(860) 594-3129

Subject: Project No. 88-177
F.A.P. No. CT-TBD
New Britain & Newington: New Britain – Hartford Busway
Contract 1.

October 7, 2011

NOTICE TO CONTRACTORS:

This is to notify all concerned and especially the prospective bidders that the bid opening for the subject project is currently scheduled for October 26, 2011, 2:00 P.M. in the Conference Room of the Department of Transportation Administration Building, 2800 Berlin Turnpike, Newington, Connecticut.

The Department has established a general mailbox to receive contractor questions. Please send all future questions to DOTContracts@ct.gov.

Addendum No. 1 is attached

Philip J. Melchionne

For: Gregory D. Straka
Contracts Manager
Division of Contracts Administration

OCTOBER 6, 2011
NEW BRITAIN – HARTFORD BUSWAY (CONTRACT 1)
FEDERAL AID PROJECT NO. TBD
STATE PROJECT NO. 88-177
TOWNS OF NEW BRITAIN AND HARTFORD

ADDENDUM NO. 1

NOTE: On the Connecticut Department of Transportation Website two duplicate subsets were included in error.
File name: CT CON FPL 0088-0177 05.19-CIV Misc. Detail Sheets.pdf - **is deleted**
File name: CT CON FPL 0088-0177 05.19-MDS Civil.pdf – **is the correct version**

SPECIAL PROVISIONS

NEW SPECIAL PROVISIONS

The following Special Provisions are hereby added to the Contract:

- NOTICE TO CONTRACTOR - INSTRUCTIONS TO BIDDERS – ALTERNATE BIDS
- NOTICE TO CONTRACTOR –BASE BID AND ALTERNATE BIDS
- SECTION 6.01 – CONCRETE FOR STRUCTURES
- ITEM NO. 0202513A – REMOVAL OF CONCRETE SIDEWALK
- ITEM NO. 0603169A – PROGRESS PHOTOGRAPHS
- ITEM NO. 0917010A – REPAIR GUIDERAIL
- ITEM NO. 1131001A - CHANGEABLE MESSAGE SIGN
- ITEM NO. 1220011A – CONSTRUCTION SIGNS – TYPE III REFLECTIVE SHEETING

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. 0947021A – BUSWAY STATION – SITE NO. 1
  - TRASH CAN
  - SECTION 061000 – ROUGH CARPENTRY CANOPY
  - SECTION 104270 – SITE WAYFINDING
  - SECTION 129343 – BENCH – TYP I AND TYPE II
  - SECTION 260000 – ELECTRICAL SYSTEMS
  - SECTION 321313 – CONCRETE SIDEWALK
- ITEM NO. 0971001A – MAINTENANCE AND PROTECTION OF TRAFFIC

CONTRACT ITEMS

NEW CONTRACT ITEMS

ITEM NO.	DESCRIPTION	UNIT	QUANTITY
0603169A	PROGRESS PHOTOGRAPHS	EA	35
1131001A	CHANGEABLE MESSAGE SIGN	DAY	30

REVISED CONTRACT ITEMS

ITEM NO.	DESCRIPTION	ORIGINAL QUANTITY	REVISED QUANTITY
0203004	STRUCTURE EXCAVATION EARTH (COMPLETE)	6,370 CY	6,105 CY
0216004A	PERVIOUS STRUCTURE BACKFILL	6,860 CY	6,319 CY
0601005A	CLASS "A" CONCRETE	2,752 CY	2,627 CY
0602003	DEFORMED STEEL BARS	286,895 LB	253,145 LB
1220011A	CONSTRUCTION SIGNS – TYPE III REFLECTIVE SHEETING	450 SF	882 SF

DELETED CONTRACT ITEM

ITEM NO.	DESCRIPTION	ORIGINAL QUANTITY	REVISED QUANTITY
0202512	CUT CONCRETE SIDEWALK	60 LF	0

PLANS

NOTE: The Subset entitled "CT CON FPL 0088-0177 05.19-CIV Misc.pdf" is hereby deleted from the contract.

NEW PLAN
The following Plan Sheet is hereby added to the Contract:

02	20	02.20.008.A1			

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

VOLUME	SUBSET	SHEET NO.			
01	02	01.02.001.A1			
03	03	03.03.027.A1			
	04	03.04.001.A1	03.04.002.A1	03.04.006.A1	03.04.007.A1
05	02	05.02.001.A1			
	10	05.10.002.A1	05.10.003.A1		
	11	05.11.002.A1			
	12	05.12.001.A1	05.12.002.A1	05.12.004.A1	05.12.005.A1
		05.12.006.A1			
	14	05.14.002.A1			
	19	05.19.003.A1	05.19.007.A1		
	20	05.20.005.A1	05.20.010.A1		
	25	05.25.002.A1			

The Detailed Estimate Sheet does not reflect these changes.

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

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

The foregoing is hereby made a part of the contract.

June 15, 2011
FEDERAL AID PROJECT NO. TBD
STATE PROJECT NO. 88-177

New Britain – Hartford Busway (Contract 1)

Town of New Britain and Hartford

Federal Aid Project No. TBD

The State of Connecticut, Department of Transportation, Standard Specifications for Roads, Bridges and Incidental Construction, Form 816, 2004, as revised by the Supplemental Specifications dated July 2010 (otherwise referred to collectively as "ConnDOT Form 816") is hereby made part of this contract, as modified by the Special Provisions contained herein. . The State of Connecticut Department of Transportation's "Construction Contract Bidding and Award Manual" ("Manual"), August 21, 2000 edition or latest issue, is hereby made part of this contract. If the provisions of this Manual conflict with provisions of other Department documents (not including statutes or regulations), the provisions of the Manual will govern. The Manual is available upon request from the Transportation Manager of Contracts. The Special Provisions relate in particular to the Construction of the New Britain – Hartford Busway (Contract 1) in the Town of New Britain.

CONTRACT TIME AND LIQUIDATED DAMAGES

In order to minimize the hazard, cost and inconvenience to the traveling public, pollution of the environment and the detriment to the business area, and because the work covered by this contract must be completed before other phases of the overall project can commence, it is necessary to limit the time of construction work which interferes with traffic as specified in Article 1.08.04 of the Special Provisions.

All work on this project must be completed on or before May 15, 2014 or within nine hundred and seventeen (917) calendar days of written Notice to Proceed, whichever occurs first, liquidated damages charge to apply will be Nine Thousand One Hundred Dollars ($9,100.00) per calendar day thereafter.

To meet the project milestones and to minimize the impacts and inconvenience to the traveling public that it may cause, extra manpower, equipment, working extended shifts and using premium time/overtime pay may be required to complete the work in accordance with the specified contract deadlines and time. To achieve the Deadline dates and the completion of work, it is anticipated the Contractor may be in different construction stages at various locations at the same time.

The allowable contract time for Contract 1 was developed assuming extended working hours, five (5), six (6) day and seven (7) day work weeks, except as indicated and restricted by the "Limitations of Operations", and working fifty-two (52) weeks per year, for the length of the contract. To meet the allowable contract time it is expected that the Contractor will be working extended shifts and using premium time simultaneously at multiple project locations, at multiple bridge locations, multiple retaining wall locations, multiple drainage runs, etc. in order to complete the Contract by the specified completion date. The low bidder shall demonstrate to the Department that they have the necessary labor force and equipment to meet the allowable contract time.

The Contractor can expect that it will be required that temperature sensitive work will be performed during the winter months. Therefore, preparations must be made by the Contractor to protect this work from the cold and adverse conditions that the winter months may bring. There will be no additional compensation paid to the Contractor for this work but it shall be included in the general cost of the work.

In order to reduce the hazard, cost and inconvenience to the traveling public and railroad and freight operations; the pollution of the environment; and the detriments to local businesses which inevitably result from construction projects such as this, it is necessary that the Contractor complete the project in accordance with the established milestones that are hereby established and made a part of the contract.

The Contractor is responsible for developing its own phasing plan for the Engineer's approval for the Project work. Although the Contractor is responsible for developing its own phasing plan, the Contractor shall comply with the following construction access constraints milestones:

Access Constraint 1 – Eight Hundred Ninety-Five (895) Calendar Days from NTP
Closure of the Elm Street Entrance to the Project Waste Stockpile Area
The Contractor must maintain access to the Project Waste Stockpile Area off of Columbus Boulevard onto Elm Street. The Contractor may construct the Busway as sections are available between Stations 21+75 to 22+50, however, the Contractor will not have full access to complete the final pavement for the Busway section until the WSA entrance from Elm Street is closed. Upon closure of this entrance the Contractor may complete the final top pavement on the Busway (Stations 20+50 to 29+17), complete the vehicular closure for Elm Street and perform the work elements required on Columbus Boulevard.

Milestone 1 – Five Hundred Eighty-Two (582) Calendar Days from NTP
Install ITS Infrastructure and Platforms

Contractor shall complete all construction work required to prepare for the installation of ITS devices. This includes completion of all infrastructure, power, platforms or pads, and supports required for the ITS Contractor to install the system integration components.

Liquidated Damages for Late Completion of Milestone 1:
$6,000 per day for each day following the 582nd calendar day,

$10,000 per day for each day following the 612th calendar day with no maximum payment.

Milestone 2 – Seven Hundred Two (702) Calendar Days from NTP
Completion of All Construction Work Except WSA Entrance Closure Elements

Contractor shall complete all construction work required on Contract 1 with the exception of the elements constrained by Access Constraint 1.

Liquidated Damages for Late Completion of Milestone 2:
$12,900 per day for each day following the 702nd calendar day, with no maximum payment.

Contract Completion Milestone – Nine Hundred Seventeen (917) Calendar Days from NTP
Complete all Contract Work

Liquidated Damages for Late Completion of the Contract:
$12,900 per day for each day following the 917th calendar day,
$29,300 per day for each day following the 947th calendar day with no maximum payment.

Liquidated Damages Terms and Conditions

Liquidated damage provisions shall apply to all circumstances in which the Engineer does not verify in writing that the pertinent Contract work has been completed by the Milestone Completion Dates listed above. If the Contractor does not complete the pertinent work on or before the applicable Milestone Dates, the Department will deduct from monies otherwise owed to the Contractor the pertinent "Liquidated Damages Daily Amount" listed above for each calendar day that it takes the Contractor to complete said work beyond the Milestone Date.

NOTICE TO CONTRACTOR - INSTRUCTIONS – ALTERNATE BIDS

The following are descriptions of project elements, included in the Base Bid of the Contract under Major Lump Sum Items (MLSI), proposed to be modified in the original contract as part of Alternate Bids. The Owner may select one or any combination of multiple Alternate Bid Packages from those described herein or none. It may be necessary to combine information from alternate bid packages and figures to determine the selected changes of work.

Alternate Bid No. 1

- Eliminate the originally specified requirements for High Performance Architectural Finish for "Metal Handrail and Guiderail" (Items No. 0947021A through 0947027A, Section 055213, Section 2.8, C, D and E in part). Maintain hot-dipped galvanized finish as specified.

Alternate Bid No. 2

- Eliminate "Washdown Hydrants" with the associated service taps, 1-1/2” copper water services, standard service curb boxes, meter pits, and associated tees from all Busway Station sites. Maintain the fire services at all Busway Station sites as originally specified.

Alternate Bid No. 3

- Eliminate "Station ID Signs". The above identified revision applies to all Busway Station sites. Install adjacent surface finish materials within the limits occupied by the eliminated “Station ID Signs”. Match adjacent surface finish material joints and patterns.

Alternate Bid No. 4

- Eliminate "Station Icons". The above identified revision applies to all Busway Station sites. Provide electrical/illumination conduits and wires to the Contract defined locations of the Station Icons and terminate the conduits in the original handhole, if within 10 feet from the specified icon location, or with a new handhole located within lawn areas adjacent to the respective site. Install adjacent surface finish materials within the limits occupied by the eliminated "Station Icons". Match adjacent surface finish material joints and patterns.

Alternate Bid No. 5

- Eliminate the originally specified "Bench Type I” (Items No. 0947021A through 0947027A, Section 129343). The above identified revision applies to all Busway Station sites. The Owner may select one or any number of benches to be eliminated at each site.

Alternate Bid No. 6

- Eliminate the originally specified “Bench Type II" (Items No. 0947021A through 0947027A, Section 129343). The above identified revision applies to all Busway Station sites. The Owner may select one or any number of benches to be eliminated at each site.

NOTICE TO CONTRACTOR - BASE BID AND ALTERNATE BIDS

Due to budgetary considerations, the bid for this project is divided into a “Total Base Bid” and six (6) deductive "Alternate Bids". Deductive alternate bids for each alternate bid package may be used to reduce the base bid to an amount within the funds available for the project. The Alternate Bids are as follows:

Alternate Bid No. 1 Eliminate High Performance Architectural Finish for "Metal Handrails and Guardrails". The above identified modification to the original project elements apply throughout all Busway Station sites and are pertinent to the project sites defined within Major Lump Sum Items (MLSI) limits.

Alternate Bid No. 2 Eliminate the "Washdown Hydrants" from all Busway Station sites.

Alternate Bid No. 3 Eliminate "Station ID Signs". The above identified revision applies to all Busway Station sites.

Alternate Bid No. 4 Eliminate "Station Icons". The above identified revision applies to all Busway Station sites.

Alternate Bid No. 5 Eliminate "Bench Type I". The above identified revision applies to all Busway Station sites in any quantity, as directed by the Owner.

Alternate Bid No. 6 Eliminate "Bench Type II". The above identified revision applies to all Busway Station sites in any quantity, as directed by the Owner.

Bidders are required to submit bids for the **Total Base Bid** and **Alternate Bid Package Nos. 1 through 6** on the forms provided. Bids which do not include the Base Bid and the Alternate Bids will be considered nonresponsive and subject to rejection in their entirety. The contract will be awarded on the basis of the lowest responsive **Total Base Bid, not including the alternate bids.**

After award of the Contract, any or all of the work identified in the above Alternate Bids may be eliminated from the Contract at the discretion of the Owner. The adjustment of the Contract price shall be based on the bid price(s) for the Alternate Bids. The Contractor will be notified as to whether any or all of the alternates will be excluded from the Contract within fourteen (14) calendar days of the Award of Contract. Contractor will include selected alternative bid items in the required submission of the schedule of values required elsewhere in the contract documents.

No change to the calendar days will be made as a result of the above identified Alternative Bids. All work must be completed within the number of calendar days specified in the Contract Documents.

The Contractor shall review the "Instructions to Bidders - Alternate Bids" included elsewhere in the Contract documents for additional requirements and additional information pertaining to Alternate Bids.

SECTION 1.08 - PROSECUTION AND PROGRESS

Article 1.08.01 – Transfer of Work or Contract: *Add the following after the last paragraph:*

The Contractor shall pay the subcontractor for work performed within thirty (30) days after the Contractor receives payment for the work performed by the subcontractor. Also, any retained monies on a subcontractor's work shall be paid to the subcontractor within thirty (30) days after satisfactory completion of all the subcontractor's work.

For the purpose of this Item, satisfactory completion shall have been accomplished when:

(1) The subcontractor has fulfilled the contract requirements of both the Department and the subcontract for the subcontracted work, including the completion of any specified material and equipment testing requirement or plant establishment period and the submission of all submittals (i.e.: certified payrolls, material samples and certifications, required state and federal submissions, etc.) required by the specifications and the Department, and
(2) The work done by the subcontractor has been inspected and approved by the Department and the final quantities of the subcontractor's work have been determined and agreed upon.

If the Contractor determines that a subcontractor's work is not complete, the Contractor shall notify the subcontractor and the Engineer, in writing, of the reasons why the subcontractor's work is not complete. This written notification shall be provided to the subcontractor and the Engineer within twenty-one (21) days of the subcontractor's request for release of retainage.

The Engineer will institute administrative procedures to expedite the determination of final quantities for the subcontractor’s satisfactorily completed work.

The inspection and approval of a subcontractor's work does not eliminate the Contractor's responsibilities for all the work as defined in Article 1.07.12, "Contractor's Responsibility for Work."

The inspection and approval of the subcontractor’s work does not release the subcontractor from its responsibility for maintenance and other periods of subcontractor responsibility specified for the subcontractor’s items of work. Failure of a subcontractor to meet its maintenance, warranty and/or defective work responsibilities may result in a finding that the subcontractor is non-responsible on future subcontract assignments.

For any dispute regarding prompt payment or release of retainage, the alternate dispute resolution provisions of this article shall apply.

The above requirements are also applicable to all sub-tier subcontractors and the above provisions shall be made a part of all subcontract agreements.

Failure of the Contractor to comply with the provisions of this section may result in a finding that the Contractor is non-responsible on future projects.

Article 1.08.04 – Limitations of Operations – Add the following:

TIME RESTRICTIONS

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

On the following State observed Legal Holidays:
New Year's Day
Good Friday, Easter*
Memorial Day
Independence Day
Labor Day
Columbus Day
Thanksgiving Day**
Christmas Day

The following restrictions also apply:

On the day before and the day after any of the above Legal Holidays.

On the Friday, Saturday and Sunday immediately preceding any of the above Holidays celebrated on a Monday.

On the Saturday, Sunday and Monday immediately following any of the above Holidays celebrated on a Friday.

* From 6:00 p.m. the Thursday before the Holiday to 8:00 p.m. the Monday after the Holiday.

** From 6:00 a.m. the Wednesday before the Holiday to 8:00 p.m. the Monday after the Holiday.

ROUTE 72

The Contractor will not be allowed to perform any work that will interfere with the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 8:00 p.m.
Saturday and Sunday between 10:00 a.m. and 9:00 p.m.

The Contractor will be allowed to close one lane of through traffic (maintain two through lanes) in each direction on:

Monday through Friday between 8:00 p.m. and 10:00 p.m.

The Contractor will be allowed to close two lanes of through traffic (maintain one through lane) in each direction on:

Monday through Friday between 10:00 p.m. and 6:00 a.m.

During ramp and shoulder construction, the existing numbers of lanes are considered to be as shown on the Maintenance and Protection of Traffic Plans contained in the Contract Plans.

ROUTE 9

The Contractor will not be allowed to perform any work that will interfere with the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 8:00 p.m.
Saturday and Sunday between 10:00 a.m. and 9:00 p.m.

The Contractor will be allowed to close one lane of through traffic (maintain two through lanes) in each direction on:

Monday through Friday between 8:00 p.m. and 10:00 p.m.

During ramp construction, the existing numbers of lanes are considered to be as shown on the Maintenance and Protection of Traffic Plans contained in the Contract Plans.

The Contractor will be allowed to halt traffic for a period not to exceed ten (10) minutes to perform necessary work for the erection and setting of structural steel, for removal of existing bridge superstructures as approved by the Engineer, from 10:00 p.m. to 5:00 a.m. the following morning on all non-Holiday days.

RAMPS AND TURNING ROADWAYS

During ramp construction, the existing numbers of lanes are considered to be as shown on the Maintenance and Protection of Traffic Plans contained in the Contract Plans.

The Contractor shall be allowed to halt traffic for a period not to exceed ten (10) minutes to perform necessary work as approved by the Engineer from 10:00 p.m. to 5:00 a.m. on all non-holiday days.

Excepted therefrom will be those periods during the allowable periods when the Contractor is actively engaged in the removal/installation of structural steel at which time the Contractor will be allowed to halt traffic on Route 71 and its turning roadways to Route 9 for a period of time not to exceed ten minutes. The Contractor shall allow all stopped vehicles to proceed through the work area before halting traffic for another ten minute period.

Excepted therefrom shall be those times when the Chestnut Street Ramp is closed to traffic as shown on the Contract Plans.

ALL OTHE ROADWAYS

The Contractor will not be allowed to perform any work that will interfere with the existing number of lanes of traffic, including turning lanes, on:

Monday through Friday between 6:00 a.m. and 8:00 p.m.
Saturday and Sunday between 10:00 a.m. and 9:00 p.m.

The Contractor will be allowed to close one lane of through traffic in each direction on:

Monday through Friday between 8:00 p.m. and 10:00 p.m.

The Contractor shall be allowed to halt traffic for a period not to exceed ten (10) minutes to perform necessary work as approved by the Engineer from 10:00 p.m. to 5:00 a.m. on all non-holiday days.

During ramp construction, the existing numbers of lanes are considered to be as shown on the Maintenance and Protection of Traffic Plans contained in the Contract Plans.
The Contractor will be allowed to halt traffic for a period not to exceed ten (10) minutes to perform necessary work for the erection and setting of structural steel, for removal of existing bridge superstructures as approved by the Engineer, from 10:00 p.m. to 5:00 a.m. the following morning on all non-Holiday days.

PAVEMENT RECONSTRUCTION

The Contractor shall schedule the operations so that pavement milling and/or repaving operations shall be full width across the roadway section by the end of a workday/work night.

Where milling of pavement is called for on the plans, mill the entire roadway, curb to curb, to the depth as required to achieve final grades. Proceed from the inside to the outside lanes.

Traffic is not to be allowed on Superpave 1.5 inch at any time. The Contractor shall place a lift of Superpave 0.5 inch prior to opening any roadway to traffic.

The Contractor shall perform the milling of the existing pavement, and the installation of the new Superpave pavement in accordance with the Special Provisions as contained elsewhere in the contract documents.

It is recommended that the Contractor utilize the various lane closures that will be required for the above work to perform other incidental work whenever possible.

LANE CLOSURE RESTRICTIONS

It is anticipated that work on adjacent projects may be ongoing simultaneously with this project. The Contractor shall be aware of those projects so that coordination is maintained for proper traffic flow at all times on all project roadways and this coordination is acceptable to the Engineer.

The Contractor will not be allowed to perform any work that will interfere with existing traffic operations on an expressway when any other Contractor is restricting existing traffic operations on that expressway within one mile of a lane closure on this project unless the Contractors have coordinated the closure and this coordination is acceptable to the Engineer.

The Contractor will not be allowed to close a lane if a Contractor working on an adjacent project has the opposite lane closed unless there is at least a one mile clear area length where the entire roadway is open to traffic, measured from the end of the first work area to the beginning of the signing pattern for the next work area.

CONSTRUCTION PHASES

The project shall be constructed in various phases in order to maintain traffic during construction.

The Contractor shall coordinate his work with all other contractors in the area and submit a revised sequence for the review and approval of the Engineer.

CONTROL POINTS

For roadways where the existing pavement markings are to be re-established in their original locations, the Contractor shall establish control points from the existing pavement markings in accordance with Section 9.08 “Construction Staking”. This work will be paid for under Item No. 980001 “Construction Staking”

SIGNALIZATION REQUIREMENTS

The Contractor shall maintain traffic signalization at all times through the use of existing, temporary signalization, new traffic signals or a combination thereof. Loop detectors disturbed by milling operations shall be made operational within 24 hours of the termination of the existing loop detectors.

SIGNING REQUIREMENTS

The Contractor shall maintain all existing highway signing through the use of existing, temporary, new or relocated signs.

Article 1.08.07 - Determination of Contract Time:

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

When the contract time is on a calendar day basis, it shall be the number of consecutive calendar days stated in the contract, INCLUDING the time period from December 1 through March 31 of each year. The contract time will begin on the effective date of the Engineer's order to commence work, and it will be computed on a consecutive day basis, including all Saturdays, Sundays, Holidays, and non-work days.

1.08.08 - Extension of Time:

Delete the last paragraph, "If an approved extension of time…. the following April 1".

Article 1.08.09 - Failure to Complete Work on Time:

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

Replace 1.08.13 – "Termination of the Contractor's Responsibility" with the following:

1.08.13 - Acceptance of Work and Termination of the Contractor's Responsibility:

The Contractor's responsibility for non-administrative Project work will be considered terminated when the final inspection has been held, any required additional work and final cleaning-up have been completed, all final operation and maintenance manuals have been submitted, and all of the Contractor's equipment and construction signs have been removed from the Project site. When these requirements have been met to the satisfaction of the Engineer, the Commissioner will accept the work by certifying in writing to the Contractor, that the non-administrative Project work has been satisfactorily completed.

SECTION 6.01 - CONCRETE FOR STRUCTURES

Subarticle M.03.01-8(b) - Joint Sealer for Structures: Add the following:

Structure joint sealers shall be one of the following type sealants:

1. Where "Joint Seal" is specified on the plans, it shall conform to the Federal Specifications SS-S-200-E (Self-leveling type), TT-S0227E (COM-NBS) Type II-Class A (Non-sag type), or one component polyurethane-base elastomeric sealants conforming to the Federal Specification TT-S-00230C Type II-Class A.

   A Certified Test Report will be required in accordance with Article 1.06.07, certifying the conformance of the sealant to the requirements set forth in the Federal Specification. Should the consignee noted on a Certified Test Report be other than the Prime Contractor, the Materials Certificates shall be required to identify the shipment.

2. Where "Silicone Joint Sealant" is specified on the plans, it shall be one of the following or an approved equal: Sealant, manufactured by the Dow Corning Corporation, Midland, Michigan 48686-0994 Dow Corning 888 Silicone Joint Sealant or Dow Corning 888-SL Self-Leveling Silicone Joint.

ITEM #0202513A – REMOVAL OF CONCRETE SIDEWALK

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

2.02.01-Description: Add the following:

Concrete sidewalks or driveway ramps shall be removed and disposed of in accordance with these specifications, where shown on the contract plans or as ordered by the Engineer.

2.02.03-Construction Methods: Add the following:

Wherever portions of concrete sidewalks or driveway ramps are to be removed, such removals shall be made to neat lines. Partial removals shall generally be to existing joints except when a location other than a joint is set as the limit by the Engineer due to construction staging limits. At removal limits where a joint is not present, the Contractor shall sawcut the concrete full depth to create a neat line.

2.02.04-Method of Measurement: Add the following:

The work of removing concrete sidewalk or concrete driveway ramps shall be measured in place before removal for payment by the number of square yards of concrete sidewalk or ramp removed.

2.02.05-Basis of Payment: Add the following:

The removal of concrete sidewalk or concrete driveway ramp will be paid for at the contract unit price per square yard for "Removal of Concrete Sidewalk" which price shall include all materials, equipment, tools and labor incidental thereto including cutting concrete at neat lines and all disposal costs.

Pay Item	**Pay Unit**
Removal of Concrete Sidewalk	s.y.

ITEM #0603169A – PROGRESS PHOTOGRAPHS

Description: Under this item, the Contractor shall engage a qualified commercial photographer to take photographs during construction. The photographer shall be a firm or an individual of established reputation that has been regularly engaged as a professional photographer for not less than 3 years.

At the Preconstruction Meeting, submit to the Designer for approval the name of the photographer whom will be responsible for taking the photographs during construction.

Submit photos of each view within seven (7) calendar days of taking photographs. Four (4) photographic sets of photos shall be submitted. ALL photos shall be submitted in IBM-PC compatible digital format on compact disc (CD). Other than the photo thumbnail index required for submission with each CD, no other hardcopy photos shall be required for the project. One (1) set of photos (on CD) of each submittal shall be sent directly to each of the following offices:

1. Manager of Highway Design, Connecticut Department of Transportation, 2800 Berlin Turnpike, P.O. Box 317546, Newington, CT 06131-7546,
2. Manager of Bridges and Facilities, Connecticut Department of Transportation, 2800 Berlin Turnpike, P.O. Box 317546, Newington, CT 06131-7546,
3. District 1 Construction, Connecticut Department of Transportation, Project Chief Inspector's Construction Trailer.
4. Bureau of Public Transportation, Office of Transit and Ridesharing, Connecticut Department of Transportation, 2800 Berlin Turnpike, P.O. Box 317546, Newington, CT 06131-7546, Attention: Mr. Michael A. Sanders, Room 1329NW.

Each CD and CD jewel case shall be labeled with the name of the project, State project number(s), name of the Contractor, date of submission, and name and address of the photographer.

Materials: Provide digital images in IBM-PC compatible JPEG format, with uncompressed (open) image size equal to or greater than the following dimensions: Pixel Dimensions = 1596 x 2000; Resolution = 200 pixels/inch. JPEG compression for each image shall equal "Quality 7" (High). Images shall be color (RGB mode).

Digital Cameras used for the purpose of creating the above noted image files shall have a minimum sensor size of 3.3 million pixels.

Image files shall be named and a photo thumbnail index created with the following file naming convention: *Project number date of submission photo number.jpg*

For example: If the first set of photos on CD for project number 0402-0002, is submitted on 12/13/01, the first photo of the submission shall be file named: 04020002_121301_1.jpg and the tenth photo of the set shall be file named: 04020002_121301_10.jpg. In the second set of

photos on CD, submitted 1/12/02, the first photo of the set shall be file named: 04020002_011202_1.jpg

A hardcopy "Photo Thumbnail" index shall be provided with each CD submission. The photo thumbnails shall be printed on 8 ½" x 11" "glossy photo quality" ink jet paper with a minimum 720 dot-per-inch ink jet printer. The thumbnail images shall be a minimum 200 x 250 pixels at 200 pixel per inch resolution. The file names shall be located under each image. The thumbnail images shall be arranged so that they can all be contained on a single 8 ½-in by 11-in inkjet print. *For example*, 35 images would be arranged in five (5) columns and seven (7) rows. The CD shall also contain the digital file of the photo thumbnail index in jpeg format. The file shall share the same format as the above noted photo file format but the word "index" shall be placed in the location of the photo number. *For example*: 04020002_121301_index1.jpg

A hardcopy 8 ½" x 11" key plan with an arrow for each photograph taken shall be provided with each CD submission. Each arrow shall be labeled with the corresponding photograph number and shall be oriented to show the point of view of the photograph.

In lieu of using a digital camera to provide the above noted image files, standard 35 mm cameras and 35 mm color negative film may be used to take the images, and the images may then be captured as a digital file through the use of a designated 35mm film scanner. The 35mm scanner must have the following minimum specifications: 2700 dot per inch optical resolution; 3.4 Dmax; 36 bit color depth. The use of flatbed scanners shall not be permitted for this purpose.

Project progress photos shall be submitted as digital files on write-once CD-ROM in a jewel case on a monthly basis. **All subsequent CD submissions shall include the image files of the previous submissions and an updated hardcopy of the photo thumbnail index that contains all current and previous photos.**

Construction Methods: Where used herein, one set of photographs will be defined as Fifty (50) photographs.

Before starting construction, take one set of color photographs of the site and surrounding properties from different points of view as selected by the Engineer. Take photographs to show existing conditions to the property before starting Work. Take photographs of existing buildings either on or adjoining the property in sufficient detail to record accurately the physical conditions at the start of construction.

Take one set of color photographs at no greater than monthly intervals, coinciding as closely as possible with the completion of a major construction phase. The photographer shall select the vantage points for each shot each month to best show the status of construction and progress since the last photographs were taken. Prior to taking any photographs, review the proposed vantage points for each shot with the Engineer. Photographs are for a record of the progress of work. Therefore, they shall be taken at a maximum interval of one month, whether or not they show any completion of work performed during the preceding month.

Take one set of color photographs upon notification by the Engineer of Final Inspection of the Project. Prior to taking any photographs, review the proposed vantage points for each shot with the Engineer. Take photographs from opposing views of the site in an effort to display various characteristics of the new construction.

Method of Measurement: This work will be measured for payment by the number of photographic sets submitted to the Engineer. "Each" photographic set shall be defined as Fifty (50) photographs. For purposes of bidding, the pay unit for a photographic set shall be "Each."

Basis of Payment: This work will be paid for at the Contract unit price each for "Progress Photographs" which price shall include all material, equipment, and labor incidental thereto. Where any submission's image files do not conform to the requirements herein, the Contractor shall not receive any payment for the item.

Pay Item	**Pay Unit**
Progress Photographs	ea.

ITEM #0917010A – REPAIR GUIDERAIL

Description: Work under this item shall consist of the repair of newly installed guiderail. It shall be repaired in the locations originally installed and fabricated in conformity with the lines, designations, dimensions, and details shown on the plans or as ordered by the Engineer.

Materials: The material for guiderail shall meet the requirements as specified within the original applicable contract items.

When repairing guiderail, the Contractor shall reuse any undamaged existing guiderail elements, timber rail, wire rope, appropriate posts, delineators, lap bolts, and other hardware within the project limits as approved by the Engineer to repair the guiderail. The Contractor shall use new materials when any components of the existing railing are damaged or missing and cannot be obtained from other guiderail systems being removed or converted within the Project limits.

Construction Methods: The repair of guiderail shall be in accordance with contraction methods as specified within the original applicable contract items.

Guiderail, including end anchors, which has been installed in final condition and accepted by the Engineer, shall be eligible for reimbursement for repairs subject to the conditions described below. If multiple runs are to be installed in a single stage as indicated in the contract documents, determination for reimbursement shall be made when all runs within the stage are complete and accepted as previously described. On projects without designated stages, guiderail installations must be complete and serving the intended function as determined by the Engineer.

