MAINE TURNPIKE AUTHORITY

MAINE TURNPIKE

CONTRACT DOCUMENTS

CONTRACT 2021.02

WATER LINE AND UTILITY VAULTS
MM 47.1, MM 47.6, AND MM 48.5

NOTICE TO CONTRACTORS

PROPOSAL

CONTRACT AGREEMENT

CONTRACT BOND

FINAL LIEN AND CLAIM WAIVER AND AFFIDAVIT

SPECIFICATIONS

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

The Specifications are divided into two parts:
Part I, Supplemental Specifications and Part II, Special Provisions.

The Maine Turnpike Supplemental Specifications are additions and alterations to the 2014 Maine Department of Transportation Standard Specifications. See Subsection 100.1.

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MAINE TURNPIKE AUTHORITY

NOTICE TO CONTRACTORS

Sealed Proposals will be received by the Maine Turnpike Authority for:

CONTRACT 2021.02

WATER LINE AND UTILITY VAULTS
MM 47.1, MM 47.6, AND MM 48.5

at the office of the Maine Turnpike Authority, 2360 Congress Street, Portland, ME, until 11:00 a.m., prevailing time as determined by the Authority on June 15, 2021 at which time and place the Proposals will be publicly opened and read. Bids will be accepted from Contractors **prequalified** by the Maine Department of Transportation for Highway Construction Projects. All other bids may be rejected. This Project includes a wage determination developed by the State of Maine Department of Labor.

The work consists of constructing utility vault extensions and watermain replacement on the Maine Turnpike in the City of Portland, Maine. The work includes embankment excavation, shoulder gravels and pavement construction, utility vault extension, watermain replacement, guardrail and culvert removal and replacement, maintenance of traffic and all other work incidental thereto in accordance with the Plans and Specifications.

Plans and Contract Documents may be examined by prospective Bidders weekdays between 8:00 a.m. and 4:30 p.m. at the office of the Maine Turnpike Authority, 2360 Congress Street, Portland, Maine. **The half size Plans** and Contract Documents may be obtained from the Authority upon payment of Seventy-Five ($75.00) Dollars for each set, which payment will not be returned. Checks shall be made payable to: Maine Turnpike Authority. The Plans and Contract Documents may also be downloaded from a link on our website at http://www.maineturnpike.com/project-and-planning/Construction-Contracts.aspx.

For general information regarding Bidding and Contracting procedures, contact Nate Carll, Purchasing Manager, at (207)482-8115. For information regarding Schedule of Items, plan holders list and bid results, visit our website at **http://www.maineturnpike.com/project-and-planning/Construction-Contracts.aspx** . For Project specific information, fax all questions to Nate Carll, Purchasing Manager, at (207) 871-7739 or email ncarll@maineturnpike.com. Responses will not be prepared for questions received by telephone. Bidders shall not contact any other Authority staff or Consultants for clarification of Contract provisions, and the Authority will not be responsible for any interpretations so obtained.

All work shall be governed by the Specifications entitled "State of Maine, Department of Transportation, Standard Specifications, Revision of November 2014", "Standard Details, Revision of November 2014" and "Best Management Practices for Erosion and Sediment Control", latest issue. Copies and recent updates to these publications can be downloaded at: http://www.maine.gov/mdot/contractors/publications/ .

Proposals must be accompanied by an original bid bond, certified or cashier's check payable to the Maine Turnpike Authority in an amount not less than Five (5%) Percent of the Total Amount in the Proposal, but not less than $500.00. The Bidder to whom a Contract is awarded will be required to furnish a Surety Corporation Bond, satisfactory to the Authority, on the standard Contract Bond form of the Authority, for a sum not less than the Total Amount of the Proposal.

Proposals must be made upon the Proposal Forms furnished by the Authority separately with the Contract Documents, and must be enclosed in the sealed special addressed envelope provided therefore bearing the name and address of the Bidder, the name of the Contract, and the date and time of Proposal opening on the outside.

A pre-bid conference will be held, virtually, on June 3, 2021 at 10:00 a.m., all registered plan holders will be sent the link for the ZOOM pre-bid meeting. The meeting link can also be obtained by contacting Nate Carll, MTA Purchasing Manager at ncarll@maineturnpike.com at least one hour prior to the start of the meeting.

The Authority reserves the unqualified right to reject any or all Proposals and to accept that Proposal which in its sole judgment will under all circumstances serve its best interest.

MAINE TURNPIKE
AUTHORITY

Nate Carll
Purchasing Manager
Maine Turnpike Authority
Portland, Maine

Maine Turnpike Authority

MAINE TURNPIKE

PROPOSAL

CONTRACT 2021.02

WATER LINE AND UTILITY VAULTS
MM 47.1, MM 47.6, AND MM 48.5

MAINE TURNPIKE AUTHORITY

PROPOSAL

CONTRACT 2021.02

WATER LINE AND UTILITY VAULTS
MM 47.1, MM 47.6, AND MM 48.5

TO MAINE TURNPIKE AUTHORITY:

The work consists of constructing utility vault extensions and watermain replacement on the Maine Turnpike in the City of Portland, Maine. The work includes embankment excavation, shoulder gravels and pavement construction, utility vault extension, watermain replacement, guardrail and culvert removal and replacement, maintenance of traffic and all other work incidental thereto in accordance with the Plans and Specifications.

This Work will be done under a Contract known as Contract 2021.02 according to the Plans and Specifications which are on file in the office of the Maine Turnpike Authority, 2360 Congress Street, Portland, Maine.

