, installation, relocating, realigning, and maintaining the necessary detection systems as to provide vehicle and pedestrian detection during each phase of construction. If not shown on the plan, program the TD modes (pulse or presence) as directed by the Engineer. If the TD method (loops, SPVD, microwave, VIDS, pushbutton, or other) is not specified on the plans, it may be the Contractor's choice. The method chosen for TD must be indicated on the TD Plan submission.

The traffic signal plan-of-record, if not in the controller cabinet will be provided upon request. Ensure the controller phase mode (recall, lock, non-lock) and phase timing are correct for the TD. Adjust these settings as needed or as directed by the Engineer.

At least 30 days prior to implementation of each phase of construction submit a TD proposal to the Engineer for approval. Submit the TD proposal at the same time as the Temporary Signalization plan. Indicate the following information for each intersection approach:

- Phase Mode
- Temporary Detection Method
- Area of Detection
- Detector Mode
-

Submit the proposed temporary phase timing settings and the TD installation schedule with the TD proposal. See the example below.

Example Proposed Temporary Detection and Timing

Site 1

Warren, Rt. 45 at Rt. 341, Location #149-201

Approach	Phase	Phase Mode	TD Method	Area of Detection	Det Mode
<i>Rt. 45 NB</i>	<i>2</i>	<i>Min Recall</i>	<i>VIDS</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 45 SB</i>	<i>2</i>	<i>Min Recall</i>	<i>SPVD</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 341</i>	<i>4</i>	<i>Lock</i>	<i>Microwave</i>	<i>30' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 341</i>	<i>4</i>	<i>Lock</i>	<i>Pushbutton</i>	<i>At SE & SW corners</i>	<i>n/a</i>

Temporary Phase Timing Settings:

Phase	Min	Ped	Ped Clr	Ext	Max 1	Max2	Yel	Red
<i>2</i>	<i>20</i>	<i>0</i>	<i>0</i>	<i>6</i>	<i>45</i>	<i>60</i>	<i>4</i>	<i>1</i>
<i>4</i>	<i>14</i>	<i>7</i>	<i>9</i>	<i>3</i>	<i>27</i>	<i>35</i>	<i>3</i>	<i>1</i>

Scheduled TD: *July 4, 2011***Site 2**

Scotland, Rt. 14 at Rt. 97, Location #123-201

Approach	Phase	Phase Mode	TD Method	Area of Detection	Det Mode
<i>Rt. 15 WB Left Turn</i>	<i>1</i>	<i>Non-Lock</i>	<i>VIDS</i>	<i>5' in front to 10' Behind Stop Bar</i>	<i>Presence</i>
<i>Rt. 14 EB</i>	<i>2</i>	<i>Min Recall</i>	<i>Existing Loop</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Ped Phase</i>	<i>3</i>	<i>Non-Lock</i>	<i>Pushbutton</i>	<i>At all corners</i>	<i>n/a</i>
<i>Rt. 14 WB</i>	<i>6</i>	<i>Min Recall</i>	<i>VIDS</i>	<i>150' from Stop Bar</i>	<i>Pulse</i>
<i>Rt. 97</i>	<i>4</i>	<i>Lock</i>	<i>Loop, Pre- formed</i>	<i>20' from Stop Bar</i>	<i>Pulse</i>

Temporary Phase Timing Settings:

Phase	Min	Ped	Ped Clr	Ext	Max 1	Max2	Yel	Red
<i>1</i>	<i>5</i>	<i>0</i>	<i>0</i>	<i>2</i>	<i>12</i>	<i>18</i>	<i>3</i>	<i>0</i>
<i>2 & 6</i>	<i>24</i>	<i>0</i>	<i>4</i>	<i>4</i>	<i>26</i>	<i>36</i>	<i>4</i>	<i>1</i>
<i>3</i>	<i>16</i>	<i>7</i>	<i>9</i>	<i>0</i>	<i>16</i>	<i>16</i>	<i>4</i>	<i>1</i>
<i>4</i>	<i>14</i>	<i>7</i>	<i>9</i>	<i>3</i>	<i>27</i>	<i>35</i>	<i>3</i>	<i>1</i>

Scheduled TD: *July 4, 2011*

Provide a list of telephone numbers of personnel who will be responsible for the TD to the Engineer. If the TD malfunctions or is damaged, notify the Engineer and place the associated phase on max recall. Respond to TD malfunctions by having a qualified representative at the site

within three (3) hours. Restore detection to the condition prior to the malfunction within twenty-four (24) hours.

If the Engineer determines that the nature of a malfunction requires immediate attention and the Contractor does not respond within three (3) hours following the initial contact, then an alternative maintenance service will be called to restore TD. Expenses incurred by the State for alternative service will be deducted from monies due to the Contractor with a minimum deduction of \$500.00 for each service call. The alternate maintenance service may be another qualified Contractor.

TD shall be terminated when the detection is no longer required. This will be when the temporary signal is taken out of service.

Any material and equipment supplied by the Contractor specifically for TD shall remain the Contractor's property.

Method of Measurement:

Temporary Detection will be paid only once per site as a percentage of the contract Lump Sum price. Fifty percent (50%) will be paid when Temporary Detection is initially set up, approved, and becomes fully operational, and fifty percent (50%) will be paid when Temporary Detection terminates and all temporary equipment is removed to the satisfaction of the Engineer.

Basis of Payment:

This work will be paid at the contract Lump Sum price for "Temporary Detection (Site No.)". The price includes furnishing, installing, relocating, realigning, maintaining, and removing, the necessary detection systems and all incidental material, labor, tools, and equipment. This price also includes any detector mode setting changes, timing or program modifications to the controller that are associated with TD. All Contractor supplied material that will remain the Contractor's property will be included in the contract Lump Sum price for "Temporary Detection (Site No.)."