When newly installed guiderail is damaged by public traffic, the following conditions must be satisfied prior to reimbursement for payment;

1. The damage must have been caused solely by the traveling public.

2. The contractor shall provide satisfactory evidence that such damage was caused by public traffic. Such as accident reports obtained from the Connecticut Department of Public Safety, police agencies or insurance companies; statements by reliable, unbiased eyewitnesses; or identification of the vehicle involved in the accident.

3. The contractor shall attempt to collect the costs from the person or persons responsible for the damage and provide documentation of those efforts to the satisfaction of the Engineer.

4. If such evidence cannot be obtained, the Engineer may determine that the damage was not caused by the Contractor and reimbursement for payment is warranted.

This repair provision does not relieve the Contractor of the requirements of Section 1.07, any other contractual requirements for maintenance and protection of traffic and final acceptance and relief of responsibility for the project.

The contractor shall remain responsible for the safety and integrity of the guiderail system for the duration of the project. In the event the guiderail is damaged, the Contractor shall provide sufficient cones, drums and other traffic control devices to provide safe passage by the public. When ordered by the Engineer, the Contractor shall furnish replacement parts and immediately repair the guiderail, but in no case more than 24 hours after notification from the Engineer. In non-emergency situations, the guiderail shall be repaired within 72 hours. The repaired guiderail or anchorages, when completed, shall conform to these specifications for a new system. The Contractor shall be responsible for the removal and the proper disposal of all damaged material and debris.

Method of Measurement: Guiderail damaged solely by the traveling public will be measured for payment. Damage caused by the Contractor's equipment or operations will not be measured for payment.

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

Basis of Payment: Repair of guiderail will be paid for in accordance with Article 1.09.04 as required to restore the rail to its full working condition in conformance with these specifications for a new system. There will be no payment for maintenance and protection of traffic for work associated with this item unless, in the opinion of the Engineer, the sole purpose of the maintenance and protection of traffic is for repair of the guiderail.

Pay Item	Pay Unit
Repair Guiderail	est. (est.)

TRASH CAN

Description: The work included in this item shall consist of providing and installing Trash Receptacle and Recycle Receptacle as shown on the plans or as directed by the Engineer.

Materials: Basis of Design Standard - The basis of design for Trash Receptacle and Recycle Receptacle is the "Austin" model litter receptacle as manufactured by Landscape Forms, Inc., 431 Lawndale Avenue, Kalamazoo, Michigan 49048 Toll Free (800) 521-2546. Phone (269) 381-0396. Fax (269) 381-3455. www.landscapeforms.com or approved equal.

1. Trash Receptacle and Recycle Receptacle

(a) Style:
   1. Side-Opening Style:
   2. Outer Diameter: 24 inches.
   3. Height: 42 inches.
   4. Capacity: 34 gallons.

(b) Mounting:
   1. Free Standing: Shipped with freestanding glides.
   2. Surface Mounted: Base casting has two holes that can accommodate 3/8" diameter anchors.

(c) Lid:
   1. Thickness: 0.100-inch
   2. Lid Bracket: 1-inch by 1-inch by 1/4-inch aluminum angle.

(d) Liner Color: Black

(e) Use Identification Signage: Each trash can and recycle receptacle shall have manufacturer applied signage as shown in the drawings to identify the use of the container.
   1. Can signage shall indicate "Trash Only"
   2. Recycle Receptacle signage shall indicate "Recyclable Material Only"
   3. Signage shall be vinyl material, adhesively applied by the manufacturer.

2. Accessories

(a) Anchor Bolts: Corrosion resistant recommended (not supplied by manufacturer)

(b) Lock: Locks are keyed alike for entire project, 2 keys per receptacle

3. Recycled Content

(a) Side Opening Receptacle:
- Recycled Material Content: Minimum of 80 percent.
- Post-Consumer Material Content: Minimum of 49 percent.
- Pre-Consumer Material Content: Minimum of 31 percent.
- Recyclable: 100%

4. Fabrication: Shop assembled little receptacles.

5. Finishes:

(a) Finish on Metal:
1. Primer: Rust inhibitor on ferrous supports.
2. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake resistant.
3. Test Results:
a. Gloss Consistency, Gardner 60 Degrees, ASTM D 523: Plus or minus 5 percent from standard.
b. UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.
c. Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
d. Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.
e. Erichsen Cupping, ISO 1520: 8 mm.
f. Impression Hardness, Buchholz, ISO 2815: 95.
g. Impact Test, ASTM D 2794: 60 inch-pounds at 2.5 mils.
h. Pencil Hardness, ASTM D 3363: 2H minimum.
i. Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max undercutting 1 mm.
j. Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max blisters 1 mm.

4. Color: Standard Silver color.

Construction Methods:

1. Examination

(a) Examine areas to receive Trash Receptacle or Recycle Receptacle.

(b) Notify Engineer of conditions that would adversely affect installation or subsequent use.

(c) Do not begin installation until unacceptable conditions are corrected.

2. Installation

(a) Install receptacles in accordance with manufacturer's instructions at locations indicated on the Drawings.

(b) Install receptacles level and plumb.

(c) Anchor receptacles securely in place.

3. Adjusting

(a) Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Engineer.

(b) Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Engineer.

4. Cleaning

(a) Clean receptacle promptly after installation in accordance with manufacturer's instructions.

(b) Do not use harsh cleaning materials or methods that could damage finish.

4. Protection: Protect installed receptacles to ensure that, except for normal weathering, benches will be without damage or deterioration at time of Substantial Completion.

Method of Measurement: This work being part of the Major Lump Sum Item "Busway Station Site -X" will not be measured for payment.

SECTION 061000 ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract including General and Supplementary Conditions, and General Requirements apply to work specified in the Section.

B. Form 816 shall mean the State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges, and Incidental Construction, Form 816 or its latest edition and any supplemental specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:

1. Wood blocking, cants, and nailers.
2. Plywood backing panels.
3. Plywood Roof Sheathing.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used, net amount of preservative retained, and chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Quality Assurance Submittals:

1. Materials Certificates: For each project, signed by manufactures.
2. Manufacturer Certification Letter in accordance with NOTICE TO CONTRACTOR - POTENTIAL FOR ASBESTOS CONTAINING MATERIALS.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship**."**

B. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 15 percent maximum moisture content at time of dressing for 2-inch nominal thickness or less, unless otherwise indicated.

C. Plywood Panels:

1. Plywood: APA Rated sheathing Group 1 Species, Exposure 1, APA C-D plugged, exterior glue; unless otherwise indicated.

2. Standard Plywood Roof Sheathing (at vaulted arch roof): Either DOC PS 1 or DOC PS 2 rated sheathing.
3. Marine Grade Plywood Roof Sheathing (at shell roofs): Constructed of Douglas-fir, Grade B-B or better veneers, with waterproof structural adhesive.
4. Thickness: As needed to comply with requirements specified but not less than thickness indicated.
5. Factory mark panels according to indicated standard.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete in exterior walls.

2.3 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Cants.
3. Nailers.
4. Furring.
5. Grounds.

B. For items of dimension lumber size, provide Construction, Stud, or No. 2 grade lumber with 15 percent moisture content.

2.4 PANEL PRODUCTS

A. Miscellaneous Concealed Plywood: Exposure 1 sheathing, span rating to suit framing in each location, and thickness as indicated but not less than 1/2 inch.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Wire, Brads, and Staples: FS FF-N-105.

C. Power-Driven Fasteners: CABO NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a State DOT testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.6 MISCELLANEOUS MATERIALS

A. Adhesive, Including Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit.

Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.

E. Countersink fastener heads on exposed carpentry work and fill holes with wood filler.

F. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

END OF SECTION

SECTION 104270 – SITE WAYFINDING & IDENTIFICATION SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY:

A. This Section includes the following types of signs:

1. Fabricated Stainless Steel Sign Box with Etched and Filled Graphics.
2. Fabricated Aluminum Post and Panel Signs with Pre-cast concrete footings.
3. Fabricated Kiosk Sign with pre-cast concrete footings and double sided exterior grade internally illuminated display case.
4. Aluminum Regulatory Sign Panels with Applied Reflective Graphics.
5. Aluminum Regulatory Post and Panel Signs with Applied Reflective Graphics.
6. Translucent-base Color Transparency Material.
7. Cast Aluminum Sign w/Braille

B. Related Sections include the following:

1. Division 3 Section “Cast-In-Place Concrete” for sign foundations.
2. Division 3 Section “Pre-cast Structural Concrete” for ID Sign foundation.

1.2 SUBMITTALS:

A. General: Submit the following in accordance with Form 816 Article 1.20-1.05.02 and NOTICE TO CONTRACTOR—SUBMITTALS.

1. Product data for each sign type specified, including details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide certifications that all work has been designed and installed in accordance with ADA requirements.

2. Shop drawings showing fabrication and mounting method of each sign type. Include plans, elevations, and large scale sections of typical components. Show anchors, layout, reinforcement, accessories and installation details.

a. Provide a message list for each sign required, including large scale details of wording and lettering layout.

b. For signs supported by or anchored to permanent construction, provide setting drawings, templates, and directions for installation of anchor bolts and other anchors to be installed.

c. Additions or modifications to details, which are necessary due to special conditions encountered during the site survey, shall be provided by the Contractor as part of the contract and at no additional cost to the State.

3. Materials List: Submit complete list of all materials proposed to be furnished and installed under this Section, making all submittals and re-submittals in accordance with the provisions of the Contract Documents and submit a notarized Certificate of Compliance.

4. Samples: Provide the following samples of each sign component for initial selection of color, pattern and surface texture as required and for verification of compliance with requirements indicated.

   a. Submit 4" x 4" color samples of each specified finish including paints, applied vinyl, translucent color transparency material, aluminum and stainless steel.

   b. Typical mounting brackets.

   c. Submit a complete sample alphabet of each typeface and pictogram specified (1" minimum height).

   d. Submit an 8-1/2" x 11" color print of each specified logotype, to include any modifications as required.

   e. As part of Shop Drawing submission provide a detailed schedule of proposed times and dates for the installation of the signs. Schedule shall be submitted for review and approval.

   f. Catalog Cuts: Catalog cuts shall be marked to indicate the item, model, capacities and other characteristics listed in the table or on printed sheets.

   g. Wiring Diagrams: Schematic and terminal to terminal connection wiring diagrams shall be submitted.

   h. Submit one sample Changeable Bus Schedule Holder type sign.

5. As part of Shop Drawing submission provide a detailed schedule of proposed times and dates for the installation of signage. Schedule shall be submitted for review and approval. All work shall be performed in accordance with any modifications affected by train schedule.

1.3 QUALITY ASSURANCE:

A. Sign Fabricator Qualifications: Firm experienced in producing signs similar to those indicated for this Project, with a record of successful in-service performance, and sufficient production capacity to produce sign units required without causing delay in the Work.

B. Single-Source Responsibility: For each separate sign type required, obtain signs from one source of a single manufacturer.

C. ADA Code Compliance: Comply with all provisions of the Americans with Disabilities Act of 1990, ANSI A117.1-03 and all other applicable codes with regard to signage, as well as any and all subsequent appendices, addenda or revisions

D. For actual fabrication of the site Signage, use only mechanics who are thoroughly trained and experienced in the skills required for the manufacture and fabrication of the units. In acceptance or rejection of the manufactured units, no allowance will be made for lack of skill on the part of the fabricator/manufacturer.

E. Tolerances:

1. Sign Panels

a. The Contractor shall note on the shop drawings all fabrication tolerances including, but not limited to: plumb, thickness, length, width, squareness, camber, and flatness.

b. Signs shall be free of defects including, but not limited to: buckles, dents, warps, wrinkles, and burrs.

2. Messages

a. Message Location: ±1/16 inch from the location as shown.

b. Line-to-Line: ±1/32 inch between each line and ±1/16 inch over entire message.

c. Letter-to-Letter or Symbol (horizontally and vertically): ±1/32 inch between each letter or symbol and ±1/16 inch over an entire line.

3. All sign face panels shall be of a single sheet. Joined pieces will not be accepted.

4. Design components to allow for expansion and contraction for temperatures ranging between -20°F and +100°F, without causing buckling, opening of joints, or overstressing of welds and fasteners.

5. Comply with AWS D1.2 for recommended practices in shop welding. Provide welds behind finished surfaces without distortion or discoloration of exposed side.

Clean exposed welded joints of all welding flux and dress on all exposed and contact surfaces.

6. Mill joints to a tight, hairline fit. Cope or miter corner joints.

F. The Contractor shall have all mounting and fabrication details and calculations designed, stamped and approved by a currently licensed Professional Engineer (PE), and reviewed and approved by the Engineer.

G. Structural Performance: Structural elements shall withstand the effects of gravity, wind, seismic, snow, and ice loads as per the Connecticut State Building Code. At a minimum, the signs must withstand a wind load of 20lbs/sf and horizontal/vertical loads of 250lbs/sf at top center of the sign with a maximum deflection of 1/360 of sign height. Calculations are to be submitted to the Engineer for review.

H. Manufacturer is to provide a five (5) year unconditional guarantee for said units against any defects in workmanship or fabrication.

I. The State reserves the right to retain an independent testing service to inspect the manufacturing process to ensure conformity to the Contract Documents.

J. The Contractor shall have in effect a Quality Assurance (QA) program clearly defining the procedures and requirements necessary to ensure that all aspects of the Work are accomplished in accordance with the Contract Documents. The Contractor will submit a copy of its QA program to the Engineer within fifteen (15) days after receipt of Notice of Award, for review and approval.

K. Minor deviations from the Specifications will be accepted to utilize a manufacturer's standard product only when approved in advance on a shop drawing as a substitution and when in the judgment of the Designer such deviations do not materially detract from the Design Concept or the intended performance.

L. The Contractor shall be responsible for the quality of all materials and workmanship required for the execution of this contract, including the materials and workmanship of any firms or individuals who act as its Subcontractors. The Contractor shall be responsible for providing Subcontractors with complete and up-to-date drawings, specifications, message schedule and other information issued by the Designer.

M. No fabrication or installation materials or methods shall be used that will change the visual quality or in any manner have an adverse effect on existing materials and surfaces. The Contractor is responsible for the structural stability of all signs and mounting thereof. All damaged surfaces and materials shall be restored to their original condition and appearance by the Contractor.

1.4 PROJECT CONDITIONS:

A. Field Measurements: Take field measurements prior to preparation of shop drawings and fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay.

B. The Contractor shall provide adequate staff to take measurements and notes to determine sign locations and conditions.

1.5 REFERENCES:

A. American Society for Testing Materials (ASTM)

B. American Welding Society (AWS) – Structural Welding Code

C. Americans with Disabilities Act – 1990.

D. ANSI A-1171.1 - Specifications for Sign Requirements for the Physically Handicapped.

E. Americans with Disabilities Act Architectural Guidelines (ADAAG)

1.6 DELIVERY, STORAGE AND HANDLING:

A. Deliver signs in factory-fabricated containers or wrappings, which offer proper protection from construction debris and physical damage.

B. Store items in original wrappings in a clean dry place. Protect from weather, dirt, fumes, and water and other abuses of the environment

C. Handle carefully to prevent damage, breaking and soiling. Do not install damaged units or components, replace with new.

D. Replacements: In the event of damage, repair will be subject to the State's discretion as to whether replacement or repair will be the procedure for damaged units, and to be provided by the Contractor at no additional cost to the State.

1.7 SCHEDULE OF MANUFACTURE:

A. The contractor shall submit a schedule of completion and sequence of delivery. This schedule shall include but not be limited to the following:

1. Preparation of Shop Drawings and review and approval of Shop Drawings.

2. Final approval, manufacture and sequence of delivery, unless otherwise indicated on the approved Construction Schedule.

1.8 DELIVERY OF UNITS:

A. Contractor shall be responsible for handling and storage. The State shall not be responsible until installed and accepted.

1.9 WARRANTY:

A. Provide a written warranty issued in the name of the State and jointly signed by the supplier stating that the signs have a guaranteed life of five years against fading, spalling, discoloration, staining, gloss reductions, or rusting from date of substantial performance.

1.10 PERMITS:

A. Contractor shall secure and pay for all permits, licenses and approvals necessary for the execution of the contract, in conformance with the rules and regulations pertaining to the performance of the work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

A. Available Manufacturers: Subject to compliance with the requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

1. Fabricated Stainless Steel Sign Box with Etched and Filled Graphics

    a. ID Resources, PO Box 127, Peterborough, NH (603) 924-3371
    b. Dura Architectural Signs, Long Island City, NY (718) 706-6400
    c. Advanced Signing LLC, Medway, MA (508) 533-9000

2. Fabricated Aluminum Post and Panel Signs:

    a. Howard Industries, Fairview, PA
    b. Sign Comp, Comstock Park, Michigan
    c. Admiral Plastics, Cape Girardeau, Missouri

3. Double Sided exterior grade internally illuminated Display Case:

    a. Nelson Harkins, Chicago Illinois, phone 1-800-882-8989
    b. Tablet & Ticket Company, Chicago Illinois, phonte 1-800-438-4959
    c. Poblocki & Sons, Milwaukee Wisconsin, phone (414) 453-4010

4. Aluminum Regulatory Sign Panels with Applied Vinyl Graphics

    a. Seton Identification Products, Branford, CT
    b. Vulcan Signs, Foley, Alabama
    c. Best Manufacturing Sign Systems, Montrose, Colorado

5. Aluminum Regulatory Post and Panel Signs with Applied Vinyl Graphics

    a. ID Resources, PO Box 127, Peterborough, NH (603) 924-3371
    b. Dura Architectural Signs, Long Island City, NY (718) 706-6400
    c. Advanced Signing LLC, Medway, MA (508) 533-9000

6. Translucent-base Color Transparency Material

    a. Metropolitan Graphics, 439 Potter Blvd., Brightwaters, NY 11718 (800) 899-0015
    b. Graphic Systems, 2632 26th Ave., South Minneapolis, MN, 55406
    c. (800) 235-0387
    d. Blue River Digital, Inc., 1624 Santa Clara Dr., Suite 145, Roseville, CA 95661 (800) 706-4276

2.2 MATERIALS:

A. Aluminum:

1. Aluminum sheet shall be of thickness and sizes shown, constructed of alloy and temper recommended by the aluminum producer or finisher for the type of use and finish indicated with not less than the strength and durability properties specified in ASTM B 209 for 5005-H15, or as noted on drawings.

2. Aluminum extrusions shall be of alloy and temper recommended by the manufacturer for the type of use and finish indicated, and with not less than the strength and durability properties specified in ASTM B 221 for 6063-T52 ST, or as noted on drawings.

3. Cast Aluminum: shall meet Aluminum Association Alloy Designation C443.2 and shall be solid aluminum, no scrap permitted. Cast aluminum shall be free of all porosity, with sharp corners, flat and accurate profiles. All exposed welds shall be filed smooth with all tool marks removed by fine abrasive grain air blasting or other approved method. All burrs and rough spots shall be removed and faces shall be polished to finishes as indicated on the drawing. Aluminum shall be mechanically sanded and degreased prior to receiving finish. All coatings shall be true to form with no irregularities.

    a. Standard dimensions of Braille to comply with Federal Register/Vol. 56, No.144/Friday, July 26, 1991/Rules and Regulations 35687 (ADA

Compliance Code) and all other applicable codes, as well as any and all subsequent appendices, addenda or revisions.

b. Contractor is responsible for translation of messages to Grade 2 Braille.

c. All metal to be free of stain, warpage and any defects impairing strength, durability and appearance.

B. Stainless Steel:

1. Provide stainless steel fabrications, as indicated on the drawings, of metals, forms and types which comply with the requirements of referenced standards and which are free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, "oil canning", stains, discolorations or other imperfections on finished units are not acceptable. Provide grade and type in the form indicated complying with the following requirements:

a. Plate: ASTM A 167 Type 316L
b. Castings: ASTM A 743/A 74 3 Grade CF 8 Type 316L
c. Barstock: ASTM A 2.76 Type 316L

2. All Metal: to be free of stain, warpage and any defects impairing strength, durability and appearance.

C. Paint:

1. Paint required for painted letters and surfaces to be a type recommended by the manufacturer for the surface to which it is applied. Colors to match as follows.

a. Green = to match Pantone Coating #376C
b. White = Matthews Natural White #42-202, VOC282-202
c. Black = Matthews Paint Company Black #41-335, Black Anodic

2. Exact identification of all paints to be noted on the shop drawings, with data describing method of application if other than air drying. Paint finish on signs shall be surface sprayed and have a consistent satin finish, free of dirt, grit, mottling, etc. Each paint coat shall contain ultra-violet inhibitors and shall be applied with sufficient time allowed between applications for proper curing. Provide barrier coats over incompatible primers or remove and reprime as required.

D. Acrylic:

1. Cast acrylic sheet: Provide cast transparent methyl methacrylate monomer plastic sheet with a minimum flexural strength of 16,000 psi when tested according to ASTM D 790 and a minimum allowable continuous service temperature of 80

degrees C. Where sheet material is indicated as “clear,” provide colorless sheet in matte finish, with light transmittance of 92% when tested according to the requirements of ASTM D 1003.

2. All acrylic panels to be free of stain, warpage and any defects impairing strength, durability and appearance.

3. Finish to be uniform on face and edges, unless otherwise specified.

4. All colored coatings, including inks and paints and films, for copy and background colors, to be of a type recommended by acrylic manufacturers for optimum adherence to acrylic surface and nonfading for the application intended.

E. Opaque Vinyl Lettering:

1. All opaque vinyl lettering to be die-cut from opaque, non-reflective vinyl film as manufactured by 3M Co., or approved equal. Vinyl shall have a matte finish with a .003 to .006 thickness and shall match colors indicated on drawings. No hand cut letters will be accepted. Messages to be prespaced for application on site. Colors shall be as follows:

   a. Green = 3M Scotchcal Series 220 #220-196 approved equal
   b. White = 3M Scotchcal Series 220 #220-10 or approved equal
   c. Black = 3M Scotchcal Series 220 #220-12 or approved equal
   d. Red = 3M Scotchcal Series 220 #220-13 or approved equal

F. Reflective Vinyl Lettering:

1. Reflective Vinyl Lettering: All reflective vinyl lettering to be 3M Company, or approved equal, engineering grade reflective vinyl with clear pressure sensitive adhesive backing and carry a minimum 5 year material warranty. Letters to con -form with the specified typeface. Colors shall be as follows:

   a. White = 3M Scotchcal Series 280 #280-10 or approved equal
   b. Black = 3M Scotchcal Series 280 #280-85 or approved equal
   c. Red =3M Scotchcal Series 220 #280-72 or approved equal

G. Translucent Color Transparency Material

1. Translucent Color Transparency Material: All Translucent Color transparency material to be Kodak Professional Grade or approved equal, with 7 mil ESTAR thick base, developed with Kodak EKTACOLOR RA chemicals or approved equal according to manufacturers specifications. Carry a minimum 5 year material warranty.

H. Electrical:

1. All electrical items – light fixtures, fluorescent lamps, wiring and appurtenances necessary for the signs shown in the drawings shall be provided and installed as part of this Contract. All specific electrical equipment required by product codes or building codes, such as item grounds, disconnect switches, insulation etc. shall be shown and noted in the shop drawings.

2. All signage needing electrical connections shall be furnished with 10’0” pigtails to easily meet with wiring provided and installed by electrical contractor.

3. All electrical items shall bear an Underwriter’s label.

4. All electrical installations and connections shall be performed by a licensed electrician.

I. Mounting Materials:

1. Mechanical Mounting: Corrosion resistant fasteners of a type recommended by the manufacturer for use in the type of substrate encountered at each location.

2. Adhesives: Where adhesive mounting techniques are required, the Contractor shall use adhesives specifically designed for compatibility with the base materials and the desired adhesive strength in accordance with recommendations made by the manufacturer of the materials specified to be laminated or adhered. No adhesives that will fade, discolor or delaminate as a result of proximity to ultraviolet light source or heat or cold shall be used. No adhesives shall change the color or deteriorate the materials to which they are applied. All adhesives shall be of a non-staining, non-yellowing quality and all visible joints shall be free from air bubbles and other defects. All adhesives shall be tested on site. All adhesives shall be indicated in the shop drawings.

J. Welding:

1. Fabrication shall be accomplished using the highest standards of workmanship. All pieces shall be cut and carefully fit together. All visible connections shall be full welded and ground smooth. All visible surfaces and connections shall be without visible grounding marks, surface differentiation or variation.

2. All metal to be free of stain, warpage and any defects impairing strength, durabil ity and appearance.

3. All welds to comply with the recommendations of the AWS.

K. Fasteners:

1. Use concealed fasteners fabricated from metals that are not corrosive to the sign material and mounting surface.

L. Anchors and Inserts:

1. Use nonferrous metal or hot-dipped galvanized anchors and inserts as required for corrosion resistance. Use toothed steel or lead expansion bolt devices for drilled in place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.3 GRAPHIC PROCESS TYPES:

A. Etched Process:

1. Etched letters numbers symbols borders or other graphic devices to be produced precisely formed indented copy of uniform depth (1/32" minimum) with sharply formed edges as shown on drawings.

2. Provide smooth background texture to receive paint.

B. Applied Vinyl:

1. All vinyl lettering to be reflective or opaque, as noted on the drawings, and to be die-cut.

2. No hand cut letters will be accepted.

3. Messages to be pre-spaced for application on site.

2.4 GRAPHIC REQUIREMENTS:

A. Typeface: The typeface shall conform with the type specifications in this sign package. Alternate type will not be accepted. Type for signs shall match Adobe Type Library fonts (Adobe Systems, Inc.):

1. Futura Heavy

2. Helvetica Medium

B. Letter and Word Spacing: shall be optical but in conformance with the examples shown on the drawings.

C. All Letterforms: shall be aligned to maintain a baseline parallel to the sign format.

D. Letter Size: to be determined by the height of the upper case 'E' of the letterform.

E. Messages: on drawings are for demonstration purposes only. In all cases refer to the Sign Schedule for messages to be used on the finished signs.

F. International Symbols: that are used are to be from the U.S. Department of Transportation current standards publication where applicable.

2.5 FABRICATION:

A. Fabricate Sign Units: of graphic process, design, copy, dimensions and color indicated or specified.

B. Copy: shall be as stated in message schedule.

1. Confirm "TBD", to be determined, information before fabrication.

C. Artwork:

1. All artwork, unless specifically noted otherwise, shall be the sole responsibility of the Contractor.

2. Where noted on the drawings, the Contractor shall coordinate and obtain from the Connecticut Transit, artwork of the Bus Rapid Transit logo for reference only. Creation of production ready artwork is the sole responsibility of the contractor.

3. Full size color proofs of all artwork, printed on high quality paper, to be submitted for approval prior to fabrication.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION:

A. The location of signs shown on the drawings are for general information only. Contractor to coordinate with the Owner to determine final location of signs in the field.

B. The Designer shall be notified of any discrepancies in the drawings, in field dimensions or conditions and/or changes in construction drawings prior to fabrication and/or installation.

C. The Contractor shall examine the areas and conditions under which work of this section will be performed and correct conditions detrimental to timely and proper completion of the work.

D. The Contractor shall not install signs until adjacent finish work is completed.

3.2 INSTALLATION:

A. Installation of components to be in compliance with manufacturer's instructions, unless otherwise specified.

B. Signs shall be installed level and plumb with the orientation shown on the drawings, unless directed otherwise by the owner, with sign surfaces free from distortion or other defects in appearance.

C. Exposed surfaces of fasteners should be field coated with paint to match surrounding surface color; exposed threads to be protected from paint to allow future maintenance of signs.

D. Anchor bolts and nuts to be coated with corrosion-resistant grease to allow future maintenance of signs.

E. Contractor to provide repair and touch up prior to and after punch list inspection.

F. Contractor to be responsible for the removal of all crating and debris from the project site upon completion.

3.3 CLEANING AND PROTECTION:

A. After installation, clean soiled sign surfaces according to the manufacturer's instructions. Protect signs from damage until acceptance by the State.

New Britain - Hartford
Bus Rapid Transit Stations
Downtown New Britain

Type	Description	Comments
A	Station ID Sign - Double Sided	
AA	Station Icon	
B	Kiosk Sign - Double Sided	
D	Pedestrian Directional	
E	Accessible Route Sign	
~~H~~	~~Local Bus Schedule Holder~~	
J/JA	Multi-Use Trail Sign	
MA	Rail - Etched Station Identifier	
N	Double-sided Bus Berth ID Sign	
NA	Bus Berth ID Sign	
P	Trailblazer Directional	
R	Interior ADA Room ID Sign	
RA	Exterior ADA Room ID Sign	
S	ADA Restroom ID Sign	

New Britain - Hartford
Bus Rapid Transit Stations
Downtown New Britain

Type	Tag	Level	Rm #	Message side "A"	Message side "B"	Comments
A	A01	SITE		DOWNTOWN NEW BRITAIN STATION (CT "Fastrak" LOGO)	DOWNTOWN NEW BRITAIN STATION (CT "Fastrak" LOGO)	Concrete Base
A Count	1					
AA	AA01	SITE		(CT "Fastrak" Orb Graphic Element)	(CT "Fastrak" Orb Graphic Element)	Duratrans
AA Count	1					
B	B01	SITE		(CT "Fastrak" LOGO) NEW BRITAIN	(CT "Fastrak" LOGO) NEW BRITAIN	Post and Panel
B Count	1					
D	D01	SITE		← (orb) Station ↑ Columbus Blvd ↑ Parking Garage	→ (orb) Station	Post and Panel
D	D02	SITE		← (orb) Station	→ (orb) Station ↑ East Main Street ↑ Myrtle Street	Post and Panel
D	D03	SITE		→ Multi-Use Trail	← Multi-Use Trail ↑ Main Street ↑ Parking Garage	Post and Panel
D	D04	SITE		↑ Multi-Use Trail → Main Street → Parking Garage	↑ Walkway To Elm Street ← Main Street ← Parking Garage	Post and Panel
D	D05	SITE		↑ (orb) Station ↑ Multi-Use Trail	↑ Walkway To Elm Street	Post and Panel
D	D06	SITE		← Walkway To Elm Street → Multi-Use Trail	→ Walkway To Elm Street ← Multi-Use Trail	Post and Panel
D	D07	SITE		↑ (orb) Station ↑ Multi-Use Trail	← Walkway To Elm Street	Post and Panel
D	D08			→ (orb) STATION	← (orb) STATION	Post and Panel
D Count	8					
E	E01	SITE		♿ ←	(none)	Post Mounted
E Count	1					
~~H~~	~~H01~~	~~SITE~~		~~(BUS SCHEDULE)~~	~~(BUS SCHEDULE)~~	~~Post Mounted~~

New Britain - Hartford
Bus Rapid Transit Stations
Downtown New Britain

~~H~~	~~H02~~	~~SITE~~		~~(BUS SCHEDULE)~~	~~(BUS SCHEDULE)~~	~~Post Mounted~~
~~H~~	~~H03~~	~~SITE~~		~~(BUS SCHEDULE)~~	~~(BUS SCHEDULE)~~	~~Post Mounted~~
~~H~~	~~H04~~	~~SITE~~		~~(BUS SCHEDULE)~~	~~(BUS SCHEDULE)~~	~~Post Mounted~~
~~H~~	~~H05~~	~~SITE~~		~~(BUS SCHEDULE)~~	~~(BUS SCHEDULE)~~	~~Post Mounted~~
~~**H Count**~~	~~5~~					
J	J01	SITE		Trail Start ↑ Newington	Trail End ↑ Main Street	Post and Panel
J	J02	SITE		↑ Walk Zone Ahead	End Walk Zone	Post and Panel
J	J03	SITE		← (orb) Station ↑ Newington	→ (orb) Station ↑ Trail End ↑ Main Street	Post and Panel
J	J04	SITE		← (orb) Station ← Walkway To Elm Street ↑ Newington	→ (orb) Station → Walkway To Elm Street ↑ Main Street	Post and Panel
J	J05	SITE		End Walk Zone	↑ Walk Zone Ahead	Post and Panel
J Count	5					
JA	JA01	SITE		(Image to be selected) WALK ZONE DO NOT RIDE	↑ New Britain	Post and Panel
JA	JA02	SITE		↑ Newington	(Image to be selected) WALK ZONE DO NOT RIDE	Post and Panel
JA Count	2					
MA	MA01	SITE		DOWNTOWN NEW BRITAIN	DOWNTOWN NEW BRITAIN	Center Message on each 8 foot rail Canopy Hung
MA	MA02	SITE		DOWNTOWN NEW BRITAIN	DOWNTOWN NEW BRITAIN	Center Message on each 8 foot rail Canopy Hung

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MA	MA03	SITE		DOWNTOWN NEW BRITAIN	DOWNTOWN NEW BRITAIN	Center Message on each 8 foot rail Canopy Hung
MA	MA04	SITE		DOWNTOWN NEW BRITAIN	DOWNTOWN NEW BRITAIN	Center Message on each 8 foot rail Canopy Hung
M Count	4					
N	N01	SITE		K	K	Canopy Hung
N	N02	SITE		J	J	Canopy Hung
N	N03	SITE		H	H	Canopy Hung
N	N04	SITE		G	G	Canopy Hung
N	N05	SITE		C	C	Canopy Hung
N	N06	SITE		B	B	Canopy Hung
N	N07	SITE		A	A	Canopy Hung
N Count	7					
NA	NA01	SITE		M	(none)	Post Mounted
NA	NA02	SITE		M	(none)	Post Mounted
NA	NA03	SITE		N	(none)	Post Mounted
NA	NA04	SITE		N	(none)	Post Mounted
NA	NA05	SITE		O	(none)	Post Mounted
NA	NA06	SITE		O	(none)	Post Mounted
NA	NA07	SITE		P	(none)	Post Mounted
NA	NA08	SITE		P	(none)	Post Mounted
NA	NA09	SITE		Q	(none)	Post Mounted
NA	NA10	SITE		Q	(none)	Post Mounted
NA	NA11	SITE		L	(none)	Post Mounted
NA	NA12	SITE		L	(none)	Post Mounted

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NA	NA13	SITE		F	(none)	Post Mounted
NA	NA14	SITE		F	(none)	Post Mounted
NA	NA15	SITE		E	(none)	Post Mounted
NA	NA16	SITE		E	(none)	Post Mounted
NA	NA17	SITE		D	(none)	Post Mounted
NA	NA18	SITE		D	(none)	Post Mounted
NA Count	18					
P	P01	SITE		↑ LOCAL BUS & PARKING GARAGE	(none)	Post Mounted
P	P02	SITE		↑ (orb) STATION	(none)	Post Mounted
P	P03	SITE		← LOCAL BUS & PARKING GARAGE	(none)	Post Mounted
P	P04	SITE		→ (orb) STATION	(none)	Post Mounted
P	P05	SITE		↑ (orb) STATION	(none)	Post Mounted
P Count	5					
R	R01	INT		SUPERVISOR'S OFFICE	(none)	Wall Mounted
R	R02	INT		CLOSET	(none)	Wall Mounted
R	R03	INT		STAFF ONLY	(none)	Wall Mounted
R	R04	INT		OFFICES	(none)	Wall Mounted
R	R05	INT		SERVICE CLOSET	(none)	Wall Mounted
R Count	5					
RA	RA01	EXT		PUBLIC LOBBY	(none)	Backer Panel
RA	RA02	EXT		PUBLIC LOBBY	(none)	Backer Panel
RA	RA03	EXT		EMPLOYEE ENTRANCE	(none)	Wall Mounted
RA Count	3					
S	S01	INT		RESTROOM	(none)	Wall Mounted

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S	S02	INT		RESTROOM	(none)	Wall Mounted
S Count	2					

END OF SECTION 104270

129343 BENCH – TYPE I AND TYPE II

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract including General and Supplementary Conditions, and General Requirements apply to work specified in this Section.