On the acceptance of this Proposal for said Work, the undersigned will give the required bond with good security conditioned for the faithful performance of said Work, according to said Plans and Specifications, and the doing of all other work required by said Specifications for the consideration herein named and with the further condition that the Maine Turnpike Authority shall be saved harmless from any and all damages that might accrue to any person, persons or property by reason of the carrying out of said Work, or any part thereof, or by reason of negligence of the undersigned, or any person or persons under his employment and engaged in said Work.

The undersigned hereby declares that he/she has carefully examined the Plans, Specifications and other Contract Documents, and that he/she will contract to carry out and complete the said Work as specified and delineated at the price per unit of measure for each scheduled item of Work stated in the Schedule of Prices as follows:

It is understood that the TOTAL AMOUNT stated by the undersigned in the following Schedule of Prices is based on approximate quantities and will be used solely for the comparison of bids, and that the quantities stated in the Schedule of Prices for the various items are estimates only and may be increased or decreased all as provided in the Specifications.

SCHEDULE OF BID PRICES
CONTRACT NO. 2021.02
WATER LINE AND UTILITY VAULTS
MM 47.1, MM 47.6, AND MM 48.5

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
202.12	Remove Existing Structural Concrete	Cubic Yard	30				
203.20	Common Excavation	Cubic Yard	980				
203.25	Granular Borrow	Cubic Yard	280				
304.14	Aggregate Base Course - Type A	Cubic Yard	850				
403.213	Hot Mix Asphalt, 12.50 mm Nominal Maximum Size (Base and Intermediate Base Course)	Ton	80				
409.15	Bituminous Tack Coat RS1 or RS1h - Applied	Gallon	15				
419.30	Sawing Bituminous Pavement	Linear Foot	450				
501.231	Dynamic Load Test	Each	2				
501.40	Steel H-beam Piles, 53 lb/ft, delivered	Linear Foot	865				
501.401	Steel H-beam Piles, 53 lb/ft, in place	Linear Foot	865				
501.90	Pile Tips	Each	10				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
			BROUGHT FORWARD:				
501.91	Pile Splices	Each	10				
501.92	Pile Driving Equipment Mobilization	Lump Sum	1				
511.091	Temporary Earth Support Systems	Lump Sum	1				
514.06	Curing Box for Concrete Cylinders	Each	1				
526.306	Temporary Concrete Barrier, Type I - Supplied by Authority (1,760 LF)	Lump Sum	1				
527.341	Work Zone Crash Cushions - TL-3	Unit	5				
603.195	24 inch Reinforced Concrete Pipe - Class III	Linear Foot	20				
603.28	Concrete Collar	Each	1				
603.281	Concrete Collar for Watermain	Each	1				
603.7424	Remove and Relay 24 inch Concrete Pipe	Linear Foot	54				
604.1581	Utility Vault Extension - STA 2360+02.55 NB	Lump Sum	1				
604.1582	Utility Vault Extension - STA 2340+52.81 NB	Lump Sum	1				
			CARRIED FORWARD:				

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
			BROUGHT FORWARD:				
604.1583	Utility Vault Extension - STA 2340+52.81 SB	Lump Sum	1				
606.366	Guardrail, Removed and Reset, Type 3c	Linear Foot	540				
610.08	Plain Riprap	Cubic Yard	11				
610.18	Stone Ditch Protection	Cubic Yard	5				
613.319	Erosion Control Blanket	Square Yard	200				
615.07	Loam	Cubic Yard	170				
618.14	Seeding Method Number 2	Unit	15				
619.1201	Mulch - Plan Quantity	Unit	15				
619.1202	Temporary Mulch	Lump Sum	1				
620.58	Erosion Control Geotextile	Square Yard	54				
627.712	White or Yellow Pavement Marking Line	Linear Foot	300				
627.73	Temporary 6 inch Pavement Marking Tape	Linear Foot	600				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
			BROUGHT FORWARD:				
629.05	Hand Labor, Straight Time	Hour	15				
631.12	All Purpose Excavator (Including Operator)	Hour	15				
631.172	Truck-Large (Including Operator)	Hour	15				
631.22	Front End Loader (Including Operator)	Hour	15				
631.36	Foreman	Hour	15				
652.30	Flashing Arrow	Each	1				
652.312	Type III Barricades	Each	2				
652.33	Drum	Each	110				
652.35	Construction Signs	Square Foot	660				
652.361	Maintenance of Traffic Control Devices	Lump Sum	1				
652.41	Portable-Changeable Message Sign	Each	2				
652.45	Truck Mounted Attenuator	Calendar Day	15				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
			BROUGHT FORWARD:				
656.50	Bailed Hay, In Place	Each	15				
656.632	30 Inch Temporary Silt Fence	Linear Foot	900				
659.10	Mobilization (Utility Vaults)	Lump Sum	1				
659.11	Mobilization (Waterline)	Lump Sum	1				
822.3405	8" Class 52 DI Pipe Push On Joint	Linear Foot	10				
822.3605	12" Class 52 DI Pipe Push on Joint	Linear Foot	160				
823.311	12" Gate Valve	Each	2				
823.333	1" Air Release Valve	Each	2				
825.60	12" DR 11 HDPE Pipe	Linear Foot	390				
827.303	Unsuitable Material Below Trench Grade	Cubic Yard	50				
845.211	Stone Pipe Support in Casing - NB, SB, & SB On Ramp	Lump Sum	1				
845.212	Stone Pipe Support in Casing - NB Off Ramp	Lump Sum	1				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
TOTAL:							

Acknowledgment is hereby made of the following Addenda received since issuance of the Plans and Specifications: _____

_____

_____

Accompanying this Proposal is an original bid bond, cashiers or certified check on _____ Bank, for _____, payable to the Maine Turnpike Authority. In case this Proposal shall be accepted by the Maine Turnpike Authority and the undersigned should fail to execute a Contract with, and furnish the security required by the Maine Turnpike Authority as set forth in the Specifications, within the time fixed therein, an amount of money equal to Five (5%) Percent of the Total Amount of the Proposal for the Contract awarded to the undersigned, but not less than $500.00, obtained out of the original bid bond, cashier's or certified check, shall become the property of the Maine Turnpike Authority; otherwise the check will be returned to the undersigned.