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Detection (Site No. 1)	L. S.

ITEM #1118051A – TEMPORARY SIGNALIZATION (SITE NO. 1)

Description:

Provide Temporary Signalization (TS) at the intersections shown on the plans or as directed by the Engineer.

The site numbers for temporary signalization locations are as follows:

- Site No. 1 – US Route 1 (Boston Post Road) and Lovers Lane/Heritage Road

Materials:

- Pertinent articles of the Standard Specifications
- Supplemental Specifications and Special Provisions contained in this contract

Construction Methods:

TS Plan

At least 30 days prior to implementation of each stage, submit a 1:40 (1:500 metric) scale TS plan for each location to the Engineer for review and comment. Include but do not limit the plan to the following:

- Survey Ties
- Dimensions of Lanes, Shoulders, and Islands
- Slope Limits
- Clearing and Grubbing Limits
- Signal Phasing and Timing
- Location of Signal Appurtenances such as Supports, Signal Heads, Pedestrian Push buttons, Pedestrian Signals
- Location of Signing and Pavement Markings (stop bars, lane lines, etc.)
- Location, method, and mode of Temporary Detection

Review of the TS plan does not relieve the Contractor of ensuring the TS meets the requirements of the MUTCD. A copy of the existing traffic signal plan for State-owned traffic signals is available from the Division of Traffic Engineering upon request. Request existing traffic signal plans for Town-owned traffic signals from the Town. Do not implement the TS plan until all review comments have been addressed.

Earthwork

Perform the necessary tree trimming, clearing and grubbing and the grading of slopes required for the installation, maintenance, and removal of the TS equipment. After TS terminates restore the affected area to the prior condition and to the satisfaction of the Engineer.

Maintenance and Protection of Traffic

Furnish, install, maintain, relocate, and remove signal-related signing (lane-use, signal ahead, NTOR, etc.) and pavement markings as needed. Install, relocate, and/or remove equipment in a manner to cause no hazard to pedestrians, traffic or property. Maintain traffic as specified in the Special Provisions “Prosecution and Progress” and “Maintenance and Protection of Traffic.”

Electrical Service at Unsignalized Intersections

Assume all charges and make all arrangements with the power company, including service requests, scheduling, and monthly bills in accordance with Section 10.00.12 and Section 10.00.13 of the Standard Specifications. A metered service is recommended where TS equipment will be removed when no longer needed.

Temporary Signalization

Furnish, install, maintain, relocate, and remove temporary traffic signal equipment and all necessary hardware; provide a Controller Assembly (CA); program the Controller Unit (CU) phasing and timing; as many times as necessary for each stage/phase of construction to maintain and protect traffic and pedestrian movements as shown on the plans or as directed by the Engineer.

Inspection

When requested by the Engineer, the TS will be subject to a field review by a representative of the Division of Traffic Engineering and/or the Town, which may generate additional comments requiring revisions to the temporary signal.

Detection

Provide vehicle detection on the existing, temporary, and/or new roadway alignment for all intersection approaches, or as directed by the Engineer. Temporary Detection is described and is paid for under Item # 1111201A - Temporary Detection (Site No. 1)

Emergency Vehicle Pre-emption System (EVPS)

Furnish, install, maintain, relocate, and remove the equipment necessary to provide an EVPS as shown on the plan. Schedule all EVPS relocations so that the system is out of service only when the Contractor is actively working. Ensure EVPS is returned to service and is completely operational at the end of the work day.

Maintenance

Once TS is in effect, assume maintenance responsibilities of the entire installation in accordance with Section 1.07.12 of the Standard Specifications. Notify the Engineer for the project records the date that Temporary Signalization begins.

Provide the Engineer a list of telephone numbers of personnel who will be on-call during TS. Respond to traffic signal malfunctions by having a representative at the site within three

hours from the initial contact. Within twenty-four (24) hours have the traffic signal operating according to plan.

If the Engineer determines that the nature of a malfunction requires immediate attention and/or the Contractor does not respond within three (3) hours, then an alternate maintenance service will be called to repair the signal. Expenses incurred by the alternate maintenance service for each call will be deducted from monies due to the Contractor with a minimum deduction of \$1,000. The alternate maintenance service may be the owner of the signal or another qualified electrical contractor.

Method of Measurement:

Temporary Signalization shall be paid only once per site on a percentage of the contract Lump Sum price. Fifty percent (50%) shall be paid when TS is operational as shown on the plan or to the satisfaction of the Engineer. Fifty percent (50%) shall be paid when TS terminates.

Basis of Payment:

This work shall be paid at the contract Lump Sum price for “Temporary Signalization (Site No.)” for each site. This price includes the preliminary inspection, TS plan for each stage/phase, furnishing, installing, maintaining, relocating and revising traffic signal equipment, controller assembly modifications, controller unit program changes such as phasing and timing, wood poles, guy wires, removing existing, temporary, and proposed traffic signal equipment, tree trimming, grading, area restoration and all necessary hardware, materials, labor, and work incidental thereto.

All material and work for signing and pavement markings is paid for under the appropriate Contract items.

All material and work necessary for vehicle detection for TS is paid for under item 1111201A - Temporary Detection (Site No. 1).

All Contractor supplied items that will remain the Contractor’s property shall be included in the contract Lump Sum price for “Temporary Signalization.”

<u>Pay Item</u>	<u>Pay Unit</u>
Temporary Signalization (Site No. 1)	L.S.