B. Form 816 shall mean the State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 816 or its latest edition and any supplemental specifications.

1.2 SECTION INCLUDES

A. The work included in this item shall consist of providing and installing Benches Type I and Type II and concrete footings as shown on the plans or as directed by the Engineer.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Section 32 13 13 – Concrete Sidewalk

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: The Contractor is to hire a qualified structural engineer licensed in the state of Connecticut to design bench anchorage and associated foundations, including comprehensive engineering analysis, using the performance requirements and design criteria indicated.

B. Structural Performance: Structural elements shall withstand the effects of gravity, wind, seismic, snow, and ice loads as per the Connecticut State Building Code, and any specific loading requirements per the bench manufacturer.

1.5 REFERENCES

A. <u>ASTM Testing Standards:</u>

1. ASTM B 117 – Standard Practice for Operating Salt Spray (Fog) Apparatus.
2. ASTM D 522 – Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
3. ASTM D 523 – Standard Test Method for Specular Gloss.
4. ASTM D 2247 – Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
5. ASTM D 2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
6. ASTM D 3359 – Standard Test Methods for Measuring Adhesion by Tape Test.
7. ASTM D 3363 – Standard Test Method for Film Hardness by Pencil Test.
8. ASTM G 155 – Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials.

B. ISO Testing Standards:

1. ISO 1520 – Paints and Varnishes – Cupping Test.
2. ISO 2815 – Paints and Varnishes – Buchholz Indentation Test.

C. ANSI/BIFMA Testing Standards:

1. ANSI/BIFMA X5.4-2005 – Standard Test for Lounge Seating.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's product data, storage and handling requirements and recommendations, installation methods and available colors, styles, patterns and textures.

B. Shop Drawings: Submit manufacturer's shop drawings, including plans and elevations, indicating overall dimensions.

C. Delegated-Design Submittal: Shop drawings and stamped design calculations for bench anchorage and associated foundations indicated to comply with performance requirements and design criteria, including structural analysis data, shall be signed and sealed by the Connecticut registered professional structural engineer responsible for their preparation.

D. Samples: Submit manufacturer's samples of materials, finishes, and colors.

E. Warranty: Manufacturer's standard warranty.

1.7 SUBMITTALS FOR MAINTENANCE

A. Bench Type I – Wood Seat Slats – provide a total of one (1) complete set of spare slats and stainless steel attachment screws.

B. Bench Type I – Center Arm Rest and Mounting Hardware – provide a total of one (1) complete set.

C. Bench Type II – Wood Seat and Back Slats – provide a total of one (1) complete set of spare slats and stainless steel attachment screws.

D. Bench Type II – Center Arm Rest and Mounting Hardware – provide a total of one (1) complete set.

E. Anchor Bolts for installation in concrete sidewalks– provide a total of one (1) dozen bolts, washers and nuts.

F. Anchor Bolts for installation in concrete paving brick sidewalks– provide a total of one (1) dozen bolts, washers and nuts.

G. Touch-up paint for powder coat finish – provide a total of one (1) gallon container of touch up paint to match specified color.

1.8 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer regularly engaged in manufacture of site furnishings for more than 10 years.

B. Product Support: Products are supported with complete engineering drawings and design patents.

C. Production: Orders are filled within a 40-day schedule.

D. Facility Operator: Welders and machine operators are certified.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage: Store materials in clean, dry area in accordance with manufacturer's instructions. Keep materials in manufacturer's original, unopened containers and packaging until installation.

C. Handling: Protect materials and finish during handling and installation to prevent damage.

1.10 WARRANTY

A. Warranty Information:
-Products will be free from defects in material and/or workmanship for a period of three years from the date of invoice.
-The warranty does not apply to damage resulting from accident, alteration, misuse, tampering, negligence, or abuse.
-Product, at the option of manufacturer, repair, replace, or refund the purchase price of any items found defective upon inspection by an authorized service representative.
-Purchasers should be aware that normal use of these high quality products can result in superficial damage affecting the finish. Scratches, nicks, and dents are to be considered normal wear and tear, and are not the responsibility of the manufacturer.

PART 2 – PRODUCTS

2.1 Basis of Design Standard - The basis of design for Bench Type I and Bench Type II is the "Arcata" model bench as manufactured by Landscape Forms, Inc., 431 Lawndale Avenue, Kalamazoo, Michigan 49048. Toll Free (800) 521-2546. Phone (269) 381-0396. Fax (269) 381-3455. Website www.landscapeforms.com. Or approved equal.

2.2 Bench Type I

A. Style:
1. Bench with no back
2. Bench with center armrest.
3. Depth: 17 inches.
4. Overall Height: 18 inches.
5. Length: 74 inches.

2.3 Bench Type II

A. Style:
1. Bench with back
2. Bench with arms and center armrest
3. Depth: 24 inches.
4. Overall Height: 32 inches.
5. Arm Height: 25.5 inches.
6. Length: 75 inches

2.4 Material

A. Supports:
-Tubular steel
-Outside Diameter: 2-1/4 inches.
-Wall Thickness: 0.188 inch.

B. Frame:
-Tubular Steel Outer Frame: Surrounds steel angle and tee inner members.
-Boards: Attached to inner members with black oxide finished stainless steel screws.

C. Seat and Back Panels:
-Nominal Board Size: 1-1/4 inches by 3 inches.
-Board Edges and Ends: Eased.

1. Wood for Exterior Use:
a. Ipe: Solid stock, select South American hardwood.

2.5 ACCESSORIES

A. Anchor Bolts: Anchor bolts required to fasten benches to foundations shall be compatible in size and material type, with the bench manufacturer's provided base plate. All anchors shall be corrosion resistant.

2.6 RECYCLED CONTENT

A. Wood Benches:
-Recycled Material Content: Minimum 67 percent.
-Post-Consumer Material Content: Minimum 44 percent.
-Pre-Consumer Material Content: Minimum 23 percent.
-Recyclable: 100 percent.

2.7 FABRICATION

A. Shop assembled benches.

2.8 FINISHES

A. Finish on Metal:
   1. Primer: Rust inhibitor.
   2. Topcoat: Thermosetting TGIC polyester powder coat. UV, chip, and flake resistant.
   3. Test Results:
      a. Gloss Consistency, Gardner 60 Degrees, ASTM D 523: Plus or minus 5 percent from standard.
      b. UV Resistance, Color and Gloss, ASTM G 155, Cycle 7: Delta E less than 2 at 2.0 mils and less than 20 percent loss.
      c. Cross-Hatch Adhesion, ASTM D 3359, Method B: 100 percent pass.
      d. Flexibility Test, Mandrel, ASTM D 522: 3 mm at 2 mils.
      e. Erichsen Cupping, ISO 1520: 8 mm.
      f. Impression Hardness, Buchholz, ISO 2815: 95.
      g. Impact Test, ASTM D 2794: 60 inch-pounds at 2.5 mils.
      h. Pencil Hardness, ASTM D 3363: 2H minimum.
      i. Corrosion Resistance, 1,500-Hour Test, ASTM B 117: Max undercutting 1 mm.
      j. Humidity Resistance, 1,500-Hour Test, ASTM D 2247: Max blisters 1 mm.
   4. Color: Standard Silver color.

B. Finish on Wood:
   1. Wood for Exterior Use:
      a. Ipe: Unfinished.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive benches and coordinate locations of thickened concrete sidewalk used for anchoring benches with the contractor responsible for the installation of the concrete sidewalk.

B. Contractor shall coordinate layout and location of all required anchor bolts with bench base plate assembly. Embedded anchor bolts shall be set using a template provided by the bench manufacturer.

C. Notify Engineer of conditions that would adversely affect installation or subsequent use.

D. Do not begin installation until unacceptable conditions are corrected.

3.2 INSTALLATION

A. Install benches in accordance with manufacturer’s instructions at locations indicated on the Drawings.

B. Install benches level.

C. Anchor benches securely in place.

3.3 ADJUSTING

A. Finish Damage: Repair minor damages to finish in accordance with manufacturer's instructions and as approved by Engineer.

B. Component Damage: Remove and replace damaged components that cannot be successfully repaired as determined by Engineer.

3.4 CLEANING

A. Clean benches promptly after installation in accordance with manufacturer's instructions.
B. Do not use harsh cleaning materials or methods that could damage finish.

3.5 PROTECTION

A. Protect installed benches to ensure that, except for normal weathering, benches will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 260000 ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 GENERAL PROVISIONS

A. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and Connecticut DOT 816 which are hereby made a part of the Section of the Specifications.

1.2 DESCRIPTION OF WORK

A. Work Included: Provide labor, materials and equipment necessary to complete the work of this Section,which includes:

1. New electric services
2. Grounding and bonding
3. Exterior service cabinets
4. Trenching and Backfill
5. Panelboards
6. TVSS
7. Meter Socket
8. Disconnect Switch
9. Handholes
10. Laminate PV panels, combiner boxes, inverters and cables.
11. Pole Foundations
12. Emergency call station
13. Conduit.
14. Wire and cable.
15. Telephone & data cabling and distribution equipment
16. Branch circuit wiring to all outlets, lighting, devices, and ITS equipment.
17. Outlets, devices, and junction boxes.
18. Lighting fixtures, poles, exit signs, and lamps.
19. Lighting bollards
20. Lighting controls and occupancy sensors
21. Lighting Control Panels
22. Temporary (construction) light and power.
23. Empty conduit and cable pathways for ITS equipment including vehicle message signs, emergency phones, ticket vending machines, ticket validators, public address speakers, and CCTV cameras.

B. Electrical work is primarily shown on Electrical Plans associated with each station and Electrical details on the detail sheet (MDS-E01, MDS-E02, MDS-E03, MDS-E04). The contractor shall also review all drawings and pay close attention to the following:

1. Architectural Plans, (ARC-01 thru ARC-26) showing poured in place concrete with conduit and boxes, stub-up locations at canopies and vaulted arches, and lighting fixture locations. ARC-02 & ARC-03 details the Station Icons which have lighting integrated
2. MDS-SG03 details the Station Kiosk Signs which are internally illuminated and require power.
3. Structural Plans showing pole foundations, and concrete pads.

C. RELATED SECTIONS:

1. Section 033000, Cast-In-Place Concrete

1.3 BIDDING REQUIREMENTS

A. In addition to the Bidding Requirements, the bids for all work within this specification shall be submitted with a schedule of values breaking the value of the total bid into the following categories:

1. Trenching and Backfill
2. Conduit, Wire, and Handholes
3. Panelboards, Service Equipment, TVSSand Cabinets
4. Lighting Fixtures, Poles, and lamps
5. Lighting bollards
6. Laminate PV panels, combiner boxes, inverters and cables.
7. Lighting Controls
8. Telephone & data cabling and distribution equipment
9. Devices and Miscellaneous.

1.4 SUBMITTALS

A. Material and equipment requiring shop drawing and product data submittal shall include but shall not be limited to:

1. Outlets, and devices and plates
2. Panelboards
3. TVSS
4. Meter Socket
5. Handholes
6. Pole foundations
7. Laminate PV panels, combiner boxes, inverters and cables.

8. Disconnect Switch
9. Exterior service cabinets
10. Lighting fixtures, poles, exit signs and lamp.
11. Lighting bollards
12. Lighting controls and occupancy sensors
13. Lighting Control Panel.
14. Emergency call station
15. Telephone & data cabling and distribution equipment.

B. Quality Assurance Submittals:
1. Materials Certificates: For each project, signed by manufacturers.
2. Manufacturer Certification Letter in accordance with NOTICE TO CONTRACTOR - POTENTIAL FOR ASBESTOS CONTAINING MATERIALS.
3. PV installer certification.

1.5 GUARANTEE/WARRANTY

A. Manufacturer(s), Contractor, and Subcontractor(s), shall provide their standard guarantees/warranties for their work under this Section. Such guarantees/warranties shall be in addition to and not instead of all other liabilities, which the manufacturer(s), Contractor and the Subcontractor(s) may have by law, or by other provisions of the Contract Documents.

1.6 PV INSTALLER QUALIFICATIONS

A. Installer of photovoltaic system shall be an authorized dealer/installer of PV laminate panels. The contractor shall note that the following dealer/installer is an authorized dealer/installer and covers the territory of this project:

Advanced Green Technologies
3551 West First St.
Sanford, FL 32771
(407) 322-1555
Contact: Mr. Todd Page
toddp@agt.com

1.7 REFERENCES

A. National standards referenced herein are included to establish recognized quality only. Equivalent quality and testing standards will be acceptable subject to their timely submission, review and acceptance by the Engineer.

1. National Electrical Code – NFPA 70
2. Connecticut DOT 816
3. Local Ordinances
4. IES – for lighting system
5. TIA/EIA-for telephone and data cabling
6. Building Industry Consulting Service International (BICSI)
7. InterNational Electrical Testing Association (NETA) - ATS-2009
8. NEMA, UL, ANSI for materials and equipment
9. Americans with Disabilities Act (ADA)

1.8 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Refer to contract general requirements for requirements pertaining to Product Delivery, Storage and Handling.

1.9 RECORD DRAWINGS

A. Record Drawings shall be submitted at the completion of the Project and conform to the contract general requirements.

1.10 ROUGH-IN

A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

B. Refer to equipment specifications in Divisions 2 through 15 for rough-in requirements.

1.11 SURVEYS AND MEASUREMENTS

A. Base measurements, both horizontal and vertical, on established benchmarks. Work shall agree with these established lines and levels. Verify measurements at site and check the corrections of same as related to the work.

B. Should the Contractor discover any discrepancy between actual measurements and those indicated, which prevents following good practice or the intent of the drawings and specifications, notify the Engineer.

1.12 SEQUENCING

A. Coordinate work of this Filed-Subcontract with that of other trades, affecting or affected by this work, and cooperate with the other trades as is necessary to assure the steady progress of work.

B. Do not order or deliver any materials until all submittals, required in the listed Specification Sections included as part of this Filed-Subcontract, have been received and approved by the Engineer.

C. Before proceeding with installation work, inspect all project conditions and all work of other trades to assure that all such conditions and work are suitable to satisfactorily receive the work of this Section and notify the Engineer in writing of any which are not. Do not proceed further until corrective work has been completed or waived.

1.13 ELECTRICAL INSTALLATIONS

A. Coordinate electrical equipment and materials installation with other canopy components. Fully coordinate work with that of other trades. Furnish information in writing that is needed for the coordination of clearances, etc., with the work of others, and such information shall be given in a timely fashion so as not to impede the progress of two or more trades. Confer and resolve the conflict immediately. If so directed by the Engineer, prepare composite drawings to resolve any space or clearance conflict.

B. Where underground conduit is routed through retaining walls or other poured in place structures, coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.

C. Where conduit and boxes are located in poured in place or precast structures, coordinate the installation to be set as they are constructed or fabricated

D. Verify all dimensions by field measurements.

E. Arrange for chases, slots, and openings in other canopy components to allow for electrical installations.

F. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

G. Where mounting heights are not detailed or dimensioned, the exact location shall be determined on the job, install electrical services and overhead equipment to provide the maximum headroom possible.

H. Install electrical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

I. Coordinate connection of electrical systems with utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

1.14 CLEANING

A. Upon completion of work, the Contractor shall clean, polish and leave bright, fixtures and lamps, and shall remove dust, dirt, debris and loose plaster from panelboards, controls, and switchboards. Unused openings in pullboxes, junction boxes, equipment and raceways shall be capped or closed by an approved means. Replace all inoperative lamps and lamps that have been used during construction..

1.15 SERVICE VOLTAGE

A. Voltage to the canopy equipment will utilize 120/208V, 1-phase, 3-wire obtained from the Connecticut Light & Power.

1.16 ELECTRIC SERVICE REQUIREMENTS AND UTILITY COMPANY CHARGES

A. Voltage to the equipment will utilize 120/208V, 1-phase, 3-wire obtained from the Connecticut Light & Power (CL&P); however CL&P reserves the right to deliver 120/240V, 1-phase, 3-wire service to all sites.

B. Make all arrangements with the electric utility company for new electrical service, including but not limited to filling out all paper work establishing work orders, paying any work order application fees, meeting with utility company on site to coordinate transformer location and underground routing, and arranging all intermediate utility inspections.

C. Make all arrangements with the electric utility company for connection of photovoltaic system, including but not limited to filling out all paper work establishing work orders, paying any work order application fees, meeting with utility company on site to coordinate interconnection and arranging all intermediate utility inspections.

D. Where underground service conduits are indicated to connect to utility manholes, penetrations into the manhole shall be performed by a contractor on CL&P's approved list

E. Contractor shall pay utility back charges up to $2000 per service.

F. Provide meter socket (400 amp, 120/240V, 5 jaw type) meeting utility company requirements.

G. Below are the Utility Contacts for the Stations:

Project Executive (Overall Project Contact)
Ms. Sheila Smith
Connecticut Light & Power
705 West Johnson Ave
Cheshire, CT 06410
(203) 271 4715
smithsa@nu.com

New Britain Territory (Cedar, Newington Junction Stations)
Mr. George Rebecchi
Connecticut Light & Power
705 West Johnson Ave
Cheshire, CT 06410
(203) 271 4837
rebecgf@nu.com

1.17 CODES, RULES, PERMITS, FEES

A. Give necessary notices, obtain permits and pay government, city, town, and state sales taxes, fees, and other costs in connection with work, file necessary approvals of departments having jurisdiction, obtain required certificates of inspection for work.

B. Materials shall be new and of current productions and shall conform to standards of Underwriters' Laboratories, incorporated in every case where such standard, listing or label has been established for the particular type material in question.

C. The installation shall be performed in accordance with and shall conform in all respects to applicable requirements of latest National Electrical Code, rules and regulations governing installation of electrical work in the locality of the work, applicable requirements state and local authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. Rigid Steel Conduit (RSC), couplings and elbows: ANSI C80.1 and UL 6; hot-dip galvanized, rigid mild steel, zinc-coated on interior and exterior surfaces.

B. Liquid-Tight Flexible Metal Conduit (LFMC): Plastic or plenum-rated jacket material, flexible, galvanized steel, Sealtite Type EF for general service areas or Type HC for high temperature locations.

C. Electrical metallic tubing (EMT) shall be zinc-coated steel that conforms to industry standards, by Republic Steel, Allied Tube and Conduit, Triangle/PWC or approved equal. EMT couplings and connectors shall be of the compression type.

D. Special Fittings: Furnish conduit sealing, explosion proof, dust proof, and other types of special fittings as required by the drawings and these specifications, consistent with the area and equipment with which they are associated, and in accordance with the following requirements:
   1. Fittings installed outdoors or in damp locations shall be sealed and gasketed.
   2. Outdoor fittings shall be of heavy cast construction.

2.2 OUTLET BOXES

A. Outlet boxes on concealed work shall be sized as required by the number of devices indicated on the plans, galvanized pressed steel with plaster rings as required. All outlet boxes shall be recessed where possible including in masonry.

B. Switch boxes, receptacle boxes and other outlet boxes shall be cast iron and sized as required with plaster rings or gang cover as required.

C. Junction boxes: NEMA FB 1, cast iron with gasketed cover.

D. All boxes used for receptacles, switches, and as junction boxes shall be UL Wet Labeled.

2.3 TELEPHONE AND DATA CABLING SYSTEMS

A. Backboards: 3/4-inch (19-mm), interior-grade, fire-retardant-treated plywood, painted black.

B. Distribution Racks: modular-steel units designed for telecommunications terminal support and coordinated, 42U heights, with dimensions of units to be supported. Width compatible with EIA 310 standard 19-inch (480-mm) panel mounting.

C. Telephone/Voice Punch Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

D. Horizontal UTP Cabling: 100-ohm, 4-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.
   1. Comply with ICEA S-90-661 for mechanical properties.
   2. Comply with UL 444.
   3. Comply with TIA/EIA-568-B.1 for performance specifications.
   4. Comply with TIA/EIA-568-B.2, Category 6. (Telephone and Data)
   5. Listed and labeled by an NRTL acceptable to authorities having jurisdiction

as complying with UL 444 and NFPA 70 for Type CMP.

6. Cable Jacket Color: Blue for Data, Gray for Voice

E. Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, using modules designed for punch-down caps or tools.
   1. IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
   2. IDC Connecting Hardware: Consistent throughout Project.

F. Patch Panel: Patch Panels shall be manufactured by Ortronics: NO SUBSTITUTIONS. Comply with TIA/EIA-568-B.2, meeting or exceeding cable performance. Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables. Patch panels shall be sized to accommodate the number of cable terminations indicated on the drawings plus a spare capacity of 25%.

G. Jacks and Jack Assemblies: Modular, color-coded, RJ-45 receptacle units with integral IDC-type terminals. Use keyed jacks for data service. Jacks for Data shall be Orange and Jacks for Voice shall be White.

H. UTP Patch Cords: Factory-made, four-pair cables in 48-inch (1200-mm) lengths; terminated with RJ-45 plug at each end. Use keyed plugs for data service. Provide 2, 6’ patch cords for each jack indicated on the plans.
   1. Provide 2 patch cords for each voice and data jack indicated on the drawings.
   2. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
   3. Patch cords shall have color-coded boots for circuit identification.

I. Workstation Outlets: 100-ohm, balanced, twisted-pair connector; four-pair, modular, RJ-45. Comply with TIA/EIA-568-B.1. Multi-jack assemblies mounted in single or multigang faceplate. Refer to faceplate details on drawings for number of jacks in each outlet.
   1. Faceplate: Stainless steel.
   2. Mounting: Flush, unless otherwise indicated.
   3. Legend: Factory-labeled, at top of jack by silk-screening or engraving indicating "Voice" and "Data," on associated jack.
   4. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
   5. Color code jacks to match color of cable jacket.

J. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
   1. Support brackets with cable tie slots for fastening cable ties to brackets.

2. Lacing bars, spools, J-hooks, and D-rings.
3. Straps and other devices.

2.4 WIRE AND CABLE 600 V INSULATION

A. Provide single-conductor, annealed copper wire and cable with insulation rated 600 V, of sizes specified and scheduled on Drawings, by Rome, Okonite or approved equal, for secondary service, feeders, branch and system wiring. Wire insulated for 300 V may be used where voltage is less than 100V, if isolated from higher voltages. Wire sizes shown and specified are American Wire Gauge for copper.

B. All wiring shall be copper.

C. Wire shall be stranded and shall be minimum #12. Wire and cable shall have THW, THHN, THWN or XHHW insulation as required.

D. Wire for PV panels shall be rated for 1000VDC, UV, USE type..

E. Wiring within light fixtures and other high-temperature equipment shall have 150 degrees C insulation as required by NEC.

F. Splices and Terminations
1. Make splices in branch circuit wiring with UL-listed, solder less connectors rated 600V, of sizes and types required by manufacturer's recommendation with temperature rating equal to those of wires. Splice connectors shall be screw-on. Insulate splices with integral covers or with plastic or rubber friction tape to preserve characteristics of wire and cable insulation.
2. Provide standard bolt-on lugs with hex screws to attach copper wire and cable to Panelboards, switchboards, disconnect switches and electrical equipment.
3. Ampacity of splices and connectors shall be equal to those of associated wires and cables.

2.5 FEEDER IDENTIFICATION

A. Provide laminated phenolic identifying tags pressure-sensitive labels for cables, feeders, and power circuits in pull boxes, panelboards, at cable termination and in other locations.

B. Tags or labels shall be incised to show ½ inch high black letter on a white background. The operating voltage of the specific feeder and/or branch circuit shall determine background color. Suspended tags with two 1/32-inch diameter nylon 55-pound test shall be attached monofilament line or two slip-free plastic cable lacing units.

2.6 WIRE PULLING EQUIPMENT

A. Provide polyethylene ropes for pulling wire.

B. Provide fish wires in telephone/data conduits and other empty conduit systems required, without splices and with ample exposed lengths at each end.

C. Provide wire pulling lubricants that meet applicable UL requirements as necessary.

2.7 WIRING DEVICES

A. Provide UL listed, heavy duty, specification grade wiring devices by single manufacturer: Arrow-Hart (Division of Crouse-Hinds), Leviton, Hubbell, Wiremold or approved equal. Devices shall be White.

B. Toggle Switches:
   1. Single-pole shall be 20A. 120-277 V AC.
   2. Double-pole shall be 20A. 120-277 V AC.
   3. Three-way shall be 20A. 120-277 V AC.
   4. Four-way shall be 20A. 120-277 V AC.

C. Receptacles:
   1. Duplex shall be 125 V, 20 A, 2-pole, 3 W, grounding.
   2. GFI Devices shall be 125 V, 20 A, 2-pole, 3 W, grounding

2.8 WIRING DEVICE PLATES

A. Provide device plates by Arrow-Hart, Bryant, Hubbell, Wiremold or approved equal.

B. All device plates shall be stainless steel.

C. Device plates shall be by manufacturer of wiring devices.

D. Receptacle device plates shall be engraved with 1/4-inch letters, filled red, indicating voltage characteristics and circuit number of outlet.

E. Outlets shall be flush to surface and square.

F. All switches and receptacles shown for one location shall be grouped under one faceplate.

G. For all exterior receptacles provide lockable, metal weatherproof “in-use” covers.

2.9 LIGHTING FIXTURES

A. Provide lighting fixtures, fixture poles, and components as indicated in the lighting fixture schedule on the drawings and according to the fixture information herein; NO SUBSTITUTIONS.

B. Type A: Fixture shall be Prudential Catalogue# 4'-P5160-2T8-04-HWA-SS-120-FH-TRS. Fixture shall be 48", 2 lamp high performance T8, wet label, opal impact resistant lens, stainless steel body, capable of continuous row mounting, electronic ballast, 1.2 ballast factor.

C. Type B and Type N: Fixture shall be Lumec Catalogue# CPLS-150MH-T2HF-120-HE-GY3TX-FUSE and with the following attributes:

1. Housing: cast 356 Aluminum alloy 0.180 (4.6mm) minimum thickness. The mounting means includes one bracket made of stamped galvanized-steel (12ga). Fits on a 1.9" (48mm) to 2 3/8" (60 mm) OD by 9" (229mm) long tenon, fixed by 3/8-16 UNC steel zinc plated bolts. The housing is complete with a ground lug and a terminal block that accepts (#8 max.) wires from the primary circuit.
2. Lamp: 150 Watt Pulse Start Metal Halide (ANSI Code M102 or M142), ED 17 bulb, medium base.
3. Optical System: (2HF), I.E.S. type II (asymmetrical), horizontal lamp position. Smartseal system. System composed of 3 main components:
   1) Shutter made of injection molded A360 aluminum alloy. Removable with a quarter turn, c/w and injection molded silicone gasket (duro 60 shore A).
   2) Multi-faceted reflector made of hydroformed 3002-0 aluminum alloy chemically brightened and anodized (a5 micron min).
   3) Flat Lens made of clear tempered glass, permanently sealed onto the reflector. The Smartseal optical system is rated IP66.
4. Ballast: High power factor of 90%. Primary voltage 120 volts. Pulse Start Type. Lamp starting capacity -20oF (-30oC) degrees. Assembled on a unitized removable tray with quick disconnect plug. Complies with efficiency ballast requirement.
5. Access-Mechanism: Quarter-turn pressure locking system made of die cast aluminum. The mechanism shall offer toolfree access to the inside of the luminaire. An embedded memory-retentive gasket shall ensure weatherproofing.
6. Wiring: Luminaire wiring is done using a terminal block located inside the housing.
7. Hardware: All exposed screws shall be stainless steel with Ceramic primer-seal basecoat to reduce seizing of the parts. All seals and sealing devices are made and/or lined with EPDM and/or silicone.
8. Finish: Color to be medium grey textured (GY3TX). Application of a polyester powder coat paint. (4 mils/100 microns). The chemical composition provides a highly durable UV and salt spray resistant finish in accordance to the ASTM-B117-73 standard and humidity proof in accordance to the ASTM-D2247-68 standard.

9. Vibration Resistance: Meets the ANSI C136.31-2001, American National Standard for Roadway Luminaire Vibration specifications for normal applications. (Tested for 1.5G over 100,000 cycles by an independent lab)

D. Type B and N Pole: Pole shall be Lumec Catalogue# APR5S-16-GY3TX and shall have the following attributes:
   1. Straight 16' height.
   2. Pole Shaft: The shaft shall be made from spun tapered 6063-T4 aluminum, tempered to T6 after welding. The base diameter is 5" with a wall thickness of 0.219". The base is welded to both bottom and top of the anchor plate. The top of the pole is closed with a cap made of molded aluminum. For Type B pole, C/w a welded extension arm, 2 3/8" (60mm) outside diameter. Type N pole, twin, 180 degree C/w a welded extension arms, 2 3/8" (60mm) outside diameter.
   3. Maintenance Opening: The pole shall have a 2" x 4 ½" (51mm x 114mm) maintenance opening centered 20" (508mm) from the bottom of the anchor plate, complete with a weatherproof aluminum cover and a copper ground lug.
   4. Color and finish to match luminaire.
   5. Base Cover: Two piece square base cover made from formed aluminum, mechanically fastened with stainless steel screws.
   6. Pole Options: (FS1) Single fuse and fuse-holder.

E. Type D: Fixture shall be Lumec Catalogue# CPLM-150MH-T15-TH3F-120-GY3TX-FUSE fixtures shall have the following attributes:
   1. Housing: The upper and lower part of the housing are made of die cast A360 Aluminum alloy 0.180 (4.6mm) minimum thickness. The mounting means includes two brackets made of stamped galvanized-steel (12ga.). Fits on a 1.9" (49mm) to 2 3/8" (60mm) OD by 10 ½" (267mm) long tenon, fixed by3/8-16 UNC steel zinc plated bolts. An integral part of the housing permits and adjustment of +/-5o. The housing is complete with a ground lug and a terminal block that accepts (#8 max.) wires from the primary circuit.
   2. Lamp: 150 watts Metal Halide pulse start (ANSI Code M102 or M142), ED17 bulb, median base.
   3. Optical System: (TH3F), I.E.S. type III (except Type E fixture shall be Type II) full cut-off (asymmetrical) Smartseal system. System composed of 3 main components:
      1) Shutter made of injection molded A360 aluminum alloy. Removable with a quarter turn, c/w an injection molded silicone gasket (duro 60 shore A). Horizontal lamp position.
      2) Multi-faceted reflector made of hydroformed 3002-0 aluminum alloy chemically brightened and anodized (5 micron min) complete with

additional reflectors made of aluminum with 95% reflectivity.