The performance of said Work under this Contract will be completed during the time specified in Subsection 107.1.

It is agreed that time is of the essence of this Contract and that I (we) will, in the event of my (our) failure to complete the Work within the time limit named above, pay to Maine Turnpike Authority liquidated damages in the amount or amounts stated in the Specifications.

The undersigned is an Individual/Partnership/Corporation under the laws of the State of _____, having principal office at _____, thereunto duly authorized.

_____ *(SEAL)*

_____ *(SEAL)*

Affix Corporate Seal
or Power of Attorney
Where Applicable

_____ *(SEAL)*

By: _____

Its: _____

Information below to be typed or printed where applicable:

INDIVIDUAL:

_____	_____
(Name)	(Address)

PARTNERSHIP - Name and Address of General Partners:

_____	_____
(Name)	(Address)
_____	_____
(Name)	(Address)
_____	_____
(Name)	(Address)
_____	_____
(Name)	(Address)

INCORPORATED COMPANY:

_____	_____
(President)	(Address)
_____	_____
(Vice-President)	(Address)
_____	_____
(Secretary)	(Address)
_____	_____
(Treasurer)	(Address)

MAINE TURNPIKE AUTHORITY

MAINE TURNPIKE

YORK TO AUGUSTA

CONTRACT AGREEMENT

This Agreement made and entered into between the Maine Turnpike Authority, and sometimes termed the "Authority", and _____

_____

herein termed the "Contractor":

WITNESSETH: That the Authority and the Contractor, in consideration of the premises and of the mutual covenants, considerations and agreements herein contained, agree as follows:

FIRST: The parties hereto mutually agree that the documents attached hereto and herein incorporated and made a part hereof collectively evidencing and constituting the entire Contract to the same extent as if herein written in full, are the Notice to Contractors, the Accepted Proposal, the Specifications, the Plans, this Agreement, the Contract Bond and all Addenda to the Contract Documents duly issued and herewith enumerated:

_____

_____

SECOND: The Contractor for and in consideration of certain payments to be made as hereafter specified, hereby covenants and agrees to perform and execute all of the provisions of this Contract and of all documents and parts attached hereto and made a part thereof, and at his own cost and expense to furnish and perform everything necessary and required to construct and complete, ready for its intended purpose, in accordance with the Contract and such instructions as the Engineer may give, acceptable to the Authority, in the times provided, all of the Work covered and included under Contract No. _____ covering _____ as herein described.

THIRD: In consideration of the performance by the Contractor of his covenants and agreements as herein set forth, the Authority hereby covenants and agrees to pay the Contractor according to the Schedule of Prices set forth in the Proposal with additions and deductions as elsewhere herein provided in the times and in the manner stated in the Specifications. This Agreement shall insure to the benefit of, and shall be binding upon the parties hereto, and upon their respective successors and assigns; but neither party hereto shall assign or transfer his interest herein in whole or in part without the consent of the other, except as herein provided.

IN WITNESS WHEREOF the parties to this Agreement have executed the same in quintuplicate.

AUTHORITY -

MAINE TURNPIKE AUTHORITY

By: _____

Title: CHAIRMAN

Date of Signature: _____

ATTEST:

_____
Secretary

CONTRACTOR -

_____
CONTRACTOR

By: _____

Title: _____

Date of Signature: _____

WITNESS:

_____

CONTRACT BOND

KNOW ALL MEN BY THESE PRESENTS that _____

of _____ in the County of _____ and State of _____

as Principal, and _____ a Corporation duly organized under the

laws of the State of _____ and having a usual place of business in _____

_____

As Surety, are held and firmly bound unto the Maine Turnpike Authority in the sum of _____Dollars ($_____.___), to be paid to said Maine Turnpike Authority, or its successors, for which payment, well and truly to be made, we bind ourselves, our heirs, executors, successors and assigns jointly and severally by these presents.

The condition of this obligation is such that the Principal, designated as Contractor in the foregoing Contract No. _____ shall faithfully perform the Contract on his part and satisfy all claims and demands incurred for the same and shall pay all bills for labor, material, equipment and all other items contracted for, or used by him, in connection with the Work contemplated by said Contract, and shall fully reimburse the Obligee for all outlay and expense which the Obligee may incur in making good any default of said Principal, then this Obligation shall be null and void; otherwise it shall remain in full force and effect.

Signed and sealed this_____day of _____, A.D., 2020___

Witnesses: CONTRACTOR

_____ _____ *(SEAL)*

_____ _____ *(SEAL)*

_____ _____ *(SEAL)*

SURETY

_____ _____ *(SEAL)*

_____ _____ *(SEAL)*

_____ _____ *(SEAL)*

(Surety must attach copy of Power of Attorney showing authority of Office or Agent to execute bonds)

FINAL LIEN AND CLAIM WAIVER AND AFFIDAVIT

Upon receipt of the sum of _____, which sum represents the total amount paid, including the current payment for work done and materials supplied for Project No. _____, in _____, Maine, under the undersigned's Contract with the Maine Turnpike Authority.

The undersigned, on oath, states that the Final Payment of _____ is the final payment for all work, labor, materials, services and miscellaneous (all of which are hereinafter referred to as "Work Items") supplied to the said Project through _____and that no additional sum is claimed by the undersigned respecting said Project.