3) Flat Lens made of clear tempered glass of 0.2" (5mm) thickness, permanently sealed onto the reflector. The Smartseal optical system is rated IP66.

4. Ballast: High power factor of 90%. Primary voltage 120 volts. Lamp starting capacity -20oF (-30oC) degrees. Assembled on a unitized removable tray with quick disconnect plug. Complies with efficiency ballast requirement. HE
5. Access-Mechanism: Quarter-turn pressure locking system made of die cast aluminum. The mechanism shall offer toolfree access to the inside of the luminaire. An embedded memory-retentive gasket shall ensure weatherproofing.
6. Bird Guard: Prevents birds from entering the luminaire. Made of high-density polyethylene 0.030" (0.8mm) thick and captive to the housing.
7. Wiring: Gauge (#14) TEW/AWM 1015 or 1230 wires, pre-wired from luminaire to the pole base, 6" (152mm) minimum exceeding from maintenance opening.
8. Hardware: All exposed screws shall be stainless steel with Ceramic primer-seal basecoat to reduce seizing of the parts. All seals and sealing devices are made and/or lined with EPDM and/or silicone.
9. Finish: Color to be medium grey textured (GY3TX). Application of a polyester powder coat paint. (4 mils/100 microns). The chemical composition provides a highly durable UV and salt spray resistant finish in accordance to the ASTM-B117-73 standard and humidity proof in accordance to the ASTM-D2247-68 standard.
10. Vibration Resistance: The CPLM meets the ANSI C136.31-2001 table 2, American National Standard for Roadway Luminaire Vibration specifications for Bridge/overpass applications. (Tested for 3G over 100,000 cycles by an independent lab).

F. Type D poles: Pole shall be Lumec Catalogue# APR5S-20-GY3TX and APR5S-18-GY3TX shall have the following attributes:
1. Type D: Straight 20' height.
2. Pole Shaft: The shaft shall be made from spun tapered 6063-T4 aluminum, tempered to T6 after welding. The base diameter is 5" with a wall thickness of 0.219". The base is welded to both bottom and top of the anchor plate. The top of the pole is closed with a cap made of molded aluminum. C/w a welded extension arm, 2 3/8" (60mm) outside diameter.
3. Maintenance Opening: The pole shall have a 2" x 4 ½" (51mm x114mm) maintenance opening centered 20" (508mm) from the bottom of the anchor plate, complete with a weatherproof aluminum cover and a copper ground lug.

4. Base Cover: Two piece square base cover made from formed aluminum, mechanically fastened with stainless steel screws.
5. Color and finish to match luminaires.
6. Pole Options: (FS1) Single fuse and fuse holder.

G. Emergency Battery Ballast for Fluorescent Fixtures
1. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
2. Emergency Connection: Operate one fluorescent lamp(s) continuously at an output of 1100 lumens each. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
3. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
4. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Battery: Sealed, maintenance-free, nickel-cadmium type.
7. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.
9. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

H. Type G: Fixture shall be Jesco Catalogue# LLMFH-1-120-30, LED rope lighting for backlight of Station Icons. Provide Length as needed for 3 evenly distributed strips of full length backlighting Station Icon.

I. Type H: Fixture shall be Philips/Color Kinetics Catalogue# 116-000026-00, w/PDS-150e 24V power supply Catalogue # 109-000008-01 and Lighting System Manager catalogue #103-000015-02, Color changing LED flood light for uplighting of canopy glass element.

J. Type J: Fixture shall be Hydrel Catalogue# PDX10—BSS22LED-CLWHO-MVOLT_MFL_FLC_34S-LPI-FUSED, LED inground fixture for uplighting of trees.

K. Type K: Fixture shall be Lithonia Catalogue# VSLC 117 SCE MVOLT GEB10IS DL 2', 1 lamp, fluorescent, rough service fixture, UV stabalized polycarbonate lens, damp label.

L. Type L: Fixture shall be Bega Catalogue# 8520-897A-Silver FUSED, 100W CMH Bollard fixture.

M. Type O: Fixture shall be Corelite Catalogue# I2WL-2N5-1-UNV-AC-48"-JB-ES, fluorescent indirect/direct 4', fixture, steel housing, 2 lamp T5/28W, adjustable aircraft cable. Provide continuous rows as indicated on the drawings.

N. Type Q: Fixture shall be Lithonia Catalogue# SB-217-120-GEBPS 2' fluorescent, 2 lamp, wraparound fixture with acrylic lens.

O. Type R: Fixture shall be Corelite Catalogue# R2WL-2N5-1-C-120-14-T1, 1'x4' high performance fluorescent troffer, 2 lamp T5/28W, recessed layin ceiling, 81% fixture efficiency.

P. Type S: Fixture shall be eLite Catalogue# EUM-LED, 24V, 35K , 2' LED undercabinet light. Provide with matching LED controller with 120V input voltage. Provide with extension coupler EUM-LED-ACC, length as needed for interconnecting all undercabinet lights into one circuit.

Q. Type T: Fixture shall be RSA Lighting Catalogue# LEDEON W, White LED strip light, field bendable, UL wet listed. Provide with matching LED controller with 120V input voltage. Provide with Two inch channel mounting clips for securing to curved portion and 6' mounting channel for straight portions of Supervisors building exterior.

R. Type U: Fixture shall be Dual-Lite Catalogue# PGN-W LED wall mounted sconce with emergency battery.

2.10 LIGHTING CONTROL PANEL

A. Basis-of-Design Product: Subject to compliance with requirements, provide equipment or comparable product by one of the following. The system described below is based on Cooper LiteKeeper LK32.
   1. Cooper Industries, Inc.
   2. Lighting Control & Design
   3. WattStopper/Legrand.

B. The lighting control panel shall consist of a packaged programmable panel with 32 low voltage relays. Control shall consist a minimum of.
   1. Time of Day: 64 Time-Of-Day/holiday schedules for 365 day programming
   2. Holiday: 32 holiday dates

3. Photocell input for dawn to dusk control
4. Timed Overrides: Timed override 1-999 minutes, resumes to normal schedule
5. Astronomical Clock Longitude and latitude input with sunset-sunrise offsets to customize outdoor lighting
6. Auto Daylight Savings Adjust. Automatically adjusts the clock at the appropriate dates, selectable.

C. Relays: Electrically held 20amp 120/277VAC relays. Relays must be specified Normally Open or Normally Closed. The relays shall be rated for 10 million mechanical operations. The relays shall be provided on a card of eight relays per card. The wire terminations shall be able to accept 10 AWG. The relays shall be rated for 10 million mechanical operations. A limited 10-year warranty shall be provided on the individual relay cards. Systems that do not offer a limited 10-year warranty on all installations are not acceptable

D. Programming the controller shall be through the RS-232 port or through a network connection. Communication to the panel can be accomplished via, RS-232, modem, or TCP/IP. Programming the controller shall also be accomplished through an integral keypad and LCD display. Descriptive information shall assist the user to employ the system with a programming manual. Lighting control systems that utilize removable programming keypads shall not be acceptable.

E. The panel shall have an Ethernet Interface Module (EIM) The control system shall provide access to control panel over a TCP/IP connection by converting sent information into RS-232 communication capable information. This unit operates on standard 110VAC. Manufacturer shall provide proper cabling from controller to Ethernet Interface Modules.

F. This specification will outline the respective responsibilities of Cooper Controls and of the customer when a TCP/IP connection is used for communication to the Cooper Controls network.

G. The controller shall accept the following types of inputs.
1. The control system shall permit 32 dry contacts inputs for override purposes. Momentary 3 wire or 2 wire (toggle) inputs shall be supported. Maintained contacts shall be supported as 2 wire (SPST) inputs. Inputs shall be dry contacts (24 VDC @ 12 ma. internally supplied to the inputs). The 24 VDC power supply is provided with an auto-resettable fuse. Should an inappropriate electrical connection be made the design will protect the board and switches until the fault is removed. Any switch input shall be software linked to any number of relays for override control. The control panel shall have dry contact inputs on the logic board. Control systems that utilize separate accessories to allow for dry contact switches shall not be acceptable.

Control systems that do not supply both digital switches and analog switches from the same controller shall not be permitted.

2. The controller shall accept dry contact ambient light sensors. The controller shall provide power for the sensor thereby eliminating any external power supply. Sensors shall provide for outdoor and indoor applications and issue a command to the controller once the threshold is reached. The sensor shall provide user adjustable dead band control.

3. The controller shall accept remote commands issued from other inputs. The controller shall provide this feature without the need to add extra equipment to the controller. Remote overrides can be issued from the Telephone Interface Module (TIM), Photocells, Motion Sensors, Digital or Dry Contact Switches. Lighting systems that need to add extra equipment to receive remote overrides are not acceptable.

2.11 PHOTOCELL

A. Photocell shall have die cast zinc, gasketed enclosure. Cell shall be cadmium sulphide, epoxy coated and contacts shall normally closed and fain in ON position. Photocell shall be capable of withstanding -40˚ - 140˚ F. Unit ON/OFF set point shall be adjustable- Turn ON between 1fc and 5fc and turn OFF between 3fc and 5fc and shall remain closed for dusk to dawn operation.

2.12 METER SOCKETS

A. NEMA 3R enclosure, UL Listed, 400A, 120/208V or 120/240V, ring less, accepts 5th terminal, with heavy duty lever bypass, meeting all requirements of CL&P.

2.13 PANELBOARDS

A. Provide UL-listed safety dead front, service entrance rated, panelboards. Panelboards shall meet or exceed requirements of NEMA Standard Publication PB-1, and UL-50 and 67. Provide cabinets with flush hinges and combination catch and lock. Provide wiring gutters to accommodate large multiple feeder cables and lugs. Except as shown otherwise on Drawings, wiring gutters shall be at least 4 inch for 208 V panels. Buses shall be copper. Short circuit rating of panels shall be 65K amp IC unless otherwise indicated on the drawings.

B. Provide molded case, bolt-on, thermal-magnetic trip, single or two pole branch circuit breakers as shown on Drawings. Multiple pole breakers shall be single handle, common-trip, multi-handles and ties will not be accepted. All circuit breakers shall have short circuit rating (AIC) of the panel. Series rated are not acceptable.

C. Main buswork of panels shall carry at least full rating of feeder over current device that supplies panel.

D. Provide separate neutral ground bus for each panelboard. Neutral bus shall be insulated from panel enclosure. (Provide oversized neutral where indicated).

E. Provide separate equipment ground bus for each panelboard. Ground bus shall be insulated from panel enclosure.

F. Power and lighting panels shall have heavy-duty continuous, section vertical-hinged to box section for access to wiring gutters in addition to trim door.

G. Provide surface metal tubs ready for painting mount panels on 5/8” outdoor plywood.

H. Provide bus connections for future overcurrent device with suitable insulation and bracing to maintain proper short circuit rating and voltage clearances, where required on Drawings. Provide for ready insertion of future breaker.

I. Provide typed panel directories, secured to inside of panel doors that show use of each circuit and electrical characteristics of panelboard.

J. Panelboard for PV panel shall have circuit breakers rated for reverse current.

2.14 EXTERIOR SERVICE CABINET

A. Refer to drawings for dimensional information and additional detail.

B. Enclosure shall and doors fabricated from 10-gauge 304 stainless steel, floor standing, NEMA Type 4X.

C. Finish: Factory-applied finish in manufacturer's standard color; undersurfaces treated with corrosion-resistant undercoating.

D. Doors: Heavy gauge aluminum continuous hinge utilizing a non-removable 3/16"-diameter stainless steel hinge pin for door support.
   1. Provided with three-point locking mechanism.
   2. 3/4"-diameter stainless steel inward turning handle with provisions for padlocking.
   3. Main Door lock - industrial standard pin tumbler lock with #2 key.
   4. Louvered inlet with filter to prevent dirt from entering with air flow.
   5. Closed-cell neoprene door seal gasket continuous along entire door.

E. Accessories: As detailed on the drawings, with minimum of the following: fluorescent lighting fixtures, ceiling mounted; wired to a light switch; ground-fault circuit interrupter (GFCI) duplex receptacle; Self regulating electric heater, heater thermostat.

F. Provide 4, 3/4" anchor bolts for concrete base mounting. Coordinate exact anchor bolt requirements with manufacturer.

2.15 HANDHOLES

A. Refer to drawings for dimensions and additional details. Handholes shall be reinforced-concrete (3000psi unless otherwise notes), monolithically poured walls and bottom unless open-bottom enclosures are indicated. Frame and cover shall form top of enclosure and shall have load rating consistent with that of handhole or pull box.

B. Frame and Cover: Weatherproof cast-iron frame, with cast-iron cover with recessed cover hook eyes and tamper-resistant, captive, cover-securing stainless-steel bolts.

C. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

D. Cover Legend: Molded lettering, as indicated for each service.

E. Configuration: Units shall be designed for flush burial and have closed bottom unless otherwise indicated.

F. Duct Entrances in Handhole Walls: Cast end-bell or duct-terminating fitting in wall for each entering duct.

G. Type and size shall match fittings to duct or conduit to be terminated.

H. Fittings shall align with elevations of approaching ducts and be located near interior corners of handholes to facilitate racking of cable.

2.16 FUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, 240V, UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate 400amp Class R fuses (unless otherwise indicated), lockable handle with capability to accept three padlocks, and interlocked with cover in closed position. Fused disconnect switches shall have a Service Entrance Label with a 100,000 amp fault current rating.

B. Provide the following Accessories:
   1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
   2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
   3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.17 NONFUSIBLE SWITCHES

A. Type HD, Heavy Duty, Single Throw, 240V, UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

2.18 GROUNDING EQUIPMENT

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

B. Bare Copper Conductors:
   1. Solid Conductors: ASTM B 3.
   2. Stranded Conductors: ASTM B 8.
   3. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
   4. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
   5. Grounding Electrode Conductor: No. 2, stranded conductor unless otherwise indicated on the drawings.
   6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

C. Connectors
   1. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
   2. Bolted Connectors for Conductors and Pipes: Cast Copper or copper alloy, pressure type with at least two bolts. UL 467 and approved for use as direct burial.
   3. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
   4. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

D. Grounding Electrodes
   1. Ground Rods: Copper-clad steel, sectional type; Unless otherwise indicated on the drawings provide, 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

2.19 OCCUPANCY SENSORS

A. Ceiling mounted dual technology sensors with/360 degree coverage with built-in light level sensor that work from 10 to 300 footcandles. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies. Detection verification of both technologies must occur in order to activate lighting systems. Upon verification, detection by either shall hold lighting on. Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 KHz. It shall utilize Advanced Signal Processing that automatically adjusts the detection threshold dynamically to compensate for changing levels of activity and airflow throughout controlled space. To avoid false ON activations and to provide immunity

to RFI and EMI, Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of a signal, to respond only to those signals caused by human motion. The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. Sensors shall be provided with power packs.

B. Wall mounted switch type occupancy sensor with dual switching relays except contractor may provide single relay unit where the plans indicate single level control in room. The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception. Sensor shall have no minimum load requirement and shall be capable of switching from 0 to 800 Watt incandescent; 0 to 800 Watt fluorescent or 1/6 hp @ 120 VAC, 50/60Hz; and 0 to 1200 Watt fluorescent @ 230/277 VAC, 50/60Hz. To blend in aesthetically, sensor shall not protrude more than 3/8" from the wall and utilize color-matched lens. To assure detection at desktop level uniformly across the space, sensor shall have a 28 segment, 2 level, Fresnel injection molded lens. Sensor shall have the option for a visual warning that shall flash lights to warn the end-user before lights turn Off automatically. Sensor shall have a built-in light level featuring simple, one-step daylighting setup that works from 8 to 180 footcandles. Switching mechanism shall be a relay(s). Triac and other harmonic generating devices shall not be allowed. Sensor shall have ground wire and grounded strap for safety.

2.20 EMERGENCY CALL STATION

A. Buzzer/Strobe: Equal to Edwards 7007B-N5, 120V, 82dBA horn, 150cd strobe, UL listed, white plastic coverplate.

B. Pull cord: Equal to Edwards 6537 double pole single throw switch, stainless steel faceplate, nylon cord, 120V 3amp contacts, silk screened faceplate "Pull to Call for Help."

2.21 LAMINATE PV PANELS, COMBINER, AND INVERTER

A. PV panels shall be based on Unisolar PVL-68 solar laminate product. UL 1703, IEC 61646 and 61730 rated. Panels shall be 15.5" wide x 112.1" long x 0.2" thick. Solar cells shall be thin film triple junction amorphous silicon. Each panel shall have a maximum rated power of 68 watts, shall be provide with quick-connect terminals, and shall have adhesive backing.

B. Combiner shall be based on SMA Combi-Switch, UL 1741 rated, NEMA 3R enclosure, with lockable disconnect switch blade, capable of connecting and

C. Inverter shall be based on PVP-4600 rated 4.6kW, 208V, 1phase, 95% efficient, UL 1741 rated, IEEE 1547 compliant, matched to photovoltaic panel DC voltage and output characteristics.

D. Provide meter and meter socket as required by utility for metering of PV power. NEMA 3R enclosure, UL Listed, 200A, 120/208V or 120/240V, ring less, accepts 5th terminal, with heavy duty lever bypass, meeting all requirements of CL&P.

E. Provide with 3, Delta LA303 and 3, Delta LA 602 lightning arresters.

F. System shall have a 5 year warranty.

G. Contractor shall cover solar panels with an opaque material before making wiring connections.

2.22 RACEWAY AND CABLE LABELS:

A. Comply with ANSI A13.1, Table 3, for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

1. Color: Black letters on orange field.
2. Legend: Indicates voltage and service.

B. Pretensioned, Wraparound Plastic Sleeves: Flexible, preprinted, color-coded, acrylic band sized to suit the diameter of the line it identifies and arranged to stay in place by pretensioned gripping action when placed in position.

C. Underground-Line Warning Tape: Permanent, bright-colored, continuous-printed, vinyl tape.

1. Not less than 6 inches wide by 4 mils thick
2. Compounded for permanent direct-burial service.
3. Embedded continuous metallic strip or core.
4. Printed legend indicating type of underground line.

D. Aluminum-Faced, Card-Stock Tags: Weather-resistant, 18-point minimum card stock faced on both sides with embossable aluminum sheet, 0.002 inch thick, laminated with moisture-resistant acrylic adhesive, punched for fasteners, and preprinted with legends to suit each application.

E. Wrap Around Cable Markers: Black, non-smear legends on white background with plastic coated cloth material which remains flexible. Strong adhesive shall assure firm bond on wire.

2.23 NAMEPLATES AND SIGNS:

A. Safety Signs: Comply with 29 CFR, Chapter XVII, Part 1910.145.

B. Engraved Plastic Nameplates and Signs: Engraving stock, melamine plastic laminate, minimum 1/16 inch thick for signs up to 20 sq. in. and 1/8 inch thick for larger sizes.
1. Engraved legend with white letters on black face.
2. Punched or drilled for mechanical fasteners.

C. Exterior, Metal-Backed, Butyrate Signs: Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for the application. 1/4-inch grommets in corners for mounting.

D. Fasteners for Nameplates and Signs: Self-tapping, stainless-steel screws or No. 10/32, stainless-steel machine screws with nuts and flat and lock washers.

2.24 MISCELLANEOUS IDENTIFICATION PRODUCTS:

A. Cable Ties: UL Listed, Fungus-inert, self-extinguishing, one-piece, self-locking, Type 6/6 nylon cable ties.
1. Minimum Width: 3/16 inch.
2. Tensile Strength: 18 lb minimum.
3. Temperature: 85 deg C.
4. Color: Natural.

B. Backboards: 3/4-inch (19-mm), interior-grade, fire-retardant-treated plywood, painted black.

2.25 TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)

A. Equal to Leviton 3200 series. Designed for 120/240 or 120/208V single phase panels.

B. MCOV: 150VAC

C. Max surge current: 80kA

D. Real-time diagnostics monitor power and surge suppression status of each phase by means of indicator light and acoustic alarm.

E. Multi phase surge protection in commercial and industrial environments.

PART 3 - EXECUTION

3.1 SPECIAL RESPONSIBILITIES

A. Coordination: Coordinate work of this Section with work of other Sections.
   1. Perform work so that progress of project, including work of other Sections, is not delayed.
   2. Provide information about items furnished under this Section to be installed under other Sections, as necessary.
   3. Obtain detailed information from manufacturers of equipment provided under this Section as to proper methods of installation.
   4. Obtain final roughing dimensions and other information as needed for complete installation of items furnished under other Sections or Others.
   5. Keep fully informed of shape, size and position of openings required for material and equipment provided under this and other Sections. Ensure that openings required for work of this Section are coordinated with work of other Sections. Provide cutting and patching as necessary.

B. Maintenance of equipment and systems: Maintain Electrical equipment and systems until final acceptance by the Engineer, and ensure adequate protection of equipment and material during delivery, storage, installation and shutdown conditions. Responsibility shall include provisions required to meet conditions incidental to delays pending final test of systems and equipment under seasonal conditions.

C. Inspection by Engineer: Periodic inspections by Engineer or designated agent shall not be construed as supervision of actual construction, nor make either responsible for providing safe place for performance of work of various trades or suppliers, or for visitors or occupants, or make either responsible for omission of safety devices called for by codes, ordinances, or specifications of equipment manufacturer.

D. Surveys and Measurements:
   1. Base horizontal and vertical measurements on reference points established by Contractor and be responsible for correct laying out of work.
   2. In the event of discrepancy between actual measurements and those indicated, notify Engineer in writing and do not proceed with work until written instructions have been issued by Engineer.

E. Temporary Utilities: Refer to requirements of Division 1 regarding temporary facilities.

F. Unload electrical materials and equipment delivered to site. Pay costs for rigging, hoisting, lowering and moving electrical equipment on-site, in building or on roof.

3.2 MATERIALS AND WORKMANSHIP

A. All receptacles and switches shall be flush mounted in wall, including all masonry walls, unless otherwise indicated.

B. Work shall be rectilinear and shall run perpendicular or parallel to general construction. Wiring shall be run concealed unless specified otherwise. Exposed conduit shall run flush to structure, parallel or perpendicular to walls. Install material and equipment according to manufacturer's recommended best practice so that complete installation operates safely and efficiently.

C. Except as specified otherwise, material or equipment specified and shown on Drawings shall be new and shall meet requirements of latest standards of NEMA, UL, IPCEA, ANSI and IEEE. Equipment shall have components required or recommended by OSHA and applicable NFPA documents, and shall be UL-approved where applicable.

D. Despite references in Specifications or on Drawings to material or piece of equipment by name, make or catalog number, such reference shall be interpreted as establishing standards of quality for materials and performance.

E. Finish of materials, components and equipment shall not be less than industry good practice. When material or equipment is visible or subject to corrosive or atmospheric conditions, finish shall be as approved by Engineer.

3.3 TESTING, INSPECTION AND CLEANING

A. Test and inspect work provided under this Section as required by Contract Documents, codes, standards and authorities that have jurisdiction, to satisfaction of the Authority's site personnel. Notify Engineer in accordance with Connecticut DOT 816 section 1.20-1.05.10.

B. Furnish Engineer with certificates of testing and inspection for electrical systems, indicating approval of authorities that have jurisdiction and conformance with requirements of Contract Documents.

C. After installing conductors before electrical circuitry has been energized, test service entrance, photovoltaic system conductors, and feeder conductors, for compliance with requirements. Perform each visual and mechanical inspection and electrical test stated in ANSI/NETA ATS-2009 *Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems*. Certify compliance with test parameters.

D. Verify and correct as necessary: voltages, tap settings, trip settings and phasing on equipment from secondary distribution system to points of use. Test secondary

voltages at panelboards, and at other locations on distribution systems as necessary. Test secondary voltages under no-load and full-load conditions.

E. Test lighting fixtures with specified lamps in place for 10 hours; check fixtures in sections. Do not operate lamps other than for testing before final inspection by Engineer. Replace lamps that fail within 90 days after acceptance by Engineer within Contract Price.

F. Provide necessary testing equipment and testing.

G. Failure or defects in workmanship or materials revealed by tests or inspection shall be corrected promptly and retested. Replace defective material.

H. After completion of project, clean the exterior surface of equipment included in this section, including concrete residue.

I. Telephone & Data cabling: Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels. UTP Performance Tests:

1. Test for each outlet. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:

    1) Wire map.
    2) Length (physical vs. electrical, and length requirements).
    3) Insertion loss.
    4) Near-end crosstalk (NEXT) loss.
    5) Power sum near-end crosstalk (PSNEXT) loss.
    6) Equal-level far-end crosstalk (ELFEXT).
    7) Power sum equal-level far-end crosstalk (PSELFEXT).
    8) Return loss.
    9) Propagation delay.
    10) Delay skew.

3.4 EMERGENCY BATTERY BALLASTS.

A. Connect emergency battery ballasts according to manufacturer requirements. Extend battery sensing connections to line side of all control devices (lighting control panel relays, occupancy sensor relays, switches, contactors, time switches, etc…) to prevent battery discharge upon normal de-energizing of lighting circuits.

3.5 IDENTIFICATION

A. Provide nameplates in or on panelboards, junction boxes and cabinets, and for special purpose switches, motor disconnect switches, remote control stations, starters or other controls furnished or installed under this Section. Nameplates shall designate equipment controlled and function.

B. Nameplates shall be a minimum of 3 inches long by 1-1/2 inches wide, with black face and white lettering screw on type. No adhesives will be allowed.

C. Identification Materials and Devices: Install at locations for most convenient viewing without interference with operation and maintenance of equipment.

D. Lettering, Colors, and Graphics: Coordinate names, abbreviations, colors, and other designations with corresponding designations in the Contract or with those required by codes and standards. Use consistent designations throughout Project.

E. Sequence of Work: If identification is applied to surfaces that require finish, install identification after completing finish work.

F. Color Banding Raceways and Exposed Cables: Band exposed and accessible raceways of the systems listed below:

1. Bands: Pretensioned, wraparound plastic sleeves; colored adhesive tape; or a combination of both. Make each color band 2 inches wide, completely encircling conduit, and place adjacent bands of two-color markings in contact, side by side.
2. Band Locations: At changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.

G. Paths of Underground Electrical Lines: During trench backfilling, for exterior underground power, control, signal, and communication lines, install continuous underground metallic line marker located directly above line at 6 inches below finished grade. Where width of multiple lines installed in a common trench or concrete envelope does not exceed 16 inches overall, use a single line marker.

H. Secondary Service, Feeder, and Branch-Circuit Conductors: Color-code throughout the secondary electrical system.

I. Color-code 208/120 or 240/120-V system as follows:

1.	Phase A	Black
2.	Phase B	Red
3.	Neutral	White
4.	Ground	Green

J. Factory apply color the entire length of conductors, except the following field-applied, color-coding methods may be used instead of factory-coded wire for sizes larger than No. 10 AWG:

1. Colored, pressure-sensitive plastic tape in half-lapped turns for a distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Use 1-inch- wide tape in colors specified. Adjust tape bands to avoid obscuring cable identification markings.
2. Colored cable ties applied in groups of three ties of specified color to each wire at each terminal or splice point starting 3 inches from the terminal and spaced 3 inches apart. Apply with a special tool or pliers, tighten to a snug fit, and cut off excess length.

K. Apply identification to conductors as follows:

1. Multiple Power or Lighting Circuits in the Same Enclosure: Identify each conductor with source, voltage, circuit number, and phase. Use color-coding to identify circuits' voltage and phase.
2. Multiple Control Circuits in the Same Enclosure: Identify each conductor by its system and circuit designation. Use a consistent system of tags, color-coding, or cable marking tape.

L. Apply warning, caution, and instruction signs as follows:

1. Warnings, Cautions, and Instructions: Install to ensure safe operation and maintenance of electrical systems and of items to which they connect. Install engraved plastic-laminated instruction signs with approved legend where instructions are needed for system or equipment operation. Install metal-backed butyrate signs for outdoor items.
2. Emergency Operation: Install engraved laminated signs with white legend on red background with minimum 3/8-inch high lettering for emergency instructions on power transfer, load shedding, and other emergency operations.

M. Equipment Identification Labels: Engraved plastic laminate. Install on each unit of equipment, including central or master unit of each system. This includes power, lighting, and control unless units are specified with their own self-explanatory identification. Unless otherwise indicated, provide a single line of text with 1/2-inch- high lettering on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high. Use white lettering on black field. Apply labels for each unit of the following categories of equipment using mechanical fasteners:

1. Panelboards, electrical cabinets, and enclosures.
2. PV inverters and combiners
3. Disconnect switches.
4. Enclosed circuit breakers.
5. Motor starters.
6. Push-button stations.
7. Contactors.
8. Control devices.
9. Main disconnect.

3.6 WIRING METHODS

A. Where specific approaches are not indicated on the drawings, provide circuiting and wiring approaches as indicated in the following schedule:

Type	Application/Locations
Rigid Galvanized Steel	1. Exterior exposed conduit runs. 2. All underground conduit runs unless otherwise indicated.
EMT	3. Feeders, branch circuit runs, and telephone data cabling runs installed above ceiling, and in wall spaces, in Supervisors Building
Liquid tight Flexible Metal Conduit	4. Connections to electrical equipment and other equipment furnished under HVAC and Plumbing Sections that are subject to movement, vibration, or misalignment, where available space dictates, and where noise transmission must be eliminated or reduced. Limit length of flexible conduit in these applications to no more than 24 inches.

B. All receptacles and switches shall be flush mounted in platform or masonry/concrete walls.

C. Where wire sizes are larger than equipment terminations in lighting control panels, or lighting fixtures, the contractor shall reduce conductor size within the equipment enclosure as necessary.

D. Wire from point of service connection to receptacles, lighting fixtures, devices, equipment, outlets for future extension, and other electrical apparatas as shown on Drawings. Provide slack wire for connections. Tape ends of wires and provide blank covers for outlet boxes designated for future use. Do not install electrical outlets back to back on opposing sides of partitions.

E. Minimum conductor size shall be #12. Provide 2#12 + #12G, 3/4" conduit for each circuit unless circuiting is specifically indicated.

F. Two or more conduits installed instead of single conduit shall contain duplicate conductors, including neutrals and ground conductors where required; total capacity of duplicate conductors shall be at least equal to capacity of conductors replaced.

G. Follow homerun circuit numbers shown on Drawings to connect circuits to panelboards. Where circuit numbers are indicated on devices but homerun symbols are not indicated, interconnect devices and provide homerun to panel indicated from nearest device. Connect each branch circuit homerun with two or more circuits and common neutral to circuit breaker or switch in three-wire or four wire branch circuit panelboard so that no two circuits are fed from same bus.

H. Install connectors and couplings as recommended by manufacturers. Compression fittings shall not be used with rigid steel, intermediate metallic or aluminum conduit.

I. Penetrate waterproof walls of structural slabs and foundation walls only where approved by Engineer. Submit proposed penetrations points, size openings and penetration methods to Engineer for approval.

J. Run concealed conduit in as direct lines as possible with minimum number of bends of longest possible radius. Run exposed conduit parallel to or at right angles to building lines. Ends shall be free from dents or flattening.

K. Unless specified or shown on Drawings, install conduit concealed.

L. Install conduit systems complete before drawing in conductors. Blow through and swab after plaster is finished and dry, and before conductors are installed.

M. Expansion/Deflection Fittings: Conduit buried or secured rigidly on opposite sides of building expansion joints, seismic joints, and long runs of exposed conduit subject to stress shall have expansion fittings. Fittings shall safely deflect and expand to twice distance of structural movement.

1. Provide separate external copper bonding jumper secured with grounding straps on each end of firring.
2. Conduits buried in concrete shall cross building expansion joints at right angles; provide expansion fittings as required by manufacturer's instructions. Provide insulated bushings at ends of conduits.

N. For all empty conduits called out on drawings, provide plastic bushings on conduit ends and pullstrings. Attach pull ropes to conductors with basket-weave grips on pulling eyes. Pull cables that share conduit at same time.

O. Provide inserts, hangers, anchors and steel supports as necessary.

P. Provide pull boxes, sized per Code for job conditions as necessary.

3.7 TELEPHONE AND DATA CABLING APPLICATION

A. Provide complete structured cabling systems for telephone and data systems including all cabling, workstation outlets, jacks, terminations, 110 blocks, patch panels, and racks.

B. All cabling for Telephone and Data jacks shall be Category 6 rated with plenum jacket.

C. Each telephone/data outlet indicated on the drawing shall have 1 telephone and 1 data jack. Each jack shall have an RJ45 jack. Provide Category 6 cable from each RJ45 jack to a patch panel in the Comm. Closet in the Supervisors Building. Extend all cabling in 3/4" conduit to Comm. Closet. Provide 1, 19” floor mounted wiring rack and 1, 48 port patch panel. Terminate all telephone and data cabling in patch panel.

3.8 TELEPHONE AND DATA CABLING INSTALLATION

A. Comply with NECA 1.

B. The Contractor shall make all final phone connections and cross connections under the supervision of the ConnDOT telecommunications personnel. The Contractor shall run all phone and cable as directed.

C. General Requirements for Cabling:
   1. Comply with TIA/EIA-568-B.1.
   2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
   3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
   4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
   5. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by
   6. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified

in BICSI ITSIM, "Cabling Termination Practices" Chapter. Use lacing bars and distribution spools.

7. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
8. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
9. In the communications equipment room, install a 10-foot- (3-m-) long service loop on each end of cable.
10. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

D. UTP Cable Installation:
   1. Comply with TIA/EIA-568-B.2.
   2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.

E. Cable and Wire Identification:
   1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
   2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
   3. Exposed Cables: Label each cable at intervals not exceeding 15 feet (4.5 m).
   4. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
   5. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA 606-A, for cables use flexible vinyl or polyester that flexes as cables are bent.

F. Cable Installation Quality Control
   1. Submit all tests to Engineer. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
   2. Perform tests and inspections.
   3. Tests and Inspections:
      a. Visually inspect UTP for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for

compliance with TIA/EIA-568-B.1.

b. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

c. Test UTP copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection

d. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

3.9 INSTALLATION OF LIGHT FIXTURES

A. Do not install fixtures until work of other trades that may damage fixtures is completed.

B. Investigate lighting fixture locations and supports to ensure that no interference exists with hangers, ducts, sprinklers, pipes and other equipment.

C. Do not suspend or support lighting fixtures or safety chains from conduit or duct. Support fixtures with threaded rod from structural members only.

D. Support surface-mounted luminaires at least two concealed points to prevent rotation.

E. Mounting height of suspended or wall-mounted luminaires shall be shown on Drawings.

3.10 INSTALLATION OF LAMINATED PV SYSTEM

A. Follow all manufacturers installation requirements.

B. The laminates must be installed on the new roof pans before the pans are installed.

C. PV laminate should be installed with a J-roller.

D. Pans shall be cleaned prior to laminating PV system to pan with Isopropyl Alcohol mixture of 90% alcohol and 10% water. If pans have been stored outside or have been installed on the roof for more than a few weeks clean panels with a power washer using a mixture made up of 1/4 cup Trisodium phosphate, and 1/2 cup laundry detergent in 5 gallons of water. This solution must be rinsed off thoroughly and cleaned with the alcohol solution.

E. Ground PV system according to NEC article 690. Provide all grounding conductors between ground fault equipment as required.

F. Provide all warning signs according to NEC article 690 at the PV service cabinet, combiners, and inverters. Warning signs shall comply with 29 CFR, Cha[ter XVII, Part 1910.145.

3.11 UNDERGROUND CONDUITS

A. Where nonmetallic underground conduit enters building and continues inside to pull box, cabinet, or other electric apparata, portion through floor or wall and within building shall be rigid galvanized steel. Provide adapter below floor or outside wall to connect plastic and metal conduit.

B. Where underground conduit enters building through membrane waterproofed wall or floor, provide malleable iron seal with gland assembly and adjustable pressure bushings secured to masonry construction with one or more integral flanges. Membrane waterproofing shall be secured to device in watertight manner.

C. Where underground conduit without concrete envelope enters building through non-waterproofed wall or floor, provide schedule 40 galvanized pipe sleeve. Fill space between conduit and sleeve with suitable plastic expansible compound or oakum and lead joint on each side of wall or floor.

D. Excavation, shoring, bracing, backfilling and grading will be provided under Division 2. Trenches shall be evenly graded so that conduits slope uniformly at least 3 inches per 100 feet, without horizontal or vertical waves.

3.12 SLEEVES

A. Provide Schedule 40 steel sleeves as required. Fill slots, sleeves and other openings in floors or walls if not used. Fill spaces in openings after installation of conduit or cable.

B. Fill for floor penetrations shall be fire-resistant, compatible with floor material and finished to prevent passage of water, smoke and fumes. Fill in walls shall be similar to wall material, shall be fire-resistant in fire walls, and shall prevent passage of air, smoke and fumes.

C. Identify unused sleeves and slots for future installation.

D. Lay out conduit and openings in advance, to permit provision in work. Set sleeves and conduit in forms before concrete is poured. Provide remedial work where sleeves and conduits are omitted or improperly placed.

E. Sleeves for conduits that penetrate outside walls, basement slabs, footings and beams shall be waterproof. Extend sleeves in toilet and apparatus rooms floors 2 inches above finished floor.

3.13 GROUNDING

A. Provide equipment grounding system as shown on Drawings. Equipment grounding system shall be designed so metallic structures, enclosures, raceways, junction boxes, outlet boxes, cabinets, machine frames, portable equipment and other conductive items in close proximity with electrical circuits operate continuously at ground potential and provide low impedance path for possible ground fault currents.

B. System shall meet NEC requirements, modified as shown on Drawings and as specified.

C. Provide separate green insulated equipment-grounding conductor for each single or three-phase feeder and each branch circuit. Install grounding conductor in common conduit with related phase or neutral conductors, or both. Parallel feeders installed in more than one raceway shall have individual full size green insulated equipment ground conductors.

D. Determine number and sizes of screw terminals for equipment grounding bars in panelboards and other electrical equipment. Provide screw terminals for active circuits, spares and spaces.

E. Provide green insulated grounding conductor in nonmetallic conduits or ducts unless specified otherwise.

F. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
   1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
   2. Connect grounding conductors to rods using exothermic welds unless otherwise indicated.

G. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
   1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
   2. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.

H. Ground Ring: Install a grounding conductor, electrically connected to each canopy structure and connect to steel column with bolted clamp connector, extending around the perimeter or as indicated on the drawings.
   1. Install grounding conductor not less than No. #2 AWG for ground ring and for taps to building steel.
   2. Bury ground ring not less than 24 inches (600 mm) from canopy foundation and 30” below grade.

I. Grounding Handholes: Install a driven ground rod through handhole floor, close to wall, and set rod depth so 4 inches (100 mm) will extend above finished floor. If necessary, install ground rod before manhole is placed and provide No. #6 AWG bare, copper conductor from ground rod into handhole through a waterproof sleeve in wall. Protect ground rods passing through concrete floor with a double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inches (50 mm) above to 6 inches (150 mm) below concrete. Seal floor opening with waterproof, nonshrink grout.

J. Grounding at foundations for poles and sign structures: Install a driven ground rod and set rod 2" below finished grade. Extend No. #8 AWG ground through foundation and bond to metal poles and structures. Provide 1/2" PVC conduit sleeve stubbed 6" above foundation for ground conductor.

K. PV Grounding: Provide equipment grounding conductor not less than No. #10 AWG for equipment grounding conductor.

L. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions. Test completed grounding system at panels in Power and Communication Cabinets, and at individual ground rods. Perform tests by fall-of-potential method according to IEEE 81. If ground resistance exceeds 10 ohms, notify Engineer promptly inspect all ground connections for proper installation, and include recommendations to reduce ground resistance if resistance still exceeds 10 ohms.

3.14 INSTALLATION OF LIGHTING CONTROL PANEL

A. The contractor shall complete all electrical connections to all control circuits, and override wiring. Meet with the Engineer to determine desired programming of each station lighting control panel. Programs for each station may be different due to potential differences in operating times. Provide programming input data sheets, explain system operation, and facilitate programming as necessary. Program system as directed. The preliminary scheduling is as follows, but should be confirmed by the contractor according to input from Engineer:

B.

Description	ON Event	OFF Event
Normal Lighting (NL)	Dusk per photocell	Dawn per photocell
Timed Lighting (TL)	Dusk per photocell	End of bus operations, 11:00PM
Security Lighting (SL)	Dusk per photocell	After bus operations, 2:00AM

C. Provide a minimum of 4 training hours on the operation and use of the control system distributed among 2 training sessions. Videotape all sessions and turn over videos for future reference.

D. Connect the photocell to the lighting control panel for input into programming.

E. Route all circuits indicated with NL, TL, and SL designations in the panel schedules through a relay in the Lighting Control Panel.

3.15 TRENCHING AND BACKFILL

A. Natural or crushed fine sand, per ASTM C33, shall be placed as shown on the plans.

B. After the excavation is completed, the Contractor shall notify the Engineer; and no conduit or cable shall be placed in the excavated area until the Engineer has approved the depth and cross-section of the excavation.

C. Suitable material removed in making the excavation shall be used for backfill. No stones or coarse material shall be placed adjacent to the conduit or cable. All surplus or unsuitable material shall be removed and disposed of as directed. Should additional material be required for backfilling, it shall be obtained from sources approved by the Engineer.

D. All backfill shall be placed in layers of not more than 6 inches in depth after compaction and shall be thoroughly compacted by means of vibrators or by pneumatic tampers. Hand tampers shall be used only with permission of the Engineer. The backfill shall be brought to the surface of the surrounding ground and neatly graded, except that where excavation is required in existing lawn or grass areas, the backfill shall be brought to within 4 inches of the top of the trench; and the remainder shall be filled with topsoil to 3/4 inch above adjacent areas as directed by the Engineer. Marking tape shall be installed in the trench at the depth as indicated on the drawings or as directed by the Engineer.

E. Where trenching occurs in riprap or crushed stone areas, the surface material shall be replaced in kind. Where trenching in bituminous concrete sidewalk or paved areas, the trench shall be sawcut and backfilled to within the depth from the surface required to replace the removed sidewalk or pavement structure, which shall then be replaced. The edges of all trenches in paved surfaces shall be sawcut to neat lines prior to paving. All trenches in existing paved surfaces, which parallel the curb, shall be no more than 1 1/2 feet from the curb, or when no curb is present, the apparent edge of road. The exception shall be to avoid existing appurtenances such as catch basins, water gates, manholes etc.

F. Where a trench is placed through a concrete sidewalk, the entire section of sidewalk between joints shall be replaced, unless otherwise directed by the Engineer.

G. Trenches shall be evenly graded so that conduits slope uniformly at least 3 inches per 100 feet, without horizontal or vertical waves.

3.16 INSTALLATION OF EQUIPMENT

A. Avoid interferences with structure and with work of other Sections. Preserve adequate headroom and clear doors and passageways, to satisfaction of Engineer and as required by codes. Installation shall permit clearance for access to equipment for repair, servicing and replacement.

B. Install equipment to distribute equipment loads properly on building structural members provided for equipment support under other Sections. Roof mounted equipment shall be installed and supported on structural steel provided under other Sections.

C. Provide suspended platforms, strap hangers, brackets, shelves, stands or legs as necessary for floor, wall or ceiling mounting of equipment provided under this Section as shown on Drawings and as specified.

D. Provide steel supports and hardware for proper installation of hangers, anchors, guides, and other devices.

E. Provide catalog cuts, weights, and other pertinent data required for proper coordination of equipment support provisions and installation.

F. Structural steel and hardware shall meet ASTM Standard Specifications requirements. Use of steel and hardware shall meet requirements of Code of Practice of American Institute of Steel Construction.

G. Verify site conditions and dimensions of equipment to ensure access for proper installation of equipment without disassembly that nullifies warrantee. Report in writing to Engineer, before purchase or shipment of equipment involved, on conditions that may prevent proper installation.

H. Repair damage to galvanized coatings with approved aluminum paint.

I. Where wire sizes are larger than equipment terminations in lighting control panels, or lighting fixtures, the contractor shall reduce conductor size within the equipment enclosure as necessary.

J. Where Equipment conduit termination knockouts and threaded hubs have sizes smaller than conduit called out on the drawings, provide cast aluminum boxes with weatherproof and direct burial covers at equipment to transition conduit sizes as necessary.

3.17 OCCUPANCY SENSOR

A. Install occupancy sensor according to manufacturer's instructions. Adjust time delay sensitivity to 15 minute or as directed by Engineer.

B. Mount remote power packs for ceiling sensors in junction box and label "OS Power Pack." Route circuiting through power pack and connect any manual switches downstream of the power pack so sensor controls power to switch. Provide low voltage cabling between sensor and power pack according to manufacturers requirements and mount cabling in 3/4" conduit.

END OF SECTION

321313 CONCRETE SIDEWALK

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. The general provisions of the Contract including General and Supplementary Conditions, and General Requirements apply to work specified in this Section.

B. Form 816 shall mean the State of Connecticut, Department of Transportation Standard Specifications for Roads, Bridges and Incidental Construction, Form 816 or its latest edition and any supplemental specifications.

1.2 SECTION INCLUDES

A. Concrete sidewalk, and reinforced concrete sidewalk including expansion joint materials and base materials.

1.3 RELATED WORK SPECIFIED IN OTHER SECTIONS

A. Section 32 14 13 – Concrete Paving Brick

B. Section 32 14 40 – Stone Block Sidewalk

C. Section 32 17 26 – Tactile Warning

1.4 QUALITY ASSURANCE

A. Testing: Testing will be required. Any retesting of unacceptable work will be paid for by the Contractor. See the General Conditions for complete description of inspection and testing requirements.

B. Materials and methods of constructions: shall comply with the following standards:

1. American Society for Testing and Materials (ASTM).

2. American Concrete Institute (ACI).

3. State of Connecticut DOT Standard Specifications. (ConnForm 816).

C. Do not change source or brands of cement, aggregate materials, admixtures or batching plant during the course of the work.

D. Drainage: Typical cross slope of pavements is 2.0% unless otherwise indicated. In no case will water be allowed to stand or puddle on any finished pavement.

E. Sample Panel: Construct 12’ x 12’ sample panel of plain concrete walk and tooling to demonstrate concrete color, texture, finish and joint treatments.

1.5 SUBMITTALS

A. Submit certified test reports and materials certificates on all concrete materials, including mix design test. Submit materials certificates and product data on all concrete reinforcement, forming accessories, admixtures, and joint system components. Certify that material items comply with specified requirements. Conform to General Conditions.

B. Submit concrete mix designs for all types of concrete specified.

C. Submit batch slips if required by the Engineer certifying concrete mix, air content, slump, and time of loading.

D. Submit shop drawings detailing specific score and expansion joint layout.

1.6 SUBMITTALS FOR MAINTENANCE

A. Sealant: provide a three (3) gallon pail of joint sealant as specified.

1.7 PROJECT CONDITIONS

A. Establish and maintain the required lines and grades during construction operations.

B. Do not install concrete work over wet, saturated, muddy, or frozen base.

C. Do not install concrete when air temperature is below 40 degrees F. Use of calcium chloride, salt, or any other admixture to prevent concrete from freezing is prohibited.

D. Protect adjacent work from damage, splatter, and all other concrete operations.

E. Provide temporary barricades and warning lights as required for protection of project work and public safety.

PART 2 - PRODUCTS

2.1 CONCRETE

A. Conform to the requirements of Form 816, Section M.03.01, Class 'F' Type II A Portland Cement and ASTM C-94. Batch mixing at site not acceptable.

B. Compressive Strength: 4,000 psi at 28 days.

C. Entrained Air: 5 to 7%. A/E Agent shall conform to ASTM C-260.

D. Water Reducing Admixture: ASTM C-494.

E. Reactive aggregates and calcium chloride are not allowed.

F. No slag or other replacement materials will be allowed.

2.2 STEEL REINFORCING AND DOWELS: Conform to ASTM A-615, Grade 60; epoxy coated cut bars true to length with ends square and free of burrs. Provide end caps for each expansion joint dowel.

2.3 WELDED WIRE FABRIC (WWF): Welded plain cold drawn steel wire fabric for concrete reinforcement (ASTM A-185). Flat sheets required, 4X4 – W2.9xW2.9, galvanized .

2.4 EXPANSION JOINT

A. Sealtight Fibre expansion joint.
   1. Thickness:
      a. 1/4" thick between abutting sidewalk sections
      b. 1/2" thick between vertical elements and sidewalk sections
   2. Depth: to match full depth of concrete sidewalk pavement section.

2.5 SEALANT

A. Sealant shall be two component polyurethane elastomeric type complying with FS-TT-S-00227E, Type I, Class A, self-leveling, and designed for foot traffic.

B. Color to match concrete sidewalk.

PART 3 - EXECUTION

3.1 CONCRETE PAVEMENT

A. General: Install concrete pavement and improvements to the lines, dimensions and grades shown on the Drawings. At points where changes in rates of grades is more than 2%, introduce vertical curve. No abrupt changes in grade will be accepted.

B. Conform to the applicable provisions of Section 9.21 of Form 816.

3.2 PREPARATORY WORK

A. Insure that all improvements and related work are accurately and properly positioned to specified line and grade prior to concrete placement. Poor or incorrect positioning will cause rejection of pavement.

B. Coordinate testing of base courses with the Engineer, as specified. Do not install forms until scheduled testing procedures are complete.

C. Verify that manholes, handholes, valves, grates and other such units are at their proper finished grade elevations. Set flush with the surface of adjoining pavement.

D. Verify that the gravel subbase material is true to line and grade, and is compacted to the required density. Subbase surface is to be smooth, free of irregularities, depressions or unsuitable material which cannot compact or will become impervious. Insure proper

drainage at all times. If required, form, shape and roll the subbase with a 10 ton roller or equivalent.

E. Insure thorough and proper compaction around all manholes, structures, utility valves and other improvements that project above base material.

F. Verify that the granite curbing is installed at the required depth, is true to line and grade.

G. Re-install or reset elevation as required of monuments or property markers in original locations. Coordinate re-installation with the owning authority.

3.3 FORMS: Conform to Article 9.21.03-3 of Form 816.

A. Forms shall be cleaned and oiled before concrete is placed to assure separation from concrete without damage.

B. Forms shall be true to line and grade and radius shown. Poorly formed curves will not be accepted.

C. Approval of formwork is required prior to pour.

3.4 EXPANSION JOINTS: Use specified expansion joint filler. Provide expansion joints wherever the pavement abuts the building, structures, curbs, walls, columns, hydrants, and other fixed improvements, and as indicated on the Drawings, 20' O.C. maximum. Approval of layout required prior to pour.

A. Install dowels and end caps where and as indicated at all expansion joints. Haunch pavements as detailed.

B. Joints shall be constructed true to line and grade; cleanly executed. Hold joint filler flush with top of concrete surface. Poorly aligned or positioned joints are just cause for rejection of the work.

3.5 REINFORCEMENT

A. Welded wire fabric (WWF): Place wire fabric with 3" edge laps. Fabric in slabs on grade shall be located not more than 2" below top of slab throughout by adequate means, other than pulling up. Where only fabric is required in slabs on grade, lay flat sheets of fabric on top of layer of fresh concrete of required thickness, followed immediately by placing additional concrete.

B. Provide and place steel reinforcing as indicated. Properly locate and provide for the installation of inserts, dowels, metal ties, etc. and for the attachment of other work.

3.6 CONCRETE PLACEMENT

A. Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete", and as specified.

B. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing. In cold weather comply with ACI 306, "Recommended Practice for Cold Weather Concreting". In hot weather comply with ACI 305, "Recommended Practice for Hot Weather Concreting".

C. Thoroughly moisten base to provide a uniform dampened condition at the time concrete is placed. Verify manholes or other structures are at required finish elevation and alignment before placing concrete.

D. Protect surrounding surfaces from splatter during concrete placement. Place and spread concrete to the full depth of the forms. Use only square-end shovels or concrete rakes for hand-spreading and consolidating concrete. Exercise care during spreading and consolidating operations to prevent segregation of aggregate and dislocation of reinforcement.

E. Work the external surface of vertical faces to force the coarse aggregate from the surface and thoroughly work the mortar against the forms. Conform to Article 6.01.03-21 of Form 816.

F. Place concrete in a continuous operation between expansion joints. Provide construction joints when sections cannot be placed continuously.

G. Place concrete in one course, monolithic construction, for the full width and depth of concrete work.

H. Strike-off and bull-float concrete after consolidating. Level ridges and fill voids. Check surface with a 10'-0" straight edge. Fill depressions and refloat repaired areas. Darby the concrete surface to provide a smooth level surface ready for finishing.

3.7 CONTROL JOINTS

A. Create joints using a scoring tool a minimum of 12” long. Use tooling method to install control joints throughout the project unless an alternative method is approved in writing prior to concrete pour.

B. Cut between the expansion joints to complete the pattern which is indicated on the drawings. Scoring joints must align with designated concrete paving brick patterns/joints.

C. Where no pattern is indicated in the drawings, cut between the expansion joints to create equally dimensioned panels. Conform to specified concrete joint placement details.

D. Tool joints while concrete is workable. Avoid depressing wings of scoring tool into joint. Trowel out any wing marks. Conform to the specified detail for depth of cut, 1/4” radius rounding typical.

3.8 EXPANSION JOINTS: Conform to Section 4.01.03-F6 (b) of Form 816 and to the specified concrete joint details and joint placement details.

3.9 FINISH

A. Exposed flat surfaces shall be medium broom finished perpendicular to long axis of pavement as approved in sample panel.

B. At handicap ramps, provide heavy bristle finish with marks perpendicular to the surface drainage of the ramp.

C. All exposed vertical faces are to receive a Rubbed Finish conforming to Article 6.01.03-21 of Form 816. Eliminate all blemishes, pock marks, and honeycombing.

3.10 CURING

A. Concrete shall be cured and protected as specified in accordance with Article 4.01.03-F7, Form 816. Under normal weather conditions, the Contractor shall have the option upon approval of the Owner's Representative of using the methods listed in Form 816 for standard concrete walks.

B. Cold Weather Protection: Conform to Article 816 4.01.03-F7.

3.11 BACKFILL: with suitable materials, compacted and finished flush with the top of the pavement as indicated. No material shall be placed until it can be tamped thoroughly without injury to the pavement or ramp. Material shall be deposited in 6" maximum layers and thoroughly compacted.

3.12 SEALANT INSTALLATION

A. Install joint sealants in all expansion joints in accordance with manufacturer's installation instructions. Remove dust, dirt and loose material. Clean and prime joints.

B. Apply sealants in continuous beads, without open joints, voids, or air pockets. Hand tool and finish all joints.

C. Confine materials to joint areas with masking tape or other precautions. Insure joint sealing is cleanly executed with no override onto adjacent pavement.

D. Remove excess compound promptly as work progresses and clean adjoining surfaces. Protect until full cured.

E. In rough surfaces or joints of uneven widths, hold joint sealant well back into joints.

3.14 PROTECTION/CLEANUP

A. Thoroughly clean all surfaces and keep clean until the completion of the project. Remove from site all excess materials, debris, and equipment.

B. Protect concrete walks until completion of the Contract. Repair/replace damaged areas as directed. Prevent all construction and vehicular traffic for a minimum of 14 days after pour.

END OF SECTION

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 follows and as limited in the Special Provision "Prosecution and Progress":

ROUTE 72

3 Lane Section:
The Contractor shall maintain and protect existing traffic operations on Route 72. During stage construction, existing traffic operations will be considered as shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall maintain and protect three lanes of through traffic on a paved travelpath not less than 33 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 two lanes of through traffic on a paved travelpath not less than 22 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 one lane of through traffic on a paved travelpath not less than 11 feet in width.

2 Lane Section:
The Contractor shall maintain and protect existing traffic operations on Route 72. During stage construction, existing traffic operations will be considered as shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall maintain and protect two lanes of through traffic on a paved travelpath not less than 22 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 one lane of through traffic on a paved travelpath not less than 11 feet in width.

ROUTE 9

The Contractor shall maintain and protect existing traffic operations on the Route 9. During stage construction, existing traffic operations will be considered to be as shown on the Maintenance and Protection of Traffic Plans contained in the contract plans.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall maintain and protect two lanes of through traffic on a paved travelpath not less than 22 feet in width.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor will be allowed to maintain and protect one lane of traffic on a paved travelpath not less than 11 feet in width.

RAMPS AND TURNING ROADWAYS

The Contractor shall maintain and protect the existing number of lanes of traffic, including turning lanes at intersections, each lane on a paved travelpath not less than 11 feet in width. During stage construction, the existing number of lanes of traffic will be considered to be the number of lanes shown on the Maintenance and Protection of Traffic Plans contained in the contract plans.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor will be allowed to maintain and protect one lane of traffic on a paved travelpath not less than 11 feet in width.

Also excepted therefrom will be those periods during the allowable periods when the Contractor is actively engaged in the removal/installation of structural steel at which time the Contractor will be allowed to halt traffic on Route 71 and its turning roadways to Route 9 for a period of time not to exceed ten minutes. The Contractor shall allow all stopped vehicles to proceed through the work area before halting traffic for another ten minute period.

Excepted therefrom shall be those times when the Chestnut Street Ramp is closed to traffic as shown on the Contract Plans.

ROUTE 71

The Contractor shall maintain and protect existing traffic operations on Route 71. During stage construction, existing traffic operations will be considered as shown on the Maintenance and Protection of Traffic plans contained in the contract plans.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor is actively working, at which time the Contractor shall maintain and protect two lanes of through traffic in each direction on a paved travelpath not less than 22 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 one lane of through traffic in each direction on a paved travelpath not less than 11 feet in width.

Excepted therefrom will be those periods, during the allowable periods, when the Contractor will be permitted to halt traffic for a period not to exceed ten minutes. The Contractor shall allow all stopped vehicles to proceed through the work area before halting traffic for another ten minute period.

Also excepted therefrom will be those periods during the allowable periods when the Contractor is actively engaged in the removal/installation of structural steel at which time the Contractor will be allowed to halt traffic on Route 71 and its turning roadways to Route 9 for a period of time not to exceed ten minutes. The Contractor shall allow all stopped vehicles to proceed through the work area before halting traffic for another ten minute period.

ALL OTHER ROADWAYS

The Contractor shall maintain and protect at least one lane of through traffic in each direction and turning lanes at intersections, each lane on a paved travelpath 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 will be allowed to maintain and protect at least an alternating one-way traffic operation on a paved travelpath not less than 12 feet in width. The length of the alternating one-way traffic operation shall not exceed 300 feet.

PEDESTRIAN ACCESS

The Contractor shall maintain pedestrian access to and egress from all commercial and business establishments and residences throughout the project limits. The Contractor will be allowed to close said walkways to perform the required work during those periods when the businesses are closed unless permission is granted from the business owner to close the accessway during business hours. If a temporary closure of an access to a commercial or business establishment or residence is necessary, the Contractor shall coordinate with the Engineer and owner to determine the time period of the closure.

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 Engineer and owner to determine the time period of the closure.

Article 9.71.03 - Construction Method is supplemented as follows:

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 existing signs and sign supports as many times as deemed necessary and install temporary sign supports and foundations if necessary and as directed by the Engineer. The temporary relocation of any existing signs and supports, and the furnishing, installation and removal of any temporary supports and foundations, shall be paid for under the item "Maintenance and Protection of Traffic."

When all work is completed, the Contractor shall remove temporary and existing signs and install new signs as shown on the Signing and Pavement Marking Plans contained in the contract plans.

The Contractor shall cover all existing signs within the limits of lane closure in conflict with the construction signage and traffic operations then in progress. The Contractor shall then uncover all signs during normal traffic operations.

TRAFFIC SIGNALS

The Contractor shall keep each traffic signal in the project limits operational at all times during construction in accordance with the Special Provision "Temporary Signalization."

The Contractor shall install final pavement markings and signing prior to the proposed traffic signal being made fully operational.

REQUIREMENTS FOR WINTER

The Contractor shall schedule a meeting with representatives of the Engineer, Maintenance, and Traffic to determine what interim traffic control measures the Contractor must accomplish for the winter to provide safety to the motorist and permit adequate snow removal procedures.

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. Traffic Cones (42" high) or Traffic Drums are to be utilized to continue a lane closure on expressways.

PAVEMENT MARKINGS – ROUTE 72, ROUTE 72 OFF-RAMP, ROUTE 9 ON-RAMP

During construction, the Contractor shall maintain all pavement markings throughout the limits of the project.

Disposition of Existing Conflicting Pavement Markings

In areas where the existing pavement will remain upon completion of the project, the Contractor shall install Preformed Black Line Mask Pavement Marking Tape to cover the existing conflicting pavement markings for shifting traffic during stage construction.

In areas where the existing or temporary pavement will ultimately be milled and resurfaced or fully reconstructed, the Contractor shall remove the existing conflicting pavement markings for shifting traffic during stage construction.

In areas where the pavement is an intermediate course of bituminous concrete pavement of the final roadway composition, the Contractor shall remove the existing conflicting pavement markings for shifting traffic during stage construction.

Interim Pavement Markings

The Contractor shall install painted pavement markings, which shall include lane lines (broken lines), shoulder edge lines, stop bars, lane-use arrows and gore markings, on each intermediate course of bituminous concrete pavement and on any milled surface by the end of the work day/night. All painted pavement markings will be paid under the appropriate items.

If the Contractor does not install permanent Epoxy Resin Pavement Markings by the end of the work day/night on exit ramps where the final course of bituminous concrete pavement has been installed, the Contractor shall install temporary 12 inch wide white stop bars. The temporary stop bars shall consist of Temporary Plastic Pavement Marking Tape and shall be installed by the end of the work day/night. 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 these markings when the permanent Epoxy Resin Pavement Markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

During stages that are shorter than six months and will not extend into winter, preformed plastic pavement markings shall be used on Route 72 and hot-applied painted pavement markings shall be used on Route 72 off-ramp and Route 9 on-ramp, unless directed otherwise by the Engineer.

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

Final Pavement Markings

In accordance with the Special Provision contained elsewhere in the contract documents, the Contractor shall install inlaid Plastic Pavement Markings at the time of installation of the final course of bituminous concrete pavement.

In accordance with Section 12.10 entitled "Epoxy Resin Pavement Markings, Symbols and Legends," the Contractor should install permanent Epoxy Resin Pavement Markings on the final course of bituminous concrete pavement by the end of the work day/night. If the permanent pavement markings are not installed by the end of the work day/night, then temporary stop bars shall be installed as described above and the permanent Epoxy Resin Pavement Markings shall be installed by the end of the work day/night on Friday of that week.

NOTE: Painted pavement markings will not be allowed as a substitution for either the permanent inlaid Plastic Pavement Markings or the permanent Epoxy Resin Pavement Markings on the final course of bituminous concrete pavement.

PAVEMENT MARKINGS – NON-LIMITED ACCESS MULTI-LANE 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.

Disposition of Existing Conflicting Pavement Markings

In areas where the existing pavement will remain upon completion of the project, the Contractor shall install Preformed Black Line Mask Pavement Marking Tape to cover the existing conflicting pavement markings for shifting traffic during stage construction.

In areas where the existing or temporary pavement will ultimately be milled and resurfaced or fully reconstructed, the Contractor shall remove the existing conflicting pavement markings for shifting traffic during stage construction.

In areas where the pavement is an intermediate course of bituminous concrete pavement of the final roadway composition, the Contractor shall remove the existing conflicting pavement markings for shifting traffic during stage construction.

Interim Pavement Markings

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

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

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

Final Pavement Markings

In accordance with Section 12.10 entitled "Epoxy Resin Pavement Markings, Symbols, and Legends," the Contractor should install permanent Epoxy Resin Pavement Markings on the final course of bituminous concrete pavement by the end of the work day/night. If the permanent 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 permanent Epoxy Resin 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 permanent Epoxy Resin Pavement Markings are installed. The cost of furnishing, installing and removing the Temporary Plastic Pavement Marking Tape shall be at the Contractor's expense.

NOTE: Painted pavement markings will not be allowed as a substitution for either the permanent Epoxy Resin Pavement Markings or the Temporary Plastic Pavement Marking Tape on the final course of bituminous concrete pavement.

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 20 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 may 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, (see Section 9), 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.

SECTION 2. INSTALLING AND REMOVING TRAFFIC CONTROL PATTERNS

2.a) Lane Closures shall be installed beginning with the advanced warning signs and proceeding forward toward the work area.

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

2.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.

2.d) Under certain situations when the safety of the traveling public and/or that of the workers may be compromised due to conditions such as traffic volume, speed, roadside obstructions, or sight line deficiencies, as determined by the Engineer and/or State Police, traffic may be briefly impeded while installing and/or removing the advanced warning signs and the first ten traffic cones/drums only. Appropriate measures shall be taken to safely slow traffic. If required, State Police may use traffic slowing techniques, including the use of Truck Mounted Impact Attenuators (TMAs) as appropriate, for a minimum of one mile in advance of the pattern starting point. Once the advanced warning signs and the first ten traffic cones/drums are installed/removed, the two TMAs and sign crew should continue to install/remove the pattern as described in Section 4c and traffic shall be allowed to resume their normal travel.

2.e) The Contractor must adhere to using the proper signs, placing the signs correctly, and ensuring the proper spacing of signs.

2.f) Additional devices are required on entrance ramps, exit ramps, and intersecting roads to warn and/or move traffic into the proper travelpath 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.

2.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.

2.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 3. USE OF HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW

3.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.).