The undersigned, on oath, states that all persons and firms who supplied Work Items to the undersigned in connection with said Project have been fully paid by the undersigned for such Work Items or that such payment will be fully effected immediately upon receipt of this payment.

In consideration of the payment herewith made, the undersigned does fully and finally release and hold harmless the Maine Turnpike Authority, and its Surety, if any, from any and all claims, liens or right to claim or lien, arising out of this Project under any applicable bond, law or statute.

It is understood that this Affidavit is submitted to assure the Owner and others that all liens and claims relating to the Work Items furnished by the undersigned are paid.

_____

(Contractor)

By: _____

Title: _____

State of MAINE

County of _____

I, _____, hereby certify on behalf of _____
(Company Officer) *(Company Name)*

its _____, being first duly sworn and stated that the foregoing representations are
(Title)

are true and correct upon his own knowledge and that the foregoing is his free act and deed in said capacity and the free act and deed of the above-named

_____
(Company Name)

The above-named, _____, personally appeared before me this ____ day of _____and swears that this is his free act and deed.

(SEAL)

_____

Notary Public

My Commission Expires: _____

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART I – SUPPLEMENTAL SPECIFICATIONS

(Rev. November 10, 2016)

Supplemental Specifications are available at www.maineturnpike.com

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART II – SPECIAL PROVISIONS

APPENDICES

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART II - SPECIAL PROVISIONS

All work shall be governed by the Maine Department of Transportation Standard Specifications, Revision of November 2014, except for that work which applies to sections of the Maine Department of Transportation Standard Specifications which are amended by the Maine Turnpike Supplemental Specifications and the following modifications, additions and deletions.

General Description of Work

The work consists of constructing utility vault extensions and watermain replacement on the Maine Turnpike in the City of Portland, Maine. The work includes embankment excavation, shoulder gravels and pavement construction, utility vault extension, watermain replacement, guardrail and culvert removal and replacement, maintenance of traffic and all other work incidental thereto in accordance with the Plans and Specifications.

Plans

The drawings included in these Contract Documents, and referred to as the Plans, show the general character of the work to be done under this Contract. They bear the general title "Maine Turnpike – Contract 2021.02 – Water Line and Utility Vaults, Mile 47.1, 47.6 And Mile 48.5". The right is reserved by the Resident to make such minor corrections or alterations in the Plans as they deem necessary without change in the unit prices on the Schedule of Prices of the Proposal.

101.2 Definition

Holidays

The following is added after Memorial Day in the Supplemental Specifications:

Independence Day 2021 (Fourth of July)	6:00 a.m. preceding Friday to 6:00 a.m. the following Tuesday
Christmas Day 2021	12:01 p.m. preceding Thursday to 6:00 a.m. the following Tuesday
New Year's Day 2022	12:01 p.m. preceding Thursday to 6:00 a.m. the following Monday
Independence Day 2022 (Fourth of July)	6:00 a.m. preceding Friday to 6:00 a.m. the following Tuesday

103.4 Notice of Award

The following sentence is added:

The Maine Turnpike Authority Board is scheduled to consider the Contract Award on June 24, 2021.

104.3.8 Wage Rates and Labor Laws

Section 104.3.8 Wage Rates and Labor Laws has been amended as follows:

The fair minimum hourly rates determined by the State of Maine Department of Labor for this Contract are as follows:

THIS DOCUMENT MUST BE CLEARLY POSTED AT ALL CONSTRUCTION SITES FUNDED IN PART WITH STATE FUNDS

State of Maine
Department of Labor
Bureau of Labor Standards
Augusta, Maine 04333-0045
Telephone (207) 623-7906

Wage Determination - In accordance with 26 MRS §1301 et. seq., this is a determination by the Bureau of Labor Standards, of the fair minimum wage rate to be paid to laborers and workers employed on the below titled project.