3.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.

3.c) The Flashing Arrow shall not be used on two lane, two-way roadways for temporary alternating one-way traffic operations.

3.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.

3.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.

3.f) If the required number of Flashing Arrows is not available, the traffic control pattern shall not be installed.

SECTION 4. USE OF TRUCK MOUNTED IMPACT ATTENUATOR VEHICLES (TMAs)

4.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.

4.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.

4.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, both 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.

4.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 may 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.

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

4.f) TMAs should be paid in accordance with how the unit is utilized. When it is used as a TMA and is in the proper location as specified, then it should be paid at the specified hourly rate for "Type 'D' Portable Impact Attenuation System". When the TMA is used as a Flashing Arrow, it should be paid at the daily rate for "High Mounted Internally Illuminated Flashing Arrow". If a TMA is used to install and remove a pattern and then is used as a Flashing Arrow, the unit should be paid as a "Type 'D' Portable Impact Attenuation System" for the hours used to install and remove the pattern, typically 2 hours (1 hour to install and 1 hour to remove), and is also paid for the day as a "High Mounted Internally Illuminated Flashing Arrow".

4.g) If the required number of TMAs is not available, the pattern <u>shall</u> <u>not</u> be installed.

SECTION 5. USE OF STATE POLICE OFFICERS

5.a) On limited access highways, the Engineer may determine that State Police Officers will be utilized for regional work zone traffic safety and enforcement operations in addition to project-related work zone assignments. State Police Officers shall be uniformed off-duty sworn Connecticut State Police Officers. Their services will also include the use of official State Police vehicles and associated equipment. State Police Officers will be used on all limited access highways. State Police Officers will not be used on non-limited access highways unless specifically under their jurisdiction or authorized in writing by the Engineer. State Police Officers with official State Police vehicles will be used at such locations and for such periods as the Engineer deems necessary to control traffic operations and promote increased safety to motorists through the construction sites.

5.b) On a weekly basis, the Contractor shall submit to the Engineer the state police request form (DPS-0691-C) as an indication of their scheduled operations for the following week. This form shall be submitted no later than Wednesday Morning of the week prior to the scheduled operations. The Engineer shall review this schedule and approve the type and number of Officers required by signing off under the "Completed by DOT's Authorized Representative" line on Department of Public Safety Form DPS-0691-C. Once the Engineer has approved the number of Officers requested the Engineer will fax the order to the Department of Public Safety's Overtime Office.

5.c) Prior to the start of operations, a meeting will be held with the Contractor, Trooper in charge and Engineer to review the Trafficperson operations, lines of responsibility, and operating guidelines which will be used for the scheduled work.

5.d) At least one Officer should 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. Certain situations may require State Police presence, if one is available, even though the general guidelines above indicate otherwise. 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.

5.e) Once the pattern is in place, the State Police Officer should be positioned in a non-hazardous location at the beginning of the pattern or at one of the work areas not protected by a TMA. If traffic backs up beyond the beginning of the pattern, then the State Police Officer should be repositioned prior to the backup to give warning to the oncoming motorists. Where State Police Officer and TMA are in close proximity to each other, the TMA should be placed to protect the State Police Officer's vehicle from oncoming traffic.

5.f) Other functions of the State Police Officer(s) shall include:

- *Assisting entering/exiting construction vehicles within the work area.
- *Enhancing worker visibility/safety for workers in close proximity to the open travel lane(s).
- Speed control of traffic within the work area.
- Enforcement of speed and other motor vehicle laws within the work area.

Typically, the State Police Officer should be out of the vehicle for the functions marked with an asterisk (*).

5.g) State Police Officers assigned to a work site are to only take direction from the Engineer.

5.h) **There will be no separate payment to the Contractor for State Police Services. The direct cost of such services will be paid by the Department. Indirect costs associated with scheduling and coordinating State Police shall be included under the Item – Maintenance and Protection of Traffic.**

SECTION 6. USE OF (REMOTE CONTROLLED) CHANGEABLE MESSAGE SIGNS

6.a) For lane closures on limited access roadways, one Changeable Message Sign shall be used in advance of the traffic control pattern. Prior to installing the pattern, the Changeable Message Sign shall be installed and in operation, displaying the appropriate lane closure information (i.e.: Left Lane Closed - Merge Right). The Changeable Message Sign 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 Changeable Message Sign 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.

6.b) On non-limited access roadways, the use of Changeable Message Signs for lane closures is optional. The roadway geometry, sight line distance, and traffic volume should be considered in the decision to use the Changeable Message Sign.

6.c) The advance Changeable Message Sign is typically placed off the right shoulder, 5 feet from the edge of pavement. In areas where the Changeable Message Sign 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 Changeable Message Sign shall be adequately protected if it is used for a continuous duration of 36 hours or more.

6.d) When the Changeable Message Signs 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.

6.e) The Changeable Message Sign generally should not be used for generic messages (ex: Road Work Ahead, Bump Ahead, Gravel Road, etc.).

6.f) The Changeable Message Sign 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).

6.g) 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.

6.h) Section 11 contains the messages that are allowed on the Changeable Message Sign. 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.

6.i) If the required number of Changeable Message Signs is not available, the pattern shall not be installed.

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

7.a) (Remote Controlled) Changeable Message Signs with Radar shall be used when specified, or as directed by the Engineer.

7.b) The typical placement of a (Remote Controlled) Changeable Message Sign with Radar is in the work zone portion of the traffic control pattern.

7.c) The typical usage of the (Remote Controlled) Changeable Message Sign with Radar is to display a message when a preset speed is exceeded. The sign will blank when no vehicles are present.

7.d) The preset speed for activating the message should be set 5-10 MPH above the posted, or desired, speed.

7.e) Section 12 contains the messages that are allowed on the (Remote Controlled) Changeable Message Sign with Radar. 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 TRAFFIC DRUMS AND TRAFFIC CONES

8.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.

8.b) Traffic drums shall be used in place of traffic cones in traffic control patterns that are in effect for more than a 72-hour duration.

8.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.

8.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 9. GENERAL

9.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.

9.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.

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

9.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 10. WORK ZONE SAFETY MEETING AGENDA

1) Review Project scope of work and time.
2) Review Section 1.08, Prosecution and Progress of the Special Provisions.
3) Review Section 9.70, Trafficperson of the Specifications.
4) Review Section 9.71, Maintenance and Protection of Traffic of the Special Provisions, including “Work Zone Safety Procedures”.
5) Review Contractor’s schedule and method of operations.
6) Review areas of special concern: ramps, turning roadways, medians, lane drops, etc.

7) Open discussion of work zone questions and issues.

8) Discussion of review and approval process for changes in contract requirements as they relate to work zone areas.

SECTION 11. WORK ZONE SAFETY PROCEDURES - ALLOWABLE MESSAGES FOR CHANGEABLE MESSAGE SIGNS

Message No.	Frame 1	Frame 2	Message No.	Frame 1	Frame 2
1	LEFT LANE CLOSED	MERGE RIGHT	9	LANES CLOSED AHEAD	REDUCE SPEED
2	2 LEFT LANES CLOSED	MERGE RIGHT	10	LANES CLOSED AHEAD	USE CAUTION
3	LEFT LANE CLOSED	REDUCE SPEED	11	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

SECTION 12. WORK ZONE SAFETY PROCEDURES - ALLOWABLE MESSAGES FOR CHANGEABLE MESSAGE SIGN WITH RADAR

Message No.	Frame 1	Frame 2	Message No.	Frame 1	Frame 2
1	TOO FAST	SLOW DOWN	4		
2	TOO FAST SLOW DOWN		5		
3	YOU'RE SPEEDING	FINES DOUBLE	6		

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. A CHANGEABLE MESSAGE SIGN MAY BE UTILIZED ONE HALF TO ONE MILE IN ADVANCE OF THE LANE CLOSURE TAPER.
5. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 72 HOURS, THEN TRAFFIC DRUMS SHALL BE USED IN PLACE OF TRAFFIC CONES.
6. ANY LEGAL SPEED LIMIT SIGNS WITHIN THE LIMITS OF A ROADWAY / LANE CLOSURE AREA WILL BE COVERED WITH AN OPAQUE MATERIAL WHILE THE CLOSURE IS IN EFFECT AND UNCOVERED WHEN THE ROADWAY / LANE CLOSURE IS REOPENED TO ALL LANES OF TRAFFIC.
7. IF THIS PLAN REMAINS IN CONTINUOUS OPERATION FOR MORE THAN 36 HOURS, THEN THE EXISTING CONFLICTING PAVEMENT MARKINGS SHALL BE ERADICATED OR COVERED AND TEMPORARY PAVEMENT MARKINGS THAT DEPICT THE PROPER TRAVELPATHS SHALL BE INSTALLED.
8. DISTANCES BETWEEN SIGNS IN THE ADVANCE WARNING AREA MAY BE REDUCED TO 200' ON LOW SPEED URBAN ROADS (SPEED LIMIT < 40 MPH).
9. FOR LANE CLOSURES ONE (1) MILE OR LONGER, A "REDUCE SPEED TO 45 MPH" SIGN SHALL BE PLACED AT THE ONE MILE POINT AND AT EACH MILE THEREAFTER.
10. 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.
11. A CHANGEABLE MESSAGE SIGN SHALL BE INSTALLED ONE HALF TO ONE MILE IN ADVANCE OF THE LANE CLOSURE TAPER.

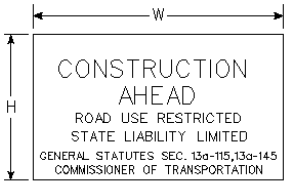
REV'D 1-02

CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

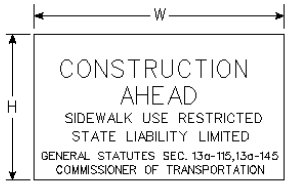
CONSTRUCTION
TRAFFIC CONTROL PLAN
NOTES

NOTES.DGN

SERIES 16 SIGNS



		W	H
16-E	80-1605	84"	60"
16-H	80-1608	60"	42"
16-M	80-1613	30"	24"



		W	H
16-S	80-1619	48"	30"

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 RAMPS PRIOR TO OR WITHIN THE WORK ZONE LIMITS.

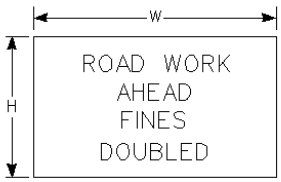
THE LOCATION OF SERIES 16 SIGNS CAN BE FOUND ELSEWHERE IN THE PLANS OR INSTALLED AS DIRECTED BY THE ENGINEER.
SIGNS 16-E AND 16-H SHALL BE POST MOUNTED.
SIGN 16-E SHALL BE USED ON ALL EXPRESSWAYS.
SIGN 16-H SHALL BE USED ON ALL RAMPS, OTHER STATE ROADWAYS, AND MAJOR TOWN/CITY ROADWAYS.
SIGN 16-M SHALL 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 WHEN THERE ARE WORKERS ON THE HIGHWAY OR WHEN THERE IS OTHER THAN EXISTING TRAFFIC OPERATIONS.

THE "ROAD WORK AHEAD, FINES DOUBLED" REGULATORY SIGNS SHALL NOT BE INSTALLED ON TOWN ROADS.

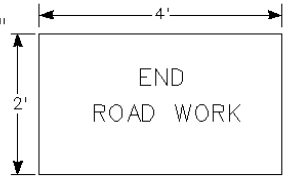
THE "ROAD WORK AHEAD FINES DOUBLED" REGULATORY SIGN SHALL BE PLACED AFTER THE SERIES 16 SIGN AND IN ADVANCE OF THE "ROAD WORK AHEAD" SIGN.



	W	H
31-1906	48"	42"

"END ROAD WORK" SIGN

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



80-9612

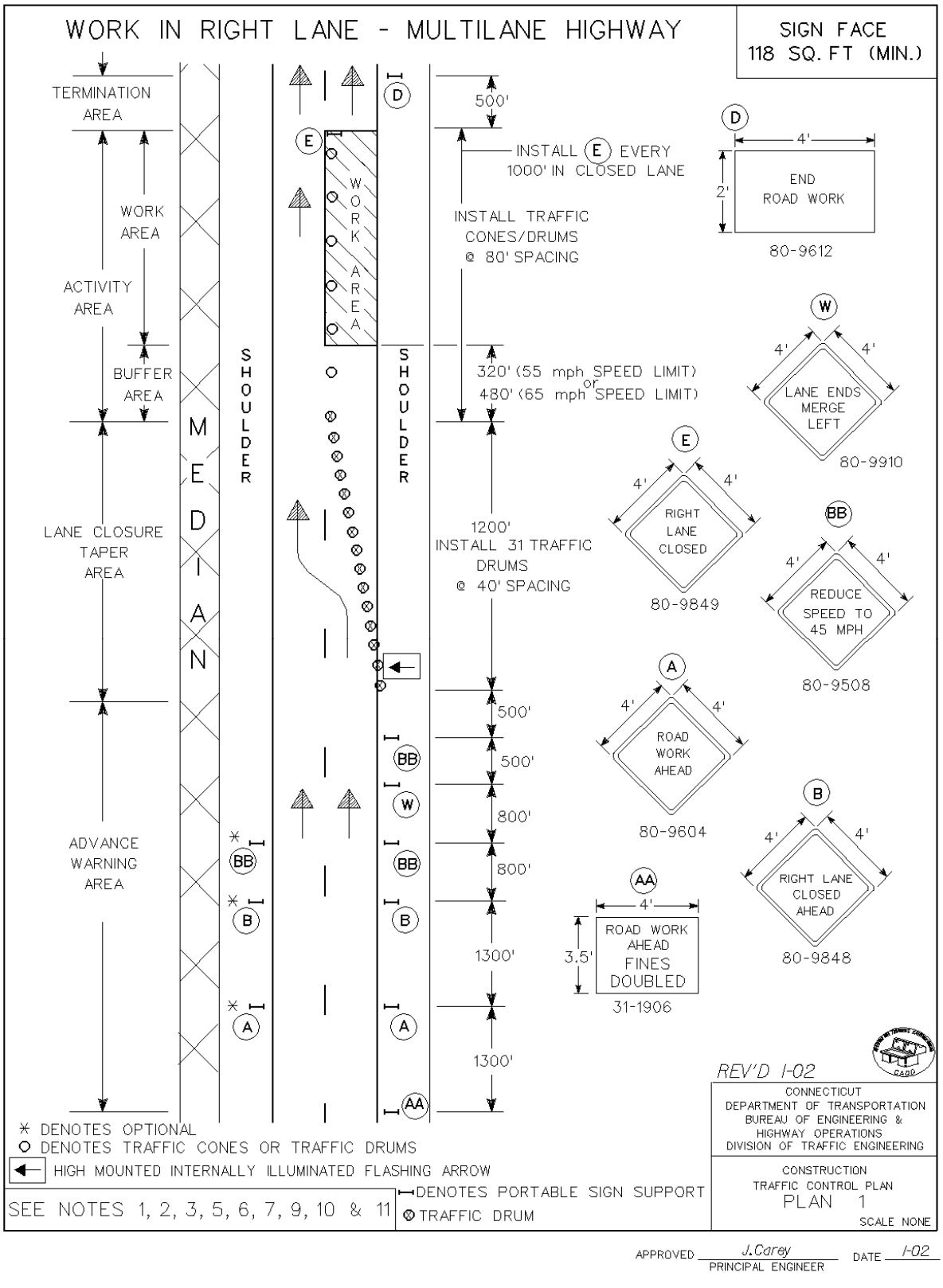
REV'D 1-02

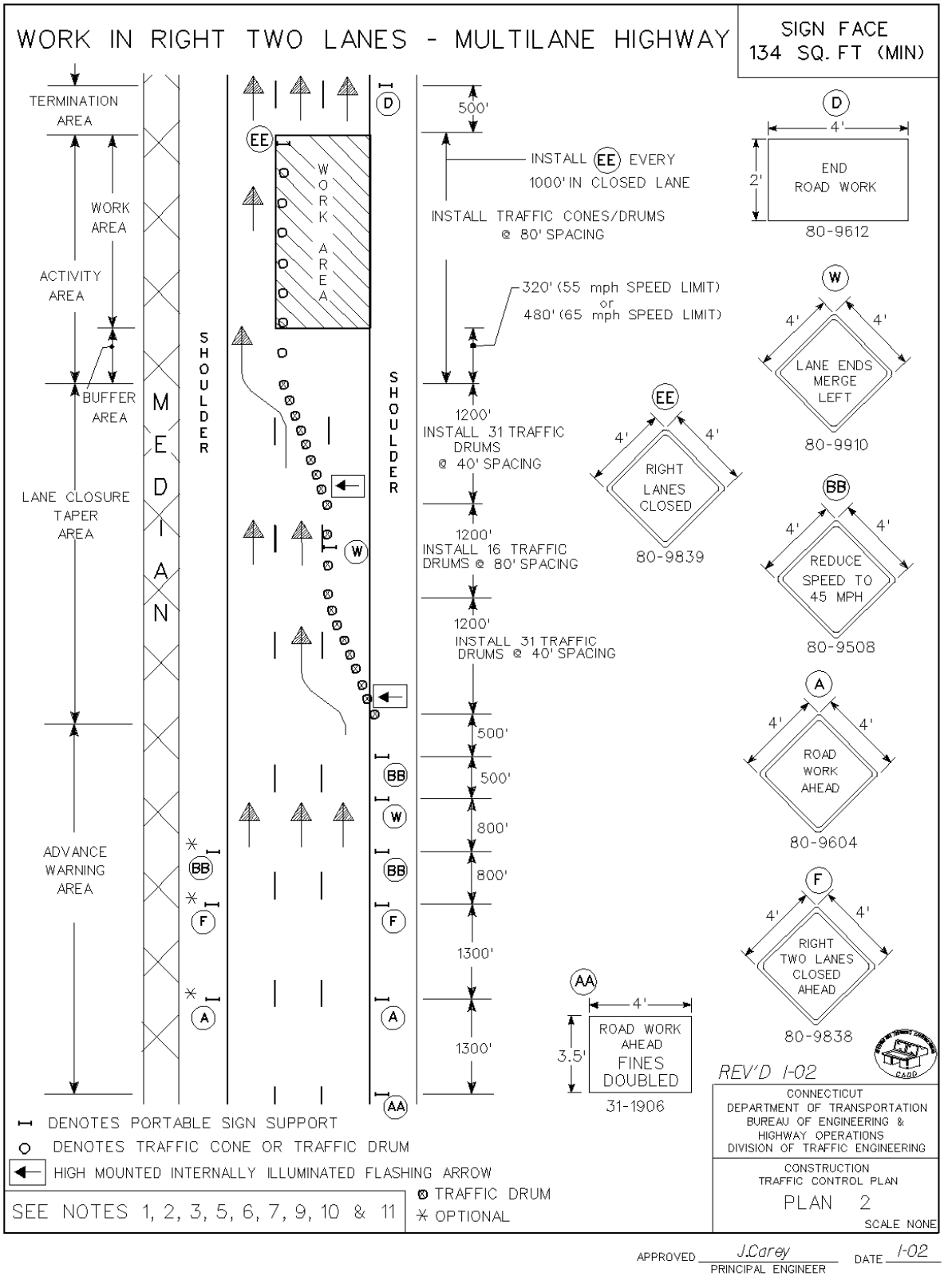
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING &
HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

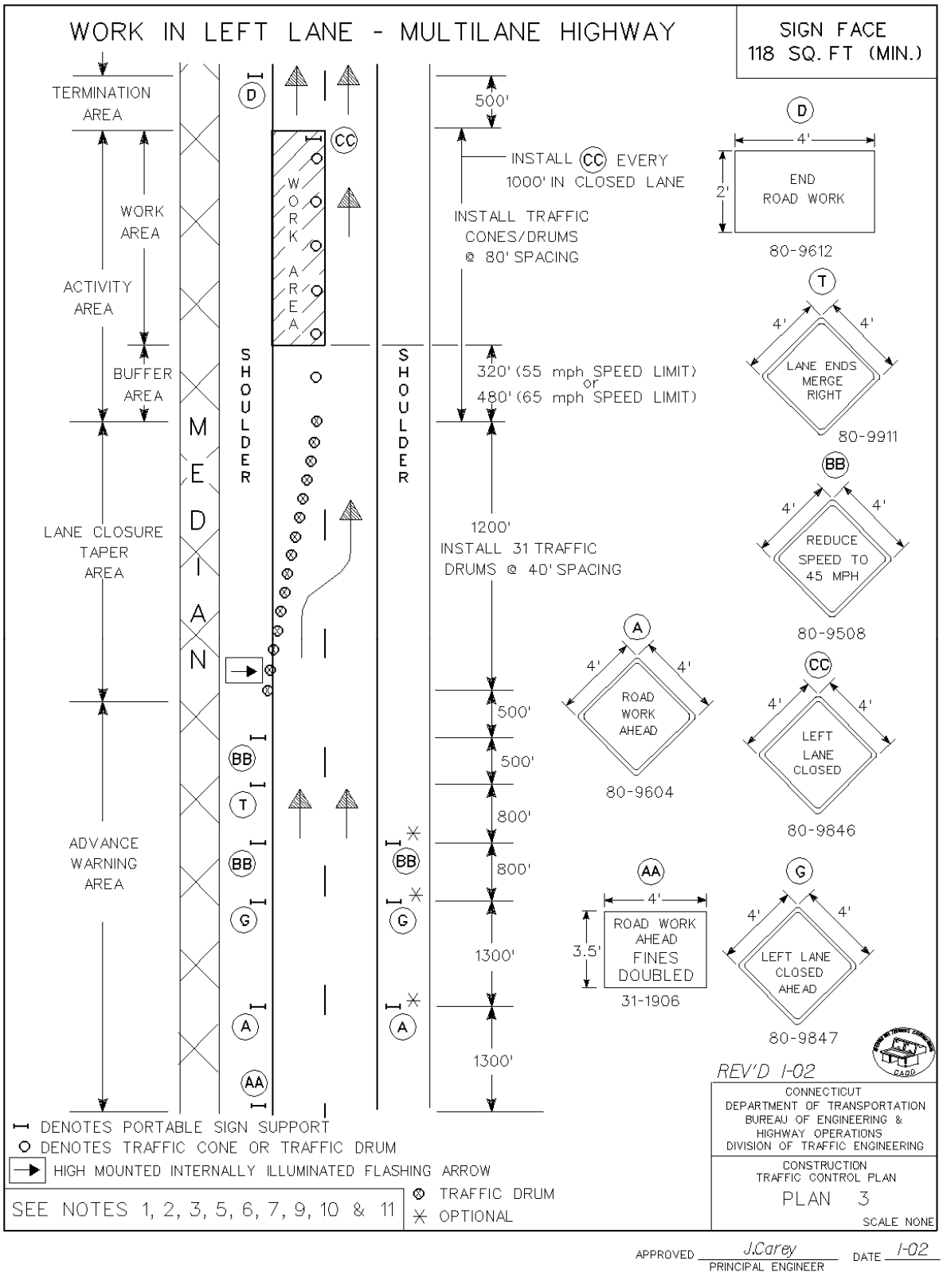
CONSTRUCTION
TRAFFIC CONTROL PLAN

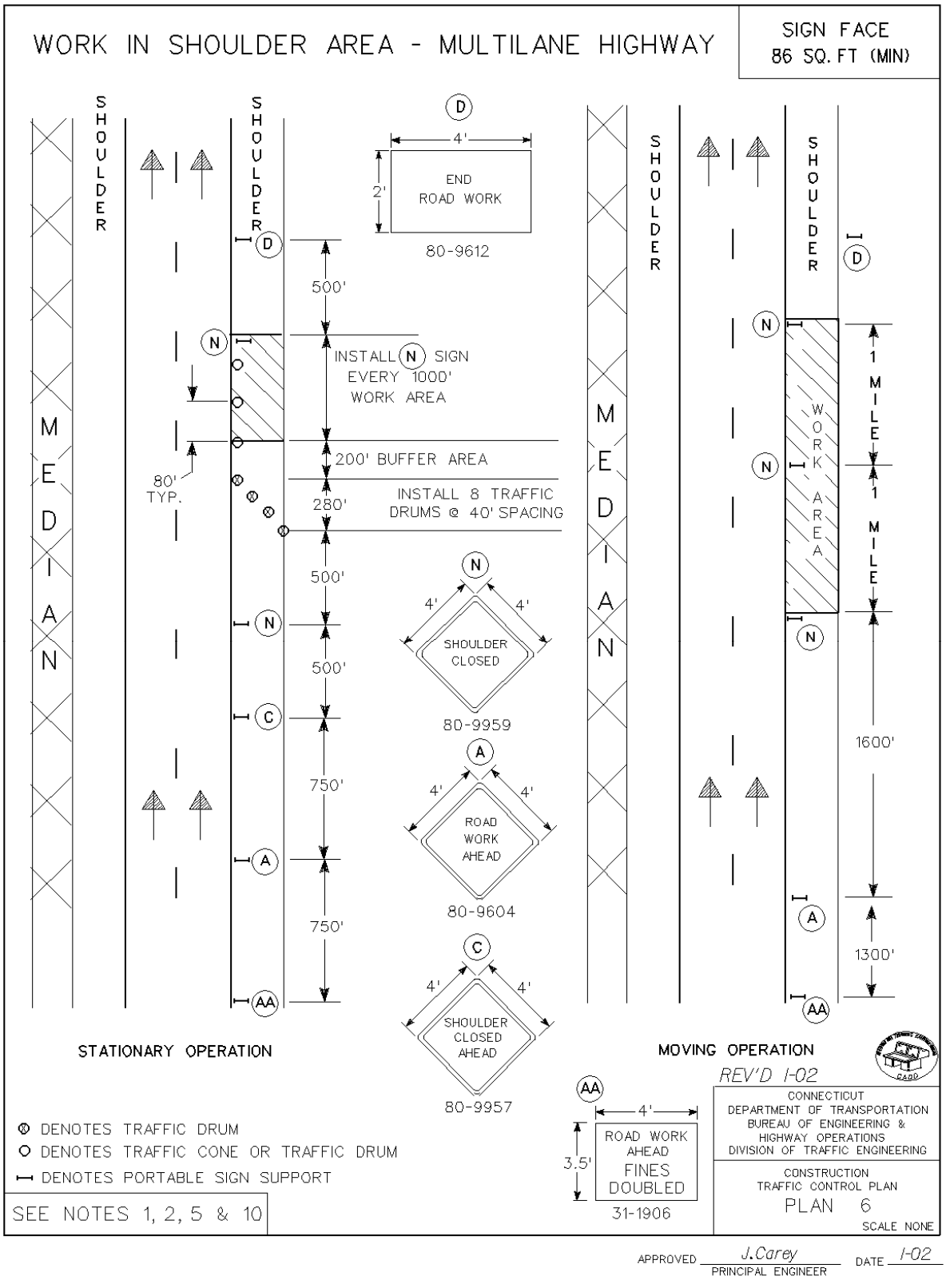
REQUIRED SIGNS

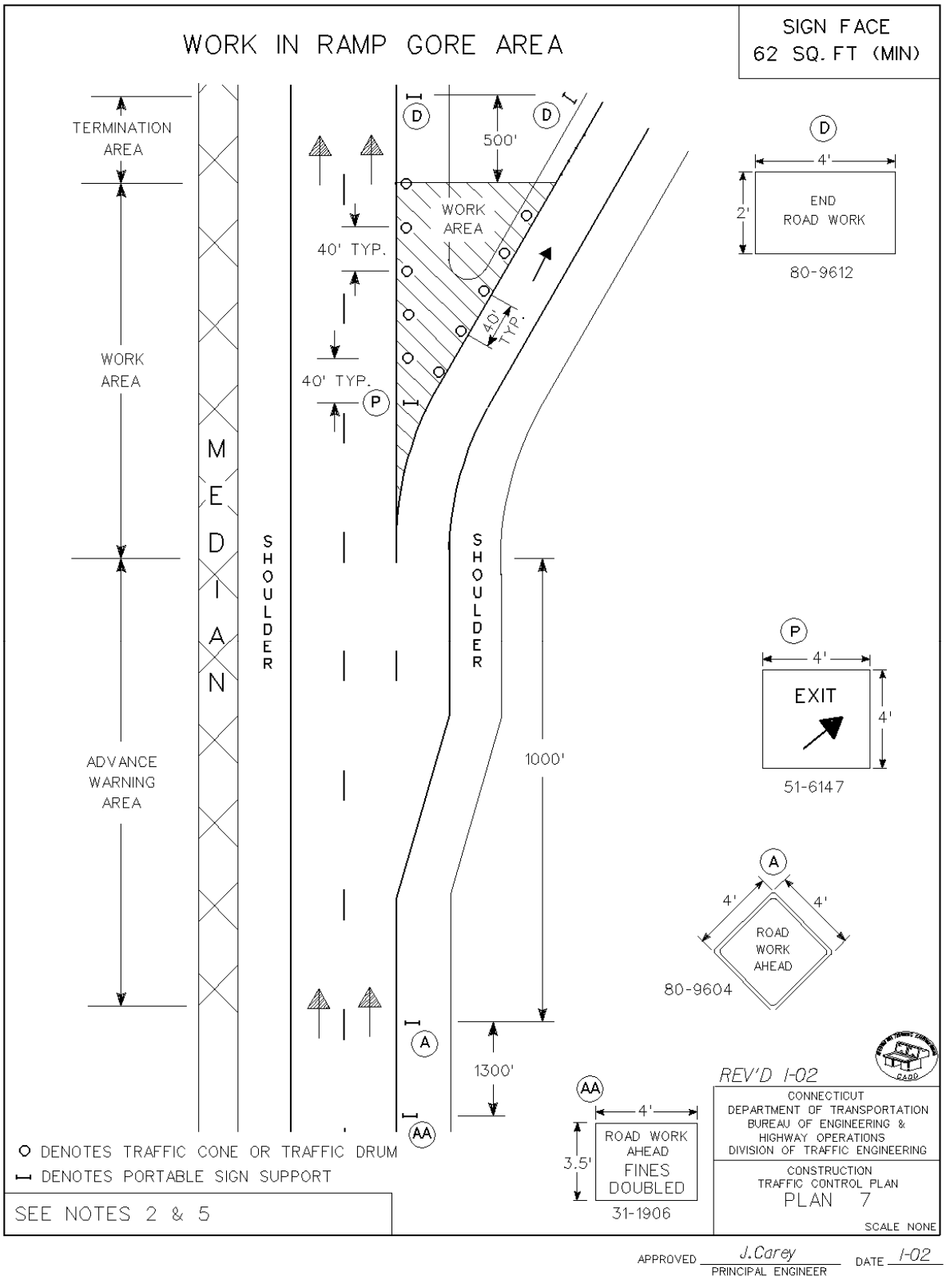
APPROVED J.Carey PRINCIPAL ENGINEER DATE 1-02


WORK IN RIGHT LANE - MULTILANE HIGHWAY
SIGN FACE
118 SQ. FT (MIN.)
TERMINATION AREA
WORK AREA
ACTIVITY AREA
BUFFER AREA
LANE CLOSURE TAPER AREA
ADVANCE WARNING AREA
SHOULDER
MEDIAN
SHOULDER
WORK AREA
500'
INSTALL (E) EVERY 1000' IN CLOSED LANE
INSTALL TRAFFIC CONES/DRUMS @ 80' SPACING
320' (55 mph SPEED LIMIT)
or
480' (65 mph SPEED LIMIT)
1200'
INSTALL 31 TRAFFIC DRUMS @ 40' SPACING
500'
500'
800'
800'
1300'
1300'
(D) 4' 2' END ROAD WORK 80-9612
(W) 4' 4' LANE ENDS MERGE LEFT 80-9910
(E) 4' 4' RIGHT LANE CLOSED 80-9849
(BB) 4' 4' REDUCE SPEED TO 45 MPH 80-9508
(A) 4' 4' ROAD WORK AHEAD 80-9604
(B) 4' 4' RIGHT LANE CLOSED AHEAD 80-9848
(AA) 4' 3.5' ROAD WORK AHEAD FINES DOUBLED 31-1906
* DENOTES OPTIONAL
O DENOTES TRAFFIC CONES OR TRAFFIC DRUMS
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW
SEE NOTES 1, 2, 3, 5, 6, 7, 9, 10 & 11
DENOTES PORTABLE SIGN SUPPORT
TRAFFIC DRUM
REV'D 1-02
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 1
SCALE NONE
APPROVED J.Carey PRINCIPAL ENGINEER
DATE 1-02


WORK IN RIGHT TWO LANES - MULTILANE HIGHWAY
SIGN FACE
134 SQ. FT (MIN)
TERMINATION AREA
WORK AREA
ACTIVITY AREA
BUFFER AREA
LANE CLOSURE TAPER AREA
ADVANCE WARNING AREA
SHOULDER
MEDIAN
SHOULDER
WORK AREA
500'
INSTALL EE EVERY 1000' IN CLOSED LANE
INSTALL TRAFFIC CONES/DRUMS @ 80' SPACING
320' (55 mph SPEED LIMIT) or 480' (65 mph SPEED LIMIT)
1200'
INSTALL 31 TRAFFIC DRUMS @ 40' SPACING
1200'
INSTALL 16 TRAFFIC DRUMS @ 80' SPACING
1200'
INSTALL 31 TRAFFIC DRUMS @ 40' SPACING
500'
500'
800'
800'
1300'
1300'
D
4'
2'
END ROAD WORK
80-9612
W
4'
4'
LANE ENDS MERGE LEFT
80-9910
EE
4'
4'
RIGHT LANES CLOSED
80-9839
BB
4'
4'
REDUCE SPEED TO 45 MPH
80-9508
A
4'
4'
ROAD WORK AHEAD
80-9604
F
4'
4'
RIGHT TWO LANES CLOSED AHEAD
80-9838
AA
4'
3.5'
ROAD WORK AHEAD
FINES DOUBLED
31-1906
REV'D 1-02
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 2
SCALE NONE
I DENOTES PORTABLE SIGN SUPPORT
O DENOTES TRAFFIC CONE OR TRAFFIC DRUM
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW
SEE NOTES 1, 2, 3, 5, 6, 7, 9, 10 & 11
TRAFFIC DRUM
* OPTIONAL
APPROVED J.Carey PRINCIPAL ENGINEER
DATE 1-02

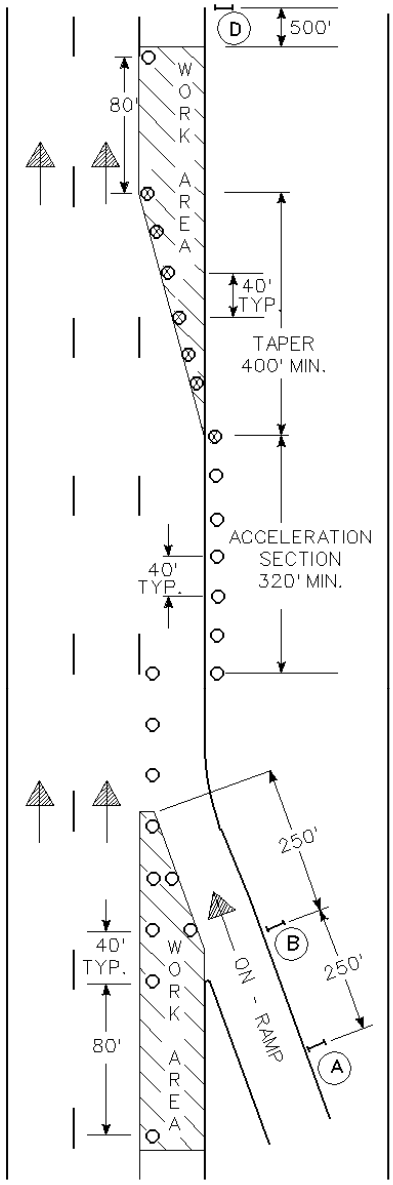

WORK IN LEFT LANE - MULTILANE HIGHWAY
SIGN FACE
118 SQ. FT (MIN.)
TERMINATION AREA
WORK AREA
ACTIVITY AREA
BUFFER AREA
LANE CLOSURE TAPER AREA
ADVANCE WARNING AREA
MEDIAN
SHOULDER
SHOULDER
WORK AREA
500'
INSTALL CC EVERY 1000' IN CLOSED LANE
INSTALL TRAFFIC CONES/DRUMS @ 80' SPACING
320' (55 mph SPEED LIMIT)
or
480' (65 mph SPEED LIMIT)
1200'
INSTALL 31 TRAFFIC DRUMS @ 40' SPACING
500'
500'
800'
800'
1300'
1300'
D
4'
2'
END ROAD WORK
80-9612
T
4'
4'
LANE ENDS MERGE RIGHT
80-9911
BB
4'
4'
REDUCE SPEED TO 45 MPH
80-9508
A
4'
4'
ROAD WORK AHEAD
80-9604
CC
4'
4'
LEFT LANE CLOSED
80-9846
AA
4'
3.5'
ROAD WORK AHEAD
FINES DOUBLED
31-1906
G
4'
4'
LEFT LANE CLOSED AHEAD
80-9847
I DENOTES PORTABLE SIGN SUPPORT
O DENOTES TRAFFIC CONE OR TRAFFIC DRUM
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW
SEE NOTES 1, 2, 3, 5, 6, 7, 9, 10 & 11
TRAFFIC DRUM
OPTIONAL
REV'D 1-02
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 3
SCALE NONE
APPROVED J.Carey
PRINCIPAL ENGINEER
DATE 1-02


WORK IN SHOULDER AREA - MULTILANE HIGHWAY
SIGN FACE
86 SQ. FT (MIN)
SHOULDER
MEDIAN
SHOULDER
SHOULDER
MEDIAN
SHOULDER
SHOULDER
WORK AREA
1 MILE
1 MILE
1600'
1300'
D
4'
2'
END
ROAD WORK
80-9612
500'
N
INSTALL N SIGN
EVERY 1000'
WORK AREA
200' BUFFER AREA
80'
TYP.
280'
INSTALL 8 TRAFFIC
DRUMS @ 40' SPACING
500'
500'
750'
750'
C
A
AA
4'
4'
SHOULDER
CLOSED
80-9959
ROAD
WORK
AHEAD
80-9604
SHOULDER
CLOSED
AHEAD
80-9957
STATIONARY OPERATION
MOVING OPERATION
DENOTES TRAFFIC DRUM
DENOTES TRAFFIC CONE OR TRAFFIC DRUM
DENOTES PORTABLE SIGN SUPPORT
SEE NOTES 1, 2, 5 & 10
3.5'
ROAD WORK
AHEAD
FINES
DOUBLED
31-1906
REV'D 1-02
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING &
HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 6
SCALE NONE
APPROVED J.Carey
PRINCIPAL ENGINEER
DATE 1-02

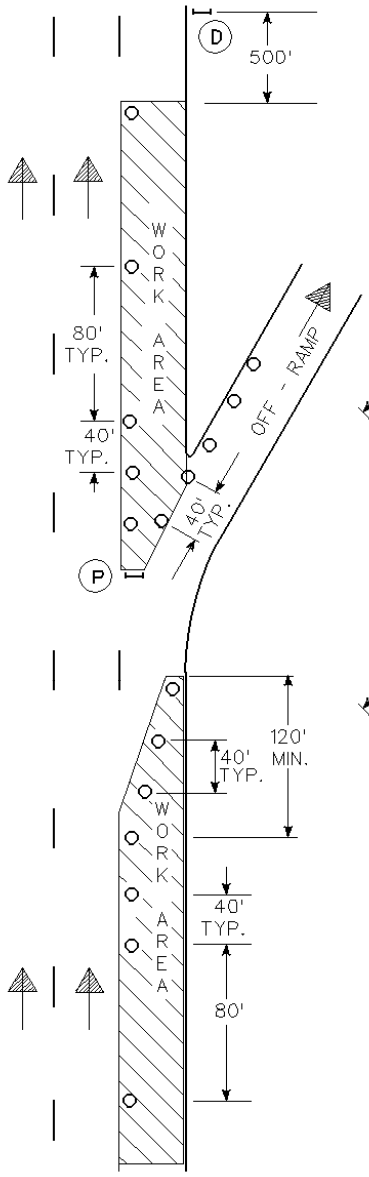

WORK IN RAMP GORE AREA
SIGN FACE
62 SQ. FT (MIN)
TERMINATION AREA
WORK AREA
ADVANCE WARNING AREA
MEDIAN
SHOULDER
SHOULDER
500'
40' TYP.
40' TYP.
40' TYP.
WORK AREA
1000'
1300'
D
4'
2'
END ROAD WORK
80-9612
P
4'
EXIT
4'
51-6147
A
4'
4'
ROAD WORK AHEAD
80-9604
AA
4'
3.5'
ROAD WORK AHEAD
FINES DOUBLED
31-1906
O DENOTES TRAFFIC CONE OR TRAFFIC DRUM
I DENOTES PORTABLE SIGN SUPPORT
SEE NOTES 2 & 5
REV'D 1-02
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 7
SCALE NONE
APPROVED J.Carey
PRINCIPAL ENGINEER
DATE 1-02

TYPICAL RAMP TREATMENTS FOR MAINLINE LANE CLOSURE - MULTILANE HIGHWAY

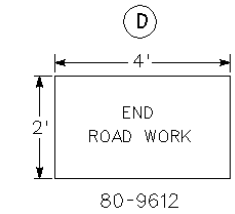
SIGN FACE
SQ. FT VARIES



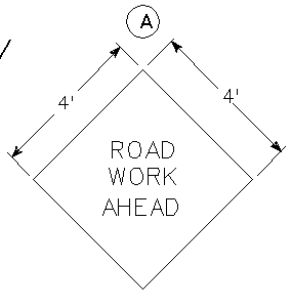
ON - RAMP
TREATMENT



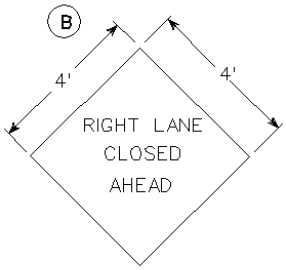
OFF - RAMP
TREATMENT



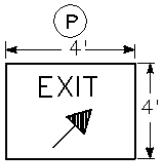
80-9612



80-9604



80-9848



51-6147

USE TRAFFIC CONTROL PLAN 1 TO CLOSE THE RIGHT LANE.
I DENOTES PORTABLE SIGN SUPPORT
O DENOTES TRAFFIC CONE OR TRAFFIC DRUM

SEE NOTES 1, 2, 5, 6, 7, 9, 10 & 11

⊗ TRAFFIC DRUM

REV'D 1-02

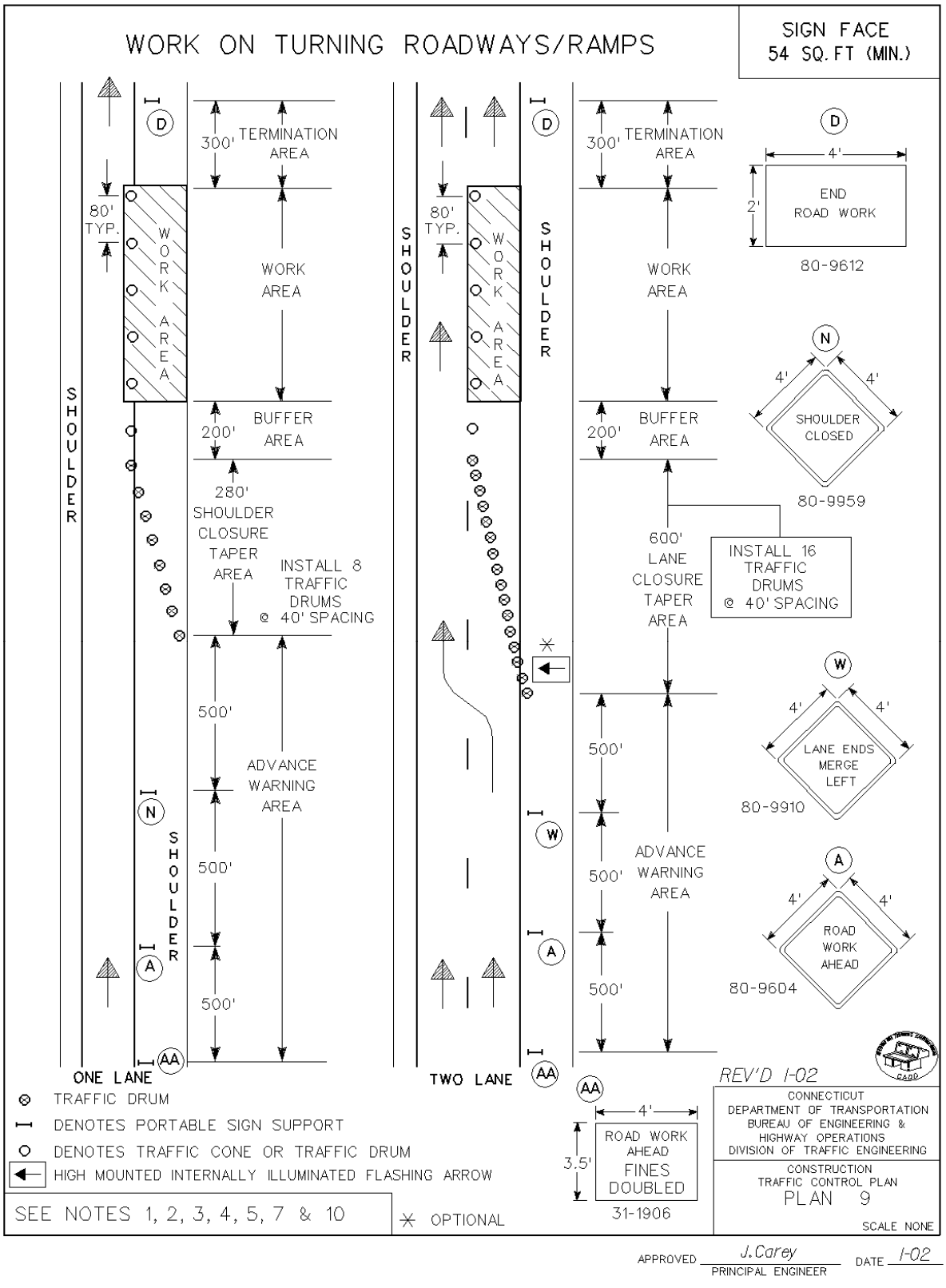
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING &
HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING

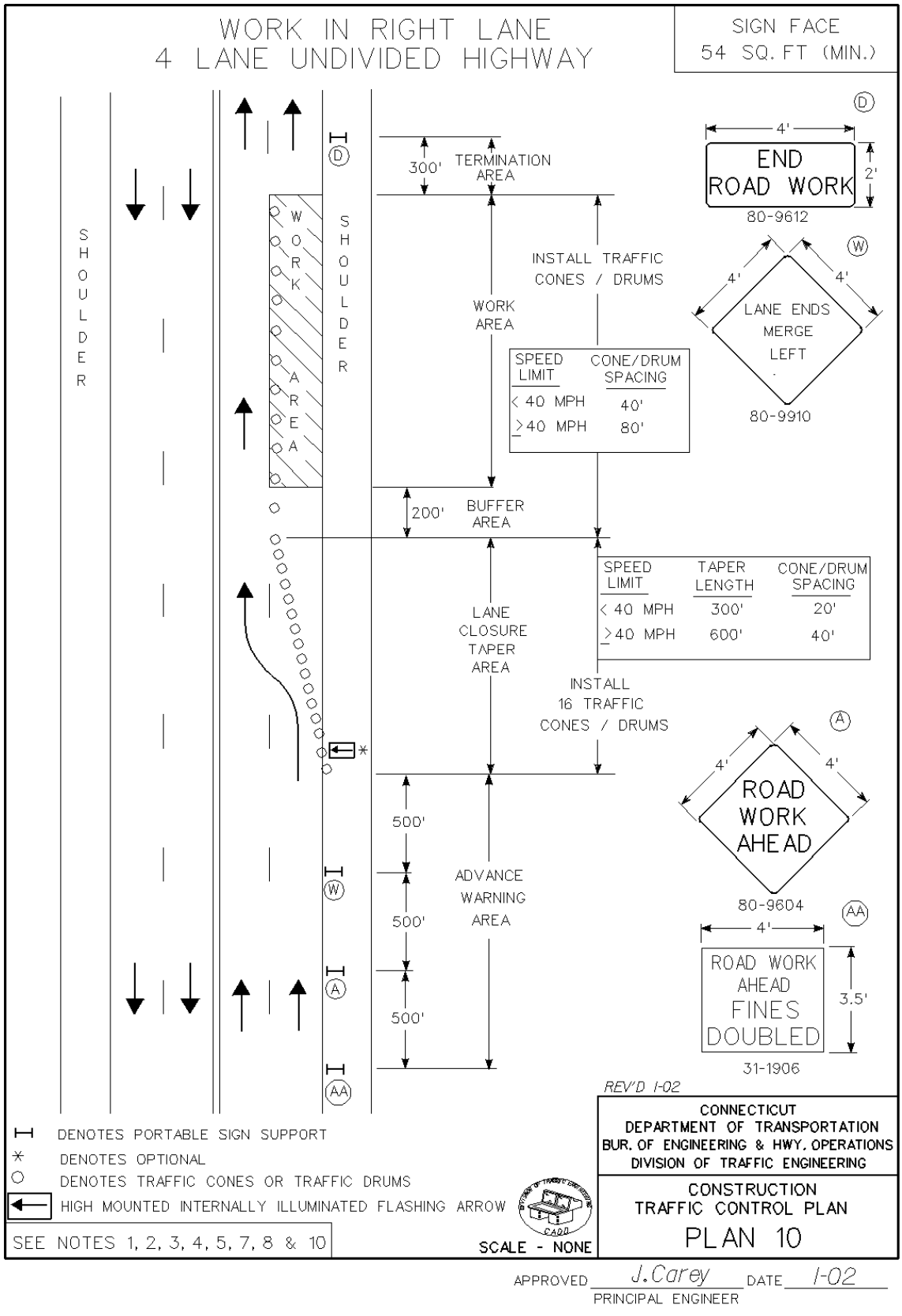
CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 8

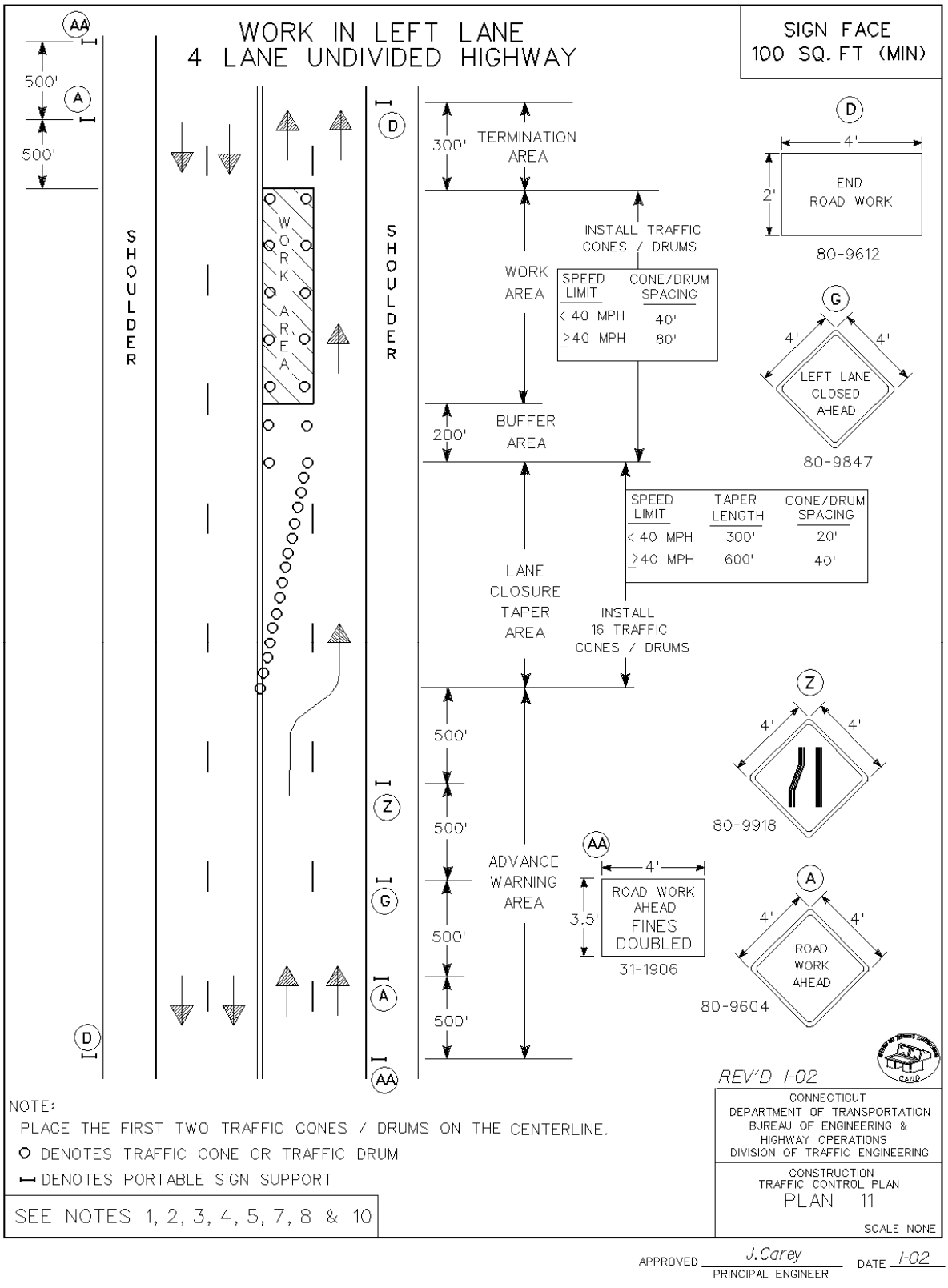
SCALE NONE

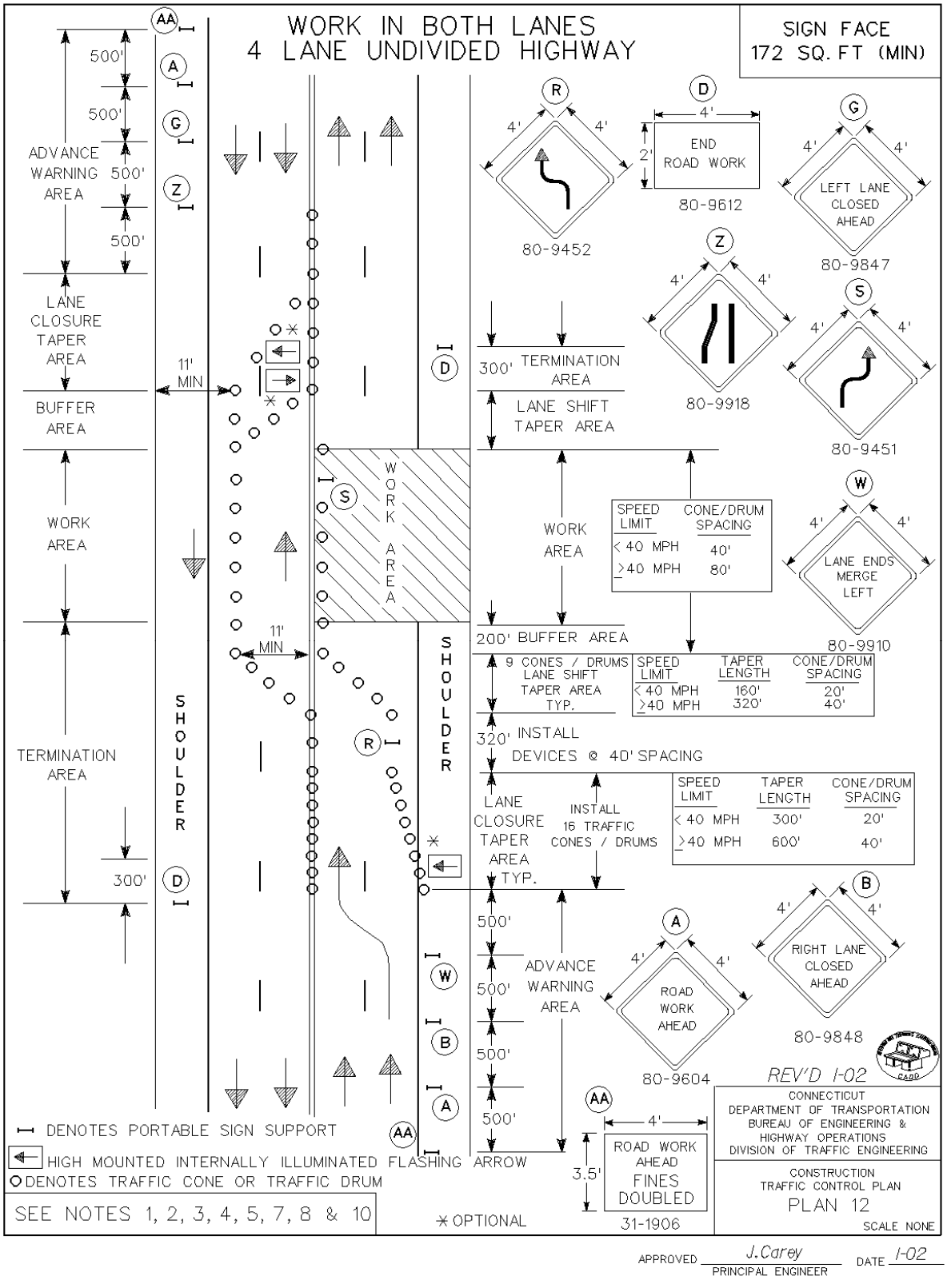
APPROVED J.Carey
PRINCIPAL ENGINEER

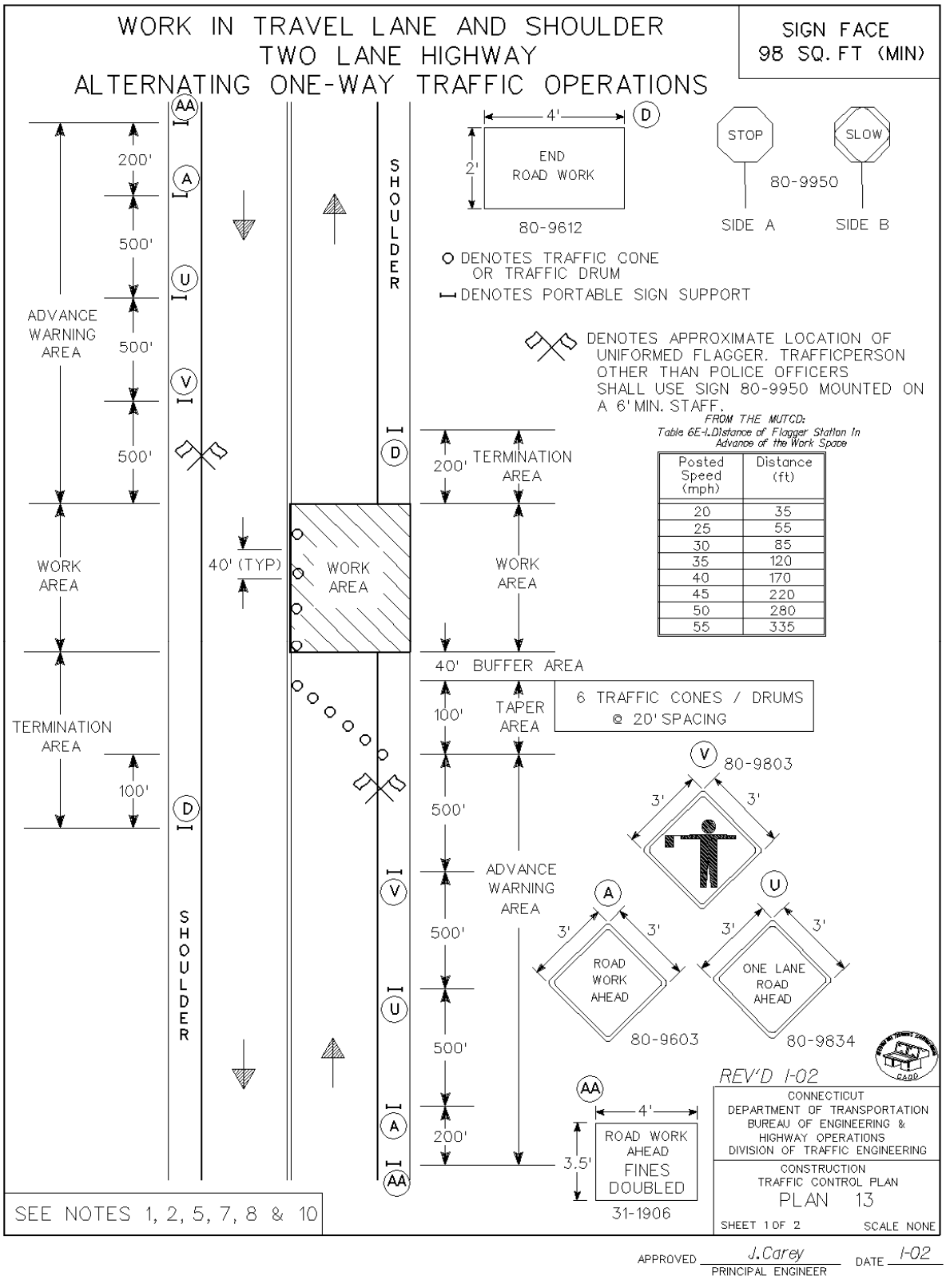
DATE 1-02


WORK ON TURNING ROADWAYS/RAMPS
SIGN FACE
54 SQ. FT (MIN.)
SHOULDER
80' TYP.
WORK AREA
300' TERMINATION AREA
WORK AREA
200' BUFFER AREA
280' SHOULDER CLOSURE TAPER AREA
INSTALL 8 TRAFFIC DRUMS @ 40' SPACING
500'
ADVANCE WARNING AREA
500'
500'
ONE LANE
TWO LANE
600' LANE CLOSURE TAPER AREA
INSTALL 16 TRAFFIC DRUMS @ 40' SPACING
4'
2'
END ROAD WORK
80-9612
SHOULDER CLOSED
80-9959
LANE ENDS MERGE LEFT
80-9910
ROAD WORK AHEAD
80-9604
3.5'
ROAD WORK AHEAD
FINES DOUBLED
31-1906
TRAFFIC DRUM
DENOTES PORTABLE SIGN SUPPORT
DENOTES TRAFFIC CONE OR TRAFFIC DRUM
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW
SEE NOTES 1, 2, 3, 4, 5, 7 & 10
OPTIONAL
REV'D 1-02
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 9
SCALE NONE
APPROVED J. Carey PRINCIPAL ENGINEER
DATE 1-02


WORK IN RIGHT LANE
4 LANE UNDIVIDED HIGHWAY
SIGN FACE
54 SQ. FT (MIN.)
SHOULDER
WORK AREA
SHOULDER
300' TERMINATION AREA
WORK AREA
INSTALL TRAFFIC CONES / DRUMS
SPEED LIMIT | CONE/DRUM SPACING
< 40 MPH | 40'
≥ 40 MPH | 80'
200' BUFFER AREA
LANE CLOSURE TAPER AREA
SPEED LIMIT | TAPER LENGTH | CONE/DRUM SPACING
< 40 MPH | 300' | 20'
≥ 40 MPH | 600' | 40'
INSTALL 16 TRAFFIC CONES / DRUMS
500'
500'
500'
ADVANCE WARNING AREA
4'
END ROAD WORK
2'
80-9612
4'
4'
LANE ENDS MERGE LEFT
80-9910
4'
4'
ROAD WORK AHEAD
80-9604
4'
ROAD WORK AHEAD FINES DOUBLED
3.5'
31-1906
DENOTES PORTABLE SIGN SUPPORT
DENOTES OPTIONAL
DENOTES TRAFFIC CONES OR TRAFFIC DRUMS
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW
SEE NOTES 1, 2, 3, 4, 5, 7, 8 & 10
SCALE - NONE
REV'D 1-02
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUR. OF ENGINEERING & HWY. OPERATIONS
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 10
APPROVED J. Carey DATE 1-02
PRINCIPAL ENGINEER


WORK IN LEFT LANE
4 LANE UNDIVIDED HIGHWAY
SIGN FACE
100 SQ. FT (MIN)
SHOULDER
WORK AREA
SHOULDER
500'
500'
300'
TERMINATION AREA
WORK AREA
200'
BUFFER AREA
LANE CLOSURE TAPER AREA
500'
500'
500'
500'
ADVANCE WARNING AREA
INSTALL TRAFFIC CONES / DRUMS
SPEED LIMIT
CONE/DRUM SPACING
< 40 MPH
40'
≥ 40 MPH
80'
SPEED LIMIT
TAPER LENGTH
CONE/DRUM SPACING
< 40 MPH
300'
20'
≥ 40 MPH
600'
40'
INSTALL 16 TRAFFIC CONES / DRUMS
4'
2'
END ROAD WORK
80-9612
4'
4'
LEFT LANE CLOSED AHEAD
80-9847
4'
4'
80-9918
4'
3.5'
ROAD WORK AHEAD
FINES DOUBLED
31-1906
4'
4'
ROAD WORK AHEAD
80-9604
REV'D 1-02
NOTE:
PLACE THE FIRST TWO TRAFFIC CONES / DRUMS ON THE CENTERLINE.
O DENOTES TRAFFIC CONE OR TRAFFIC DRUM
⊢ DENOTES PORTABLE SIGN SUPPORT
SEE NOTES 1, 2, 3, 4, 5, 7, 8 & 10
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 11
SCALE NONE
APPROVED J.Carey
PRINCIPAL ENGINEER
DATE 1-02


WORK IN BOTH LANES
4 LANE UNDIVIDED HIGHWAY
SIGN FACE
172 SQ. FT (MIN)
ADVANCE WARNING AREA
500'
500'
500'
LANE CLOSURE TAPER AREA
BUFFER AREA
WORK AREA
TERMINATION AREA
300'
11' MIN
11' MIN
SHOULDER
SHOULDER
WORK AREA
300' TERMINATION AREA
LANE SHIFT TAPER AREA
WORK AREA
200' BUFFER AREA
9 CONES / DRUMS LANE SHIFT TAPER AREA TYP.
320' INSTALL DEVICES @ 40' SPACING
LANE CLOSURE TAPER AREA TYP.
INSTALL 16 TRAFFIC CONES / DRUMS
ADVANCE WARNING AREA
500'
500'
500'
500'
SPEED LIMIT
CONE/DRUM SPACING
< 40 MPH 40'
≥ 40 MPH 80'
SPEED LIMIT
TAPER LENGTH
CONE/DRUM SPACING
< 40 MPH 160' 20'
≥ 40 MPH 320' 40'
SPEED LIMIT
TAPER LENGTH
CONE/DRUM SPACING
< 40 MPH 300' 20'
≥ 40 MPH 600' 40'
80-9452
END ROAD WORK
80-9612
LEFT LANE CLOSED AHEAD
80-9847
80-9918
80-9451
LANE ENDS MERGE LEFT
80-9910
ROAD WORK AHEAD
80-9604
RIGHT LANE CLOSED AHEAD
80-9848
ROAD WORK AHEAD FINES DOUBLED
3.5'
31-1906
I DENOTES PORTABLE SIGN SUPPORT
HIGH MOUNTED INTERNALLY ILLUMINATED FLASHING ARROW
DENOTES TRAFFIC CONE OR TRAFFIC DRUM
SEE NOTES 1, 2, 3, 4, 5, 7, 8 & 10
* OPTIONAL
REV'D 1-02
CONNECTICUT DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION TRAFFIC CONTROL PLAN
PLAN 12
SCALE NONE
APPROVED J.Carey PRINCIPAL ENGINEER
DATE 1-02


WORK IN TRAVEL LANE AND SHOULDER
TWO LANE HIGHWAY
ALTERNATING ONE-WAY TRAFFIC OPERATIONS
SIGN FACE
98 SQ. FT (MIN)
200'
500'
500'
500'
ADVANCE WARNING AREA
WORK AREA
TERMINATION AREA
100'
40' (TYP)
SHOULDER
SHOULDER
WORK AREA
4'
2'
END ROAD WORK
80-9612
STOP
SLOW
80-9950
SIDE A
SIDE B
DENOTES TRAFFIC CONE OR TRAFFIC DRUM
DENOTES PORTABLE SIGN SUPPORT
DENOTES APPROXIMATE LOCATION OF UNIFORMED FLAGGER. TRAFFICPERSON OTHER THAN POLICE OFFICERS SHALL USE SIGN 80-9950 MOUNTED ON A 6' MIN. STAFF.
FROM THE MUTCD:
Table 6E-1.Distance of Flagger Station In Advance of the Work Space
Posted Speed (mph) | Distance (ft)
20 | 35
25 | 55
30 | 85
35 | 120
40 | 170
45 | 220
50 | 280
55 | 335
200' TERMINATION AREA
WORK AREA
40' BUFFER AREA
100' TAPER AREA
6 TRAFFIC CONES / DRUMS @ 20' SPACING
500'
ADVANCE WARNING AREA
500'
500'
200'
80-9803
3'
3'
ROAD WORK AHEAD
80-9603
ONE LANE ROAD AHEAD
80-9834
REV'D 1-02
4'
3.5'
ROAD WORK AHEAD
FINES DOUBLED
31-1906
CONNECTICUT
DEPARTMENT OF TRANSPORTATION
BUREAU OF ENGINEERING & HIGHWAY OPERATIONS
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 13
SHEET 1 OF 2
SCALE NONE
SEE NOTES 1, 2, 5, 7, 8 & 10
APPROVED J.Carey
PRINCIPAL ENGINEER
DATE 1-02

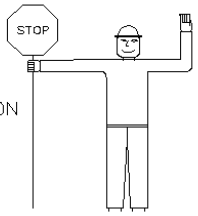
WORK IN TRAVEL LANE AND SHOULDER
TWO LANE HIGHWAY
ALTERNATING ONE-WAY TRAFFIC OPERATIONS

HAND SIGNAL METHODS TO BE USED BY UNIFORMED FLAGGERS

THE FOLLOWING METHODS FROM SECTION 6E.04 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 TYPICAL DETAIL SHEET ENTITLED "SIGNS FOR CONSTRUCTION AND PERMIT OPERATIONS" SHALL BE USED.