2021 Fair Minimum Wage Rates
Heavy & Bridge Cumberland County

Occupation Title	Minimum Wage	Minimum Benefit	Total	Occupation Title	Minimum Wage	Minimum Benefit	Total
Asphalt Raker	$ 19.51	$ 2.14	$ 21.65	Ironworker - Reinforcing	$ 29.38	$ 6.98	$ 36.36
Backhoe Loader Operator	$ 28.75	$ 12.88	$ 41.63	Ironworker - Structural	$ 22.00	$ 4.94	$ 26.94
Boom Truck (Truck Crane) Operator	$ 25.00	$ 5.86	$ 30.86	Laborer - Skilled	$ 22.50	$ 4.46	$ 26.96
Bulldozer Operator	$ 23.97	$ 3.88	$ 27.85	Laborers (Helpers & Tenders)	$ 21.01	$ 1.52	$ 22.53
Carpenter	$ 24.75	$ 5.90	$ 30.65	Line Erector - Power/Cable Splicer	$ 32.89	$ 5.85	$ 38.74
Carpenter - Rough	$ 25.00	$ 5.67	$ 30.67	Loader Operator - Front-End	$ 26.00	$ 4.54	$ 30.54
Cement Mason/Finisher	$ 24.50	$ 0.00	$ 24.50	Mechanic- Maintenance	$ 24.61	$ 3.67	$ 28.28
Comm Transmission Erector-Microwave/Cell	$ 23.00	$ 4.64	$ 27.64	Mechanic- Refrigeration	$ 26.50	$ 6.58	$ 33.08
Communication Equip Installer	$ 19.75	$ 3.69	$ 23.44	Millwright	$ 27.00	$ 5.49	$ 32.49
Crane Operator =>15 Tons)	$ 31.98	$ 6.87	$ 38.85	Painter	$ 35.00	$ 0.00	$ 35.00
Diver	$ 32.00	$ 4.80	$ 36.80	Paver Operator	$ 23.91	$ 7.36	$ 31.27
Dry-Wall Applicator	$ 24.00	$ 0.00	$ 24.00	Pipe/Steam/Sprinkler Fitter	$ 27.00	$ 6.72	$ 33.72
Dry-Wall Taper & Finisher	$ 24.00	$ 0.84	$ 24.84	Pipelayer	$ 25.50	$ 5.90	$ 31.40
Earth Auger Operator	$ 27.33	$ 5.85	$ 33.18	Plumber (Licensed)	$ 28.00	$ 4.19	$ 32.19
Electrician - Licensed	$ 31.98	$ 8.44	$ 40.42	Plumber Helper/Trainee	$ 19.25	$ 2.10	$ 21.35
Electrician Helper/Cable Puller	$ 21.75	$ 18.67	$ 40.42	Reclaimer Operator	$ 26.83	$ 13.25	$ 40.08
Elevator Constructor/Installer	$ 61.42	$ 41.17	$ 102.59	Rigger	$ 26.00	$ 7.43	$ 33.43
Excavator Operator	$ 28.00	$ 4.27	$ 32.27	Roller Operator - Earth	$ 20.00	$ 1.92	$ 21.92
Fence Setter	$ 18.50	$ 2.00	$ 20.50	Roller Operator - Pavement	$ 23.91	$ 4.70	$ 28.61
Flagger	$ 15.00	$ 0.00	$ 15.00	Screed/Wheelman	$ 21.00	$ 3.61	$ 24.61
Floor Layer	$ 22.00	$ 4.32	$ 26.32	Sheet Metal Worker	$ 22.50	$ 5.42	$ 27.92
Grader/Scraper Operator	$ 23.71	$ 4.85	$ 28.56	Truck Driver - Heavy	$ 23.99	$ 1.93	$ 25.92
Hot Top Plant Operator	$ 23.91	$ 10.99	$ 34.90	Truck Driver - Light	$ 17.00	$ 0.52	$ 17.52
Industrial Truck (Forklift) Operator	$ 26.83	$ 1.95	$ 28.78	Truck Driver - Medium	$ 20.95	$ 2.02	$ 22.97
Insulation Installer	$ 21.00	$ 2.12	$ 23.12	Truck Driver - Tractor Trailer	$ 25.00	$ 2.57	$ 27.57

The Laborer classifications include a wide range of work duties. Therefore, if any specific occupation to be employed on this project is not listed in this determination, call the Bureau of Labor Standards at the above number for further clarification.

Welders are classified in the trade to which the welding is incidental.

Apprentices – The minimum wage rate for registered apprentices are those set forth in the standards and policies of the Maine State Apprenticeship and Training Council for approved apprenticeship programs.

Title 26 §1310 requires that a clearly legible statement of all fair minimum wage and benefits rates to be paid the several classes of laborers, workers and mechanics employed on the construction on the public work must be kept posted in a prominent and easily accessible place at the site by each contractor and subcontractor subject to sections 1304 to 1313.

Appeal – Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates.

A true copy

Attest: Scott R. Cotnoir

Scott R. Cotnoir
Wage & Hour Director
Bureau of Labor Standards

Expiration Date: 12-31-2021
Revised 2-25-2021

THIS DOCUMENT MUST BE CLEARLY POSTED AT ALL CONSTRUCTION SITES FUNDED IN PART WITH STATE FUNDS

State of Maine
Department of Labor
Bureau of Labor Standards
Augusta, Maine 04333-0045
Telephone (207) 623-7906

Wage Determination - In accordance with 26 MRS §1301 et. seq., this is a determination by the Bureau of Labor Standards, of the fair minimum wage rate to be paid to laborers and workers employed on the below titled project.

2021 Fair Minimum Wage Rates
Highway & Earth Cumberland County

Occupation Title	Minimum Wage	Minimum Benefit	Total	Occupation Title	Minimum Wage	Minimum Benefit	Total
Asphalt Raker	$ 19.80	$ 1.01	$ 20.81	Ironworker - Reinforcing	$ 28.36	$ 0.00	$ 28.36
Backhoe Loader Operator	$ 25.46	$ 4.33	$ 29.79	Laborer - Skilled	$ 20.61	$ 2.19	$ 22.80
Boom Truck (Truck Crane) Operator	$ 25.00	$ 5.86	$ 30.86	Laborers (Helpers & Tenders)	$ 20.00	$ 0.89	$ 20.89
Bulldozer Operator	$ 24.97	$ 3.50	$ 28.47	Loader Operator - Front-End	$ 20.50	$ 3.80	$ 24.30
Carpenter - Rough	$ 30.76	$ 19.72	$ 50.48	Mechanic- Maintenance	$ 24.00	$ 3.92	$ 27.92
Cement Mason/Finisher	$ 20.50	$ 1.42	$ 21.92	Millwright	$ 25.75	$ 5.41	$ 31.16
Communication Equip Installer	$ 22.00	$ 0.00	$ 22.00	Painter	$ 19.50	$ 0.00	$ 19.50
Crane Operator =>15 Tons)	$ 29.00	$ 6.68	$ 35.68	Paver Operator	$ 30.00	$ 5.21	$ 35.21
Crusher Plant Operator	$ 20.00	$ 2.39	$ 22.39	Pipelayer	$ 23.90	$ 3.50	$ 27.40
Electrician - Licensed	$ 28.00	$ 5.90	$ 33.90	Reclaimer Operator	$ 26.83	$ 13.25	$ 40.08
Electrician Helper/Cable Puller	$ 18.50	$ 2.39	$ 20.89	Roller Operator - Earth	$ 19.83	$ 0.00	$ 19.83
Excavator Operator	$ 24.20	$ 4.00	$ 28.20	Roller Operator - Pavement	$ 23.06	$ 4.59	$ 27.65
Fence Setter	$ 19.00	$ 2.00	$ 21.00	Screed/Wheelman	$ 24.86	$ 4.18	$ 29.04
Flagger	$ 15.50	$ 0.00	$ 15.50	Stone Mason	$ 25.00	$ 1.88	$ 26.88
Grader/Scraper Operator	$ 27.89	$ 8.90	$ 36.79	Truck Driver - Heavy	$ 19.00	$ 2.03	$ 21.03
Highway Worker/Guardrail Installer	$ 24.87	$ 1.36	$ 26.23	Truck Driver - Light	$ 24.15	$ 0.38	$ 24.53
Hot Top Plant Operator	$ 23.91	$ 13.25	$ 37.16	Truck Driver - Medium	$ 21.00	$ 1.64	$ 22.64
Industrial Truck (Forklift) Operator	$ 26.83	$ 1.48	$ 28.31	Truck Driver - Tractor Trailer	$ 20.00	$ 0.72	$ 20.72