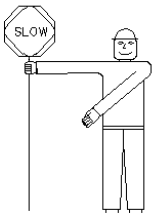
A. TO STOP TRAFFIC

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.



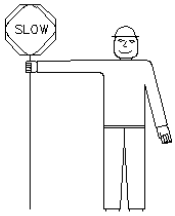
B. TO DIRECT TRAFFIC TO PROCEED

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.



SEE NOTES 1, 2, 5, 7, 8 & 10

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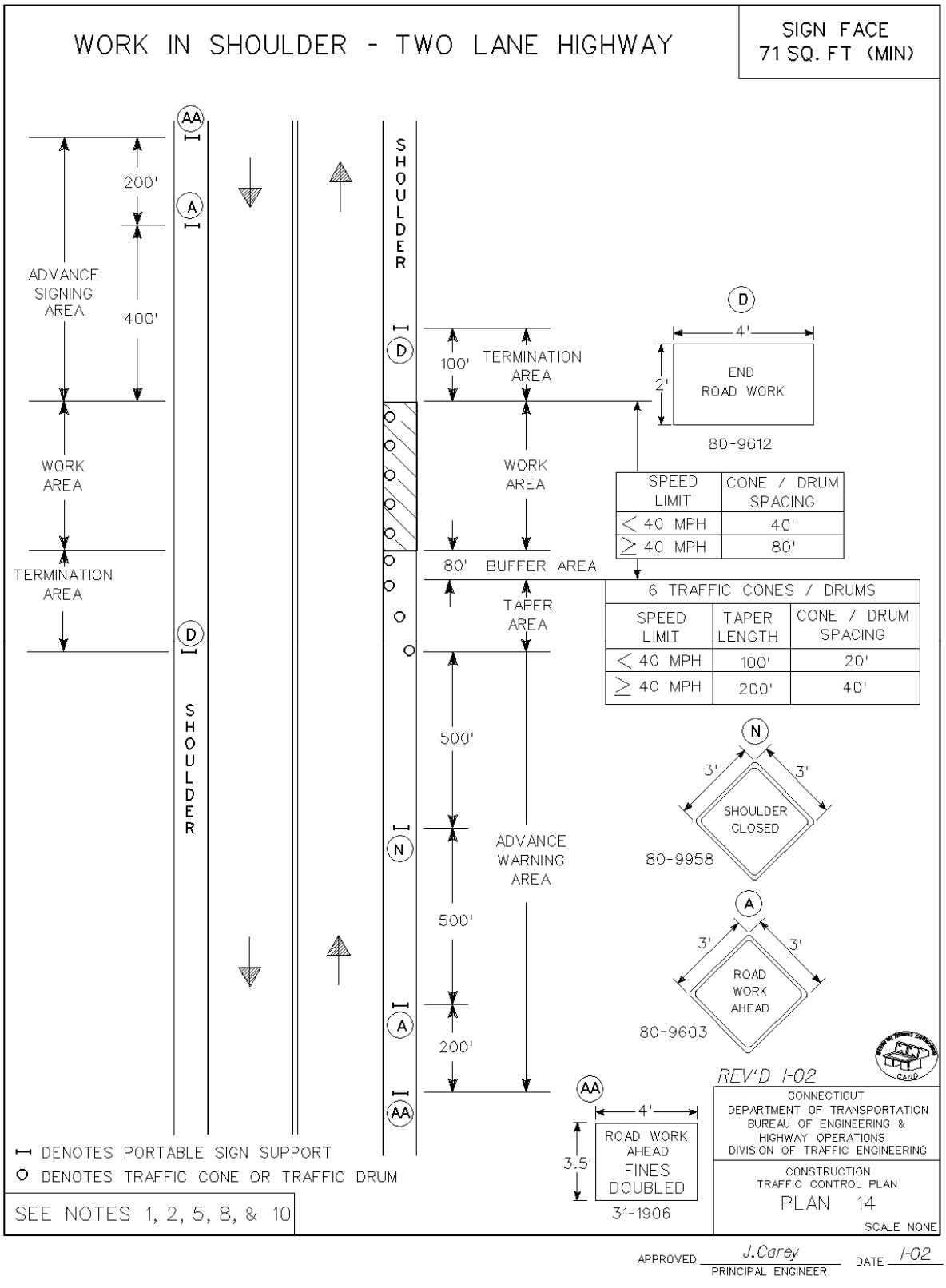
SHEET 2 OF 2 SCALE NONE

APPROVED J. Carey PRINCIPAL ENGINEER DATE 1-02


WORK IN SHOULDER - TWO LANE HIGHWAY
SIGN FACE
71 SQ. FT (MIN)
AA
A
D
N
200'
400'
ADVANCE SIGNING AREA
WORK AREA
TERMINATION AREA
SHOULDER
SHOULDER
100'
TERMINATION AREA
WORK AREA
80' BUFFER AREA
TAPER AREA
500'
ADVANCE WARNING AREA
500'
200'
4'
2'
END ROAD WORK
80-9612
SPEED LIMIT
CONE / DRUM SPACING
< 40 MPH
40'
≥ 40 MPH
80'
6 TRAFFIC CONES / DRUMS
SPEED LIMIT
TAPER LENGTH
CONE / DRUM SPACING
< 40 MPH
100'
20'
≥ 40 MPH
200'
40'
3'
3'
SHOULDER CLOSED
80-9958
ROAD WORK AHEAD
80-9603
4'
3.5'
ROAD WORK AHEAD
FINES DOUBLED
31-1906
I DENOTES PORTABLE SIGN SUPPORT
O DENOTES TRAFFIC CONE OR TRAFFIC DRUM
SEE NOTES 1, 2, 5, 8, & 10
REV'D 1-02
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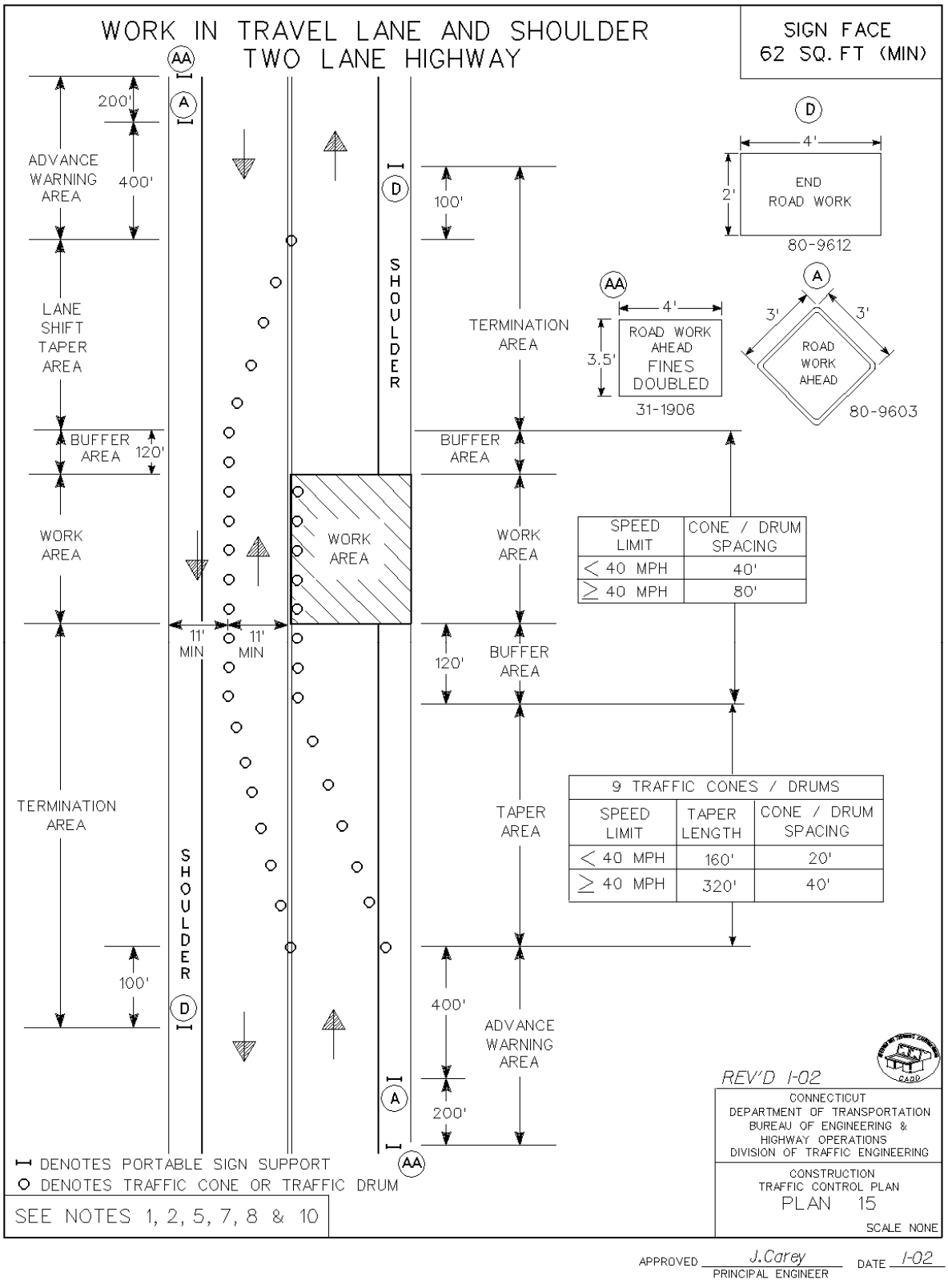
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 14
SCALE NONE
APPROVED J.Carey
PRINCIPAL ENGINEER
DATE 1-02


WORK IN TRAVEL LANE AND SHOULDER
TWO LANE HIGHWAY
SIGN FACE
62 SQ. FT (MIN)
ADVANCE WARNING AREA
200'
400'
LANE SHIFT TAPER AREA
BUFFER AREA
120'
WORK AREA
TERMINATION AREA
100'
11' MIN
11' MIN
SHOULDER
WORK AREA
TERMINATION AREA
BUFFER AREA
120'
TAPER AREA
400'
ADVANCE WARNING AREA
200'
END ROAD WORK
4'
2'
80-9612
ROAD WORK AHEAD FINES DOUBLED
4'
3.5'
31-1906
ROAD WORK AHEAD
3'
3'
80-9603
SPEED LIMIT
CONE / DRUM SPACING
< 40 MPH
40'
≥ 40 MPH
80'
9 TRAFFIC CONES / DRUMS
SPEED LIMIT
TAPER LENGTH
CONE / DRUM SPACING
< 40 MPH
160'
20'
≥ 40 MPH
320'
40'
I DENOTES PORTABLE SIGN SUPPORT
O DENOTES TRAFFIC CONE OR TRAFFIC DRUM
SEE NOTES 1, 2, 5, 7, 8 & 10
REV'D 1-02
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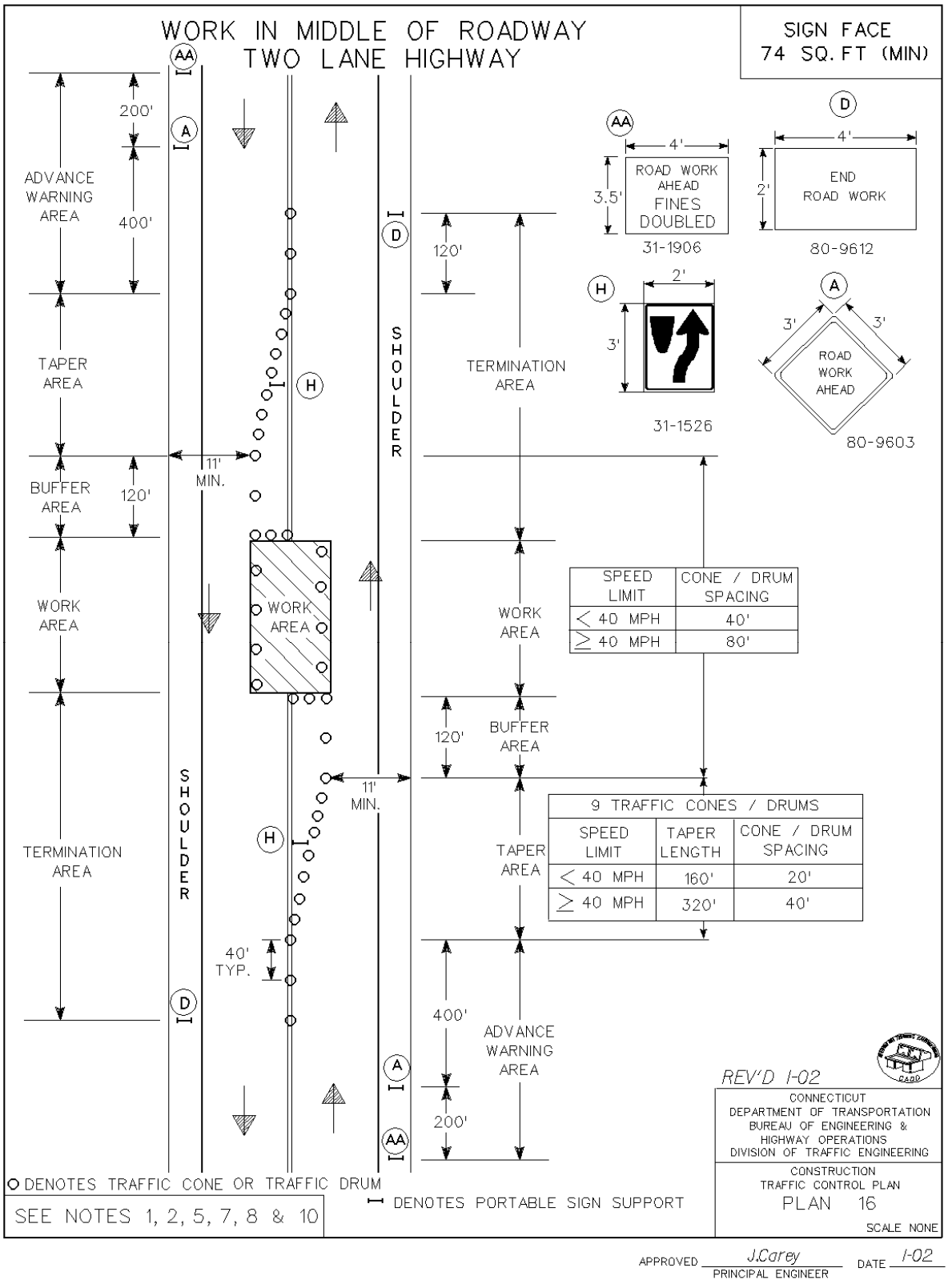
DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION
TRAFFIC CONTROL PLAN
PLAN 15
SCALE NONE
APPROVED J.Carey
PRINCIPAL ENGINEER
DATE 1-02


WORK IN MIDDLE OF ROADWAY
TWO LANE HIGHWAY
SIGN FACE
74 SQ. FT (MIN)
ADVANCE WARNING AREA
200'
400'
TAPER AREA
BUFFER AREA
120'
11' MIN.
WORK AREA
TERMINATION AREA
SHOULDER
40' TYP.
120'
TERMINATION AREA
WORK AREA
BUFFER AREA
11' MIN.
TAPER AREA
ADVANCE WARNING AREA
400'
200'
ROAD WORK AHEAD
FINES DOUBLED
3.5'
4'
31-1906
END ROAD WORK
2'
80-9612
2'
3'
31-1526
ROAD WORK AHEAD
80-9603
SPEED LIMIT
CONE / DRUM SPACING
< 40 MPH
40'
≥ 40 MPH
80'
9 TRAFFIC CONES / DRUMS
SPEED LIMIT
TAPER LENGTH
CONE / DRUM SPACING
< 40 MPH
160'
20'
≥ 40 MPH
320'
40'
O DENOTES TRAFFIC CONE OR TRAFFIC DRUM
I DENOTES PORTABLE SIGN SUPPORT
SEE NOTES 1, 2, 5, 7, 8 & 10
REV'D 1-02
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DIVISION OF TRAFFIC ENGINEERING
CONSTRUCTION
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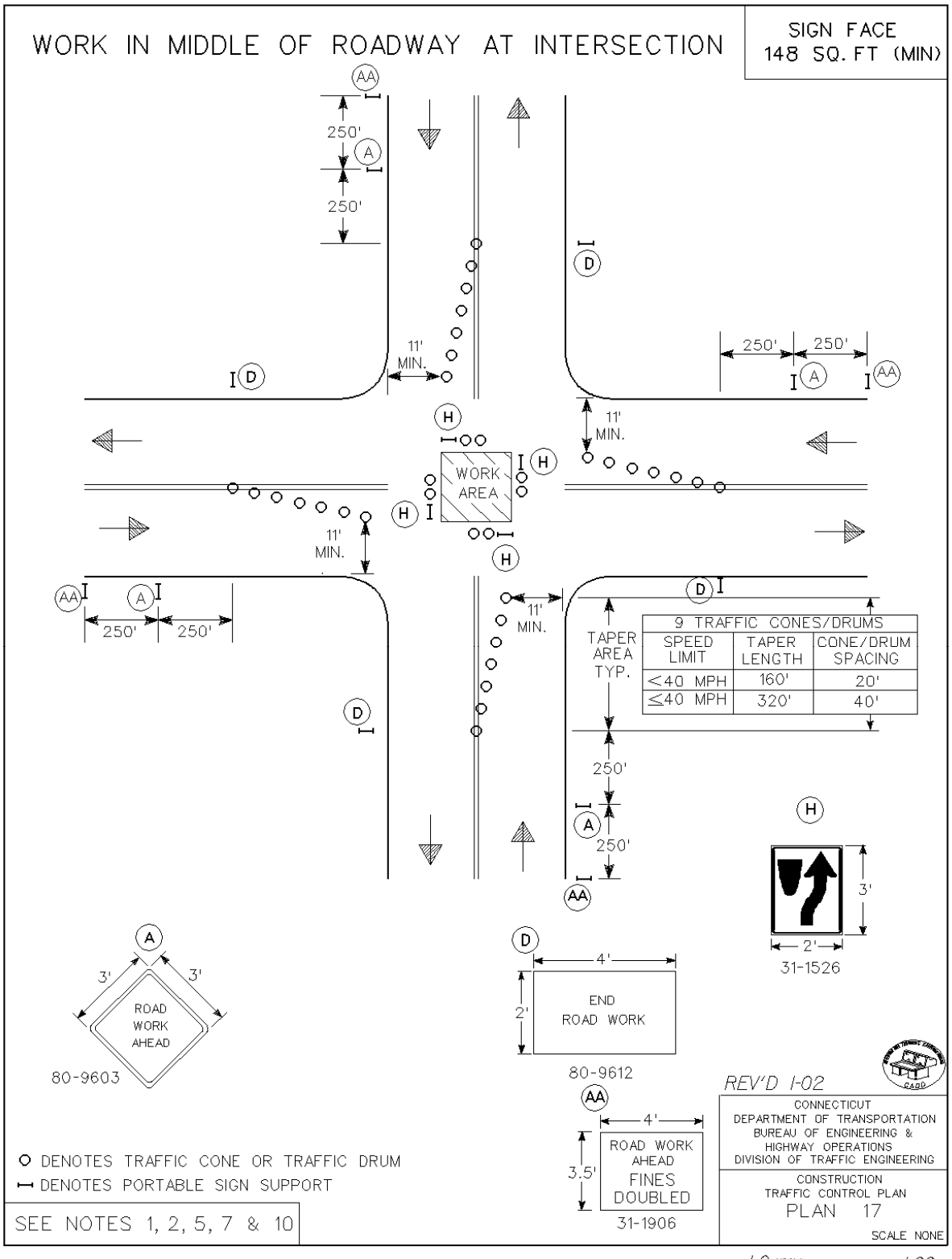
PLAN 16
SCALE NONE
APPROVED J.Carey PRINCIPAL ENGINEER
DATE 1-02


WORK IN MIDDLE OF ROADWAY AT INTERSECTION
SIGN FACE
148 SQ. FT (MIN)
AA
250'
A
250'
D
11'
MIN.
250'
250'
A
AA
H
WORK
AREA
11'
MIN.
11'
MIN.
AA
A
250'
250'
11'
MIN.
D
TAPER
AREA
TYP.
9 TRAFFIC CONES/DRUMS
SPEED LIMIT
TAPER LENGTH
CONE/DRUM SPACING
≤40 MPH
160'
20'
≥40 MPH
320'
40'
250'
A
250'
AA
H
3'
2'
31-1526
A
3'
3'
ROAD
WORK
AHEAD
80-9603
D
4'
2'
END
ROAD WORK
80-9612
AA
4'
3.5'
ROAD WORK
AHEAD
FINES
DOUBLED
31-1906
REV'D 1-02
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TRAFFIC CONTROL PLAN
PLAN 17
SCALE NONE
O DENOTES TRAFFIC CONE OR TRAFFIC DRUM
I DENOTES PORTABLE SIGN SUPPORT
SEE NOTES 1, 2, 5, 7 & 10
APPROVED J.Carey
PRINCIPAL ENGINEER
DATE 1-02

Article 9.71.04 – Method of Measurement: "Maintenance and Protection of Traffic" will be at the Contract lump sum for maintenance and protection of traffic. A per month cost will be derived by taking the lump sum divided by the total number of contract months.

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 furnishing, installing, and removing the material for the temporary traversable slope in those areas where a longitudinal dropdown exists.

If there is no method for payment for the temporary transition in those areas where a transverse dropdown exists, then the contract lump sum price for the "Maintenance and Protection of Traffic" shall also include furnishing, installing, and removing the material for the temporary transition.

This price shall also include the temporary relocation of any existing signs during construction.

Pay Item	Pay Unit
Maintenance and Protection of Traffic	l.s.

ITEM #1131001A - CHANGEABLE MESSAGE SIGN

Description: Work under this item shall include furnishing and maintaining a trailer-mounted, "Changeable Message Sign" at the locations indicated on the plans or as directed by the Engineer.

Materials: The full matrix, internally illuminated variable message sign shall consist of a LED, fiber optic, lamp matrix, or hybrid magnetically operated matrix – LED message board; and a computer operated interface, all mounted on a towable, heavy duty trailer.

The sign shall have a minimum horizontal dimension of 115 inches and rotate a complete 360 degrees atop the lift mechanism.

In the raised position, the bottom of the sign shall be at least 7 feet above the roadway. The messages displayed shall be visible from a distance of 1/2 mile and be clearly legible from a distance of 900 feet during both the day and night.

The lighting system shall be controlled both manually and by a photocell for automatic sign dimming during nighttime use.

The sign shall be capable of storing a minimum of 100 preprogrammed messages and be able to display any one of those messages upon call from the trailer mounted terminal.

The sign shall be a full matrix sign that is able to display messages composed of any combination of alphanumeric text, punctuation symbols, and graphic images (notwithstanding NTCIP limitations). The display shall be capable of producing arrow functions. Full- matrix displays shall allow the use of graphics, traffic safety symbols and various character heights.

Standard messages shall be displayed in a three-line message format with 8 characters per line. The letter height shall not be less than 18 inches.

The sign shall utilize yellow green for the display with a black background. Each matrix shall have a minimum size of 6 x 9 pixels. Each pixel shall utilize a minimum of four high output yellow green LEDs or equivalent light source. The LEDs or light source shall have a minimum 1.4 candela luminance intensity, 22 degrees viewing angle, and wavelength of 590 (+/- 3) nanometers.

For hybrid magnetically operated matrix – LED matrix, each pixel shall have one single shutter faced with yellow green retro-reflective sheeting with a minimum of four high output yellow green LEDs or equivalent light source. The hybrid magnetically operated matrix – LED matrix sign shall be capable of operating in three display modes; shutter only, LED only, and both LED and shutter. These modes shall be automatically controlled by a photocell for day and night conditions and also capable of being manually controlled through the software.

The sign shall be controlled by an on-board computer. The sign shall automatically change to a preselected default message upon failure. That default message shall remain on display until the problem is corrected.

The sign shall include all necessary controls, including, but not limited to, personal computer, keyboard or alphanumeric hand-held keyboard, and software. The sign shall interface with PCs, cellular phones, and radar speed detection devices as required.

Controls shall be furnished for raising and lowering the message board, aligning the message board and, for solar powered units, a read-out of the battery bank charge.

Power shall be provided by a self-contained solar maintained power source or a diesel engine driven generator. Hardware for connection to a 110-volt power source shall also be provided.

Solar powered signs shall display programmed messages with the solar panel disconnected, in full night conditions, for a minimum of 30 consecutive days.

Construction Methods: The Contractor shall furnish, place, operate, maintain and relocate the sign as required. When the sign is no longer required, it shall be removed and become the property of the Contractor.

When the sign is not in use, it shall either be turned off with a blank display or turned from view.

Any signs that are missing, damaged, defaced or improperly functioning so that they are not effective, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices," shall be replaced by the Contractor at no cost to the State.

Method of Measurement: This work will be measured for payment for each "Changeable Message Sign" furnished and installed, for the number of calendar days that the sign is in place and in operation, measured to the nearest day. When a sign is in operation for less than a day, such a period of time shall be considered to be a full day regardless of actual time in operation.

Basis of Payment: This work will be paid for at the Contract unit price per day for each "Changeable Message Sign" which price shall include placing, maintaining, relocating and removing the sign and its appurtenances and all material, labor, tools and equipment incidental thereto.

Pay Item	**Pay Unit**
Changeable Message Sign	Day

ITEM #1220011A - CONSTRUCTION SIGNS – TYPE III REFLECTIVE SHEETING

Article 12.20.01 – **Description:** The Contractor shall furnish construction signs with Type III reflective sheeting and their required portable supports or metal sign posts that conform to the requirements of NCHRP Report 350 (TL-3) and to the signing requirements stated in Article 9.71 "Maintenance and Protection of Traffic," as shown on the plans and/or as directed by the Engineer.

Article 12.20.02 – Materials: Prior to using the construction signs and their portable supports, the Contractor shall submit to the Engineer a copy of the Letter of Acceptance issued by the FHWA to the manufacturer documenting that the devices (both sign and portable support tested together) conform to NCHRP Report 350 (TL-3).

Portable sign supports shall be designed and fabricated so that the signs do not blow over or become displaced by the wind from passing vehicles. Portable sign supports shall be approved by the Engineer before they are used.

Mounting height of signs on portable sign supports shall be a minimum of 1 foot and a maximum of 2 feet, measured from the pavement to the bottom of the sign.

All sign faces shall be rigid and reflectorized. Reflective sheeting shall conform to the requirements of Article M.18.09.01 (Type III). Sheet aluminum sign blanks shall conform to the requirements of Article M.18.13. Metal sign posts shall conform to the requirements of Article M.18.14. Application of reflective sheeting, legends, symbols, and borders shall conform to the requirements specified by the reflective sheeting manufacturer. Attachments shall be provided so that the signs can be firmly attached to the portable sign supports or metal posts without causing damage to the signs.

The following types of construction signs shall not be used: mesh, non-rigid, roll-up.

The following portable sign support systems or equivalent systems that meet the above requirements may be used:

- Korman Model #SS548 flexible sign stand with composite aluminum sign substrate (APOLIC)

- Traffix "Little Buster" dual spring folding sign stand with corrugated polyethylene (0.4 in. thick) sign substrate (InteCel)

Article 12.20.03 – Construction Methods: Ineffective signs, as determined by the Engineer and in accordance with the ATSSA guidelines contained in "Quality Standards for Work Zone Traffic Control Devices", shall be replaced by the Contractor at no cost to the State.

Signs and their portable supports or metal posts that are no longer required shall be removed from the project and shall remain the property of the Contractor.

Article 12.20.04 – Method of Measurement: Construction Signs - Type III Reflective Sheeting will be measured for payment by the number of square feet of sign face. Sign supports will not be measured for payment.

Article 12.20.05 – Basis of Payment: "Construction Signs – Type III Reflective Sheeting" required and used on the project will be paid for at the Contract unit price per square foot. This price shall include the furnishing and maintenance of the signs, portable sign supports, metal sign posts and all hardware. Each sign and support or posts will be paid for once, regardless of the number of times it is used.

Pay Item	Pay Unit
Construction Signs – Type III Reflective Sheeting	S.F.