The Laborer classifications include a wide range of work duties. Therefore, if any specific occupation to be employed on this project is not listed in this determination, call the Bureau of Labor Standards at the above number for further clarification.

Welders are classified in the trade to which the welding is incidental.

Apprentices – The minimum wage rate for registered apprentices are those set forth in the standards and policies of the Maine State Apprenticeship and Training Council for approved apprenticeship programs.

Title 26 §1310 requires that a clearly legible statement of all fair minimum wage and benefits rates to be paid the several classes of laborers, workers and mechanics employed on the construction on the public work must be kept posted in a prominent and easily accessible place at the site by each contractor and subcontractor subject to sections 1304 to 1313.

Appeal – Any person affected by the determination of these rates may appeal to the Commissioner of Labor by filing a written notice with the Commissioner stating the specific grounds of the objection within ten (10) days from the filing of these rates.

A true copy

Attest: Scott R. Cotnoir
Scott R. Cotnoir
Wage & Hour Director
Bureau of Labor Standards

Expiration Date: 12-31-2021
Revised 2-25-2021

104.4.6 Utility Coordination

This Subsection is amended by the addition of the following:

These Special Provisions outline the arrangements which have been established by the Authority for coordination of the work to be accomplished by the utilities. The scope and schedule of utility relocation work is noted herein. The Contractor shall plan and conduct his work accordingly.

General

Utility working days are Monday through Friday, conditions permitting. Times are estimated on the basis of a single crew for each utility. Any times and dates mentioned are estimates only and are dependent upon favorable weather, working conditions, and freedom from emergencies. The Contractor shall have no claim against the Authority if they are exceeded.

The Contractor shall plan and conduct operations in accordance with the following utility schedule. The Contractor must comply with all OSHA regulations pertaining to work adjacent to utility wires. The Contractor shall plan and conduct work accordingly.

The following utilities are located within the Project limits. The Contractor shall ascertain the location of the existing utilities and any other necessary information by direct inquiry at the office of the following utility owners:

AERIAL UTILITIES

The aerial utility facilities identified below are present within the project limits. Existing aerial distribution and communications cables cross the Turnpike mainline.

Temporary utility adjustments are not anticipated. If temporary relocation becomes necessary, the Contractor shall notify the affected utilities. Any cost for temporary relocations shall be the responsibility of the Contractor. The Contractor shall not have any claims against the Authority if the existing lines become a construction issue. Sufficient time will need to be allowed prior to the construction for all required temporary relocation.

The Contractor shall not excavate around any pole, guy anchor, or street light to a depth that compromises the stability of the pole.

The following aerial utilities are known to be present on this project, including contact information:

CENTRAL MAINE POWER COMPANY (CMPCo)
83 Edison Drive
Augusta, ME 04336
ATTN: Randy Berry
Tel: (207) 500-1407

Email: RBerry@canacre.com

160 Canco Road
Portland, ME 04103
ATTN: Alpay Balkir
Tel: (207) 239-8372
Email: alpay.balkir@cmpco.com

CMP has aerial crossings of the Turnpike: south of and along Congress St, north of Westbrook St, south of Rand Rd/Westbrook Arterial, and north of and along Brighton Ave.

- There are no grading concerns for the transmission line north of Westbrook Street. The contractor shall however, be aware of pole guys near slope limits in this location. The Contractor shall be aware that they may be working next to, or under the existing wires with limited clearance in this area. The Contractor shall be responsible for complying with M.R.S.A. Title35-A, Chapter 7-A Sections 751 -761 Overhead High-Voltage Line Safety Act. Prior to commencing any work that may come within ten (10) feet of any aerial electrical line the Contractor shall notify the aerial utilities as per section 757 of the aforementioned act. Any work within 25 feet of CMPCo's facilities will require advance coordination with CMPCo to have a CMPCo representative on-site to provide a safety watch. The CMPCo representative may stop work within the CMPCo right-of-way if they believe the work activities are unsafe or may cause damage to CMPCo's facilities. All CMPCo poles or guy wires that will have construction activities or construction traffic within 25 ft shall be protected by two sections of temporary concrete barrier. Three temporary barrier markers shall be mounted on the barrier at each location.
- Similarly, the pole guys for the Rand Road crossing are close to the slope limits; the contractor should be aware, follow the same precautions, and have the same responsibilities as noted for the Westbrook Street crossing.
- There are no grading concerns for the crossing along Brighton Avenue.
- The contractor shall provide CMP with 10 days notice of grading around all poles, guys, and push poles.
- The Contractor shall prepare and submit for approval, a crane layout plan depicting the working area of all components of the crane and infrastructure being installed as well as the poles, guys, and conductors. The plan shall be submitted a minimum of 30 days prior to planned work adjacent to the conductors. Written approval must be received prior to work commencing.
- A Utility Pre-Construction meeting is required and shall be completed prior to construction.

CROWN CASTLE FIBER (LIGHTOWER)
80 Central Street
Boxborough, MA 01719
ATTN: Mark Bonnano
Tel: (617) 828-1415
Email: mbonnano@lightower.com

Lightower has aerial facilities on the same poles as CMP south of Rand Road and north of Brighton Avenue. There are no concerns with proposed work in either of these areas. Contractor shall provide 10 days notice before grading around poles, braces, or pole guys.

FEDERAL AVIATION ADMINISTRATION (FAA)
1001 Westbrook Street
Portland, ME 04102
ATTN: Jim Mello
Tel: (207) 552-1505
Email: james.mello@faa.gov

1001 Westbrook Street
Portland, ME 04102
ATTN: Dave Simard
Tel: (207) 318-2827
Email: david.p.simard@faa.gov

1001 Westbrook Street
Portland, ME 04102
ATTN: Robert Durocher
Tel: (207) 552-1501
Email: robert.durocher@faa.gov

Contractor shall review and comply with the Special Conditions contained in Aeronautical Studies: No. 2021-ANE-18-OE, No. 2021-ANE-19-OE, No. 2021-ANE-29-OE, and FAA Advisory Circular AC No. 70/7460-1 M, Obstruction Marking and Lighting. These documents are contained in the Appendix. FAA has determined equipment that is 100 feet tall or less (above ground level at the waterline crossings) may be used on this project with special marking and/or lighting; see documents noted in this paragraph. Any equipment or part of equipment that exceeds 100 feet above ground level will require an additional application process, review, and approval of the FAA before the equipment can be used.

Contractor shall contact the FAA (Portland International Jetport), including PWM Air Traffic Control Tower at 207-552-1415, and PWM Manager at 207-756-8310, as noted in these documents, at least 3 business days prior to use of construction equipment at the three waterline crossings AND when the construction is complete.

Contractor must submit FAA Form 7460-2 Notice of Actual Construction or Alteration to the Resident within 3 days of when construction equipment is removed from the site.

UNDERGROUND UTILITIES

The underground utility facilities identified below are present within the project limits.

Unless otherwise specified, any underground utility facilities shown on the project plans represent approximate locations gathered from available information. The MTA cannot certify the level of accuracy of this data. Underground facilities indicated on the plan sheets have been collected from historical records and/or on-site designations provided by the respective utility companies. Underground facilities indicated on the cross-sections have been carried over from the plan view data and may also include further approximations of the elevations (depths) based upon straight-line interpolation from the nearest manholes, gate valves, or test pits.

The following underground utilities are known to be present to this project, including contact information:

ELECTRIC (LIGHTING)
Maine Turnpike Authority
2360 Congress Street
Portland, ME 04102
ATTN: Shawn Laverdiere
Tel: (207) 829-3767
Email: SLaverdiere@maineturnpike.com

Maine Turnpike Authority owns highway lighting facilities within the project limits along each interchange ramp. The utility vault extensions and watermain replacement will require excavation around/near electrical conduits supplying power to the interchange lightings.

The Contractor shall coordinate with MTA at least 10-days prior to excavation around lighting facilities. Interchange lighting must remain operational at all times

PORTLAND PIPE LINE CORPORATION (PPLC)
30 Hill Street
South Portland, ME 04106
ATTN: Randy Hughes
Tel: (207) 767-0437
Email: randy.hughes@pmpl.com
ATTN: Ken Brown
Tel:(207)767-0449
Email: Ken.Brown@pmpl.com

Portland Pipe Line Corporation (PPLC) has a 24-inch oil pipeline approximately 80 feet from the construction of a utility vault, station 2340+50 left.

Special coordination is required for waterline replacement and grading in the Exit 48 interchange between the Turnpike mainline and the northbound off ramp. PPLC maintains pipe vents and a cathodic protection test station at this location which must be maintained. Cover requirements shall also be maintained in this area over the pipelines. The contractor shall provide a 30-day notice of construction in this area.

PPLC requires a Pre-Construction meeting to finalize all construction details and schedule including details of heavy and vibratory equipment to be operated near and over the pipelines. In addition, the contractor must follow a set of construction guidelines, labeled Portland Pipe Line Corporation – Construction Practices for work within 1,000 feet of their facility; see Appendix. This contains general restrictions regarding work and rock excavation near the PPLC facilities. Prior to rock excavation within 1000-feet of PPLC's facility, PPLC requires a two-week notice of work, an advance copy of the rock excavation plan submittal, and monitoring requirement, to ensure that the rock excavation plan includes measures which protect and monitor the pipeline. PPLC then requires a 48-hours' notice for any work in the vicinity of its pipelines. Additionally, PPLC will have an inspector onsite during construction within 50-feet of any PPLC facilities. In case of emergency the Contractor shall contact the 24-hour/7-days a week PPLC control center, 1-866-253-7351 or 1-207-767-3231.

PORTLAND WATER DISTRICT (PWD)
225 Douglass Street P.O. Box 3553
Portland, ME 04104
ATTN: Joseph Parent
Tel: (207) 232-3851
Email: jparent@pwd.org

Portland Water District has a 12-inch main in a 24-inch casing crossing the Turnpike near Congress Street at approximately station 2303+50.

Portland Water District has a water main in a utility vault crossing the Turnpike at the following locations:

- 42-inch RCCP water main located at Station 2340+52.81 near Westbrook St.
- 42-inch CIP water main located at Station 2360+02.55 near Rand Rd.

The Contractor shall develop a construction procedure, temporary water main support, and temporary support systems that will protect, at all times, the 42" Cast Iron Pipe (1912, leaded joint) – at station 2360+02.55 and the 42" Reinforced Concrete Cylinder Pipe (1931, rubber and steel joint) – at station 2340+52.81, during construction of the tunnel extensions. Each water main will be removed from service by PWD during the work by closing valves on each side of the work area. The Contractor is required to fully complete the work on one utility vault before work can begin on the other utility vault. The maximum pipe support spacing shall be 6' along the pipeline. The Contractor is responsible for design of the construction procedure which shall be stamped by a professional engineer licensed in the State of Maine. The Contractor shall submit the design for review to the Resident Engineer and PWD at least 30 days prior to the start of construction.

Portland Water District has an 8-inch main in a 24-inch casing at Exit 48 interchange, crossing the mainline at station 2407+50, southbound onramp at station 125+00, and northbound offramp at station 145+00. The Contractor shall replace the water main and extend casings as shown on the PWD plans and described in the project Specifications.

PWD shall receive at least 96-hours advance notice of work to be performed within the PWD's easements or Rights-of-Way. No work shall be performed within the PWD pipeline easements or Rights-of-Way without prior approval of PWD and a PWD representative being on-site for inspection purposes.

The Portland Water District (PWD) requires a Pre-Construction meeting to finalize all construction details and schedule including details of heavy and vibratory equipment to be operated near and over the waterlines. Contractor shall provide a 10-day notice of work within 100' of their facilities. In addition to the advanced notice, a PWD inspector will be onsite during construction within 25-feet of any PWD infrastructure. Additionally, for any rock excavation within 500' of a PWD facility, PWD requires a two-week advance copy of the rock excavation plan submittal with the proximity to PWD's nearest main, for their review and approval.

104.4.7 Cooperation With Other Contractors

This Subsection is amended by the addition of the following:

Adjacent contracts currently scheduled for the 2020 & 2021 construction season include:

- MTA Contract 2018.19 – Cummings Road Underpass Bridge Replacement, MM 44.6
- MTA Contract 2020.02 – Exit 45 Interchange Reconstruction, MM 44.9
- MTA Contract 2020.03 – Portland Area Widening & Safety Improvements, MM 43.0 to 46.4
- MTA Contract 2019.10 – Warren Avenue Overpass Bridge Replacement, MM 49.0
- MaineDOT WIN 21745 Interstate 295 Over Veranda Street in Portland (for purposes of traffic management during planned I-295 closures)

105.8.2 Permit Requirements

The Project is being constructed under multiple environmental permits, including: the Maine Department of Environmental Protection (DEP) Natural Resources Protection Act Permit and Water Quality Certification L-27726-TG-A-N; U.S. Army Corps of Engineers Individual Permit NAE-2019-00701 under Section 404 of the Clean Water Act; and Self-Verification Notice authorization NAE-2021-01318 under the U.S. Army Corps of Engineers General Permits for the State of Maine.

These permits authorize temporary or permanent construction disturbance within wetlands located within the limits of disturbance (LOD) shown on the site plans. Any alterations to the LOD proposed by the contractor requires review and approval by MTA's Resident Engineer and environmental staff before being implemented. The permits require that no tree cutting shall occur in wetlands or uplands between June 1 and July 31. Erosion and sediment controls must be

maintained during and following construction in accordance with MTA's Supplemental Specification Section 656.

The Project is subject to all general, special, and project-specific conditions contained in the DEP and U.S. Army Corps of Engineers Permits. Copies of the permits will be provided to the Contractor. The Contractor shall comply with the conditions outlined in the U.S. Army Corps of Engineers and DEP permits. The Contractor shall indemnify and hold harmless the Maine Turnpike Authority or its agents, representatives and employees against any and all claims, liabilities or fines arising from or based on the violation of the above noted permits.

107.1 Contract Time and Contract Completion Date

This Subsection is amended by the addition of the following:

All work shall be complete on or before December 3, 2021. The construction shall be substantially complete by November 15, 2021.

107.1.1 Substantial Completion

This Subsection is amended by the addition of the following:

Substantially complete shall be defined by the Authority as the following:

- All utility vault extensions complete and normal operation of the contained watermain is restored.
- All watermain casing extension and watermain replacement complete and normal operation of the watermain is restored.
- All shoulder pavement is completed.
- All temporary traffic control, including temporary concrete barrier, is removed from the Turnpike.
- All culverts and stormwater drainage systems have been restored to their pre-construction operation.
- All disturbed slopes loamed, seeded, and mulched, and temporary erosion control installed where necessary.

Supplemental Liquidated damages on a calendar day basis in accordance with Subsection 107.8 shall be assessed for each calendar day that any substantial completion is not achieved and as outlined above in this Subsection and below in Subsection 107.4.6 Prosecution of Work.

107.4.6 Prosecution of Work

The following activities must be completed by or within the date(s) specified:

a. No tree cutting shall occur between June 1 and July 31.

107.4.7 Limitations of Operations

a. The Contractor may have only one watermain shut down at a time. The work must be complete, with the watermain brought back into service, at one watermain crossing before the other watermain is shut down to begin work on the other watermain crossing. The watermain replacement at Exit 48 may be completed anytime within the contract time, including overlapping with the utility vault work.

b. Multiple temporary ramp closures within an interchange are not allowed; only one ramp may be closed at a time.

c. The Contractor shall be responsible for coordinating and scheduling work activities with adjacent contracts in overlapping work zones.

d. Contractor shall review and comply with the Special Conditions contained in Aeronautical Studies: No. 2021-ANE-18-OE, No. 2021-ANE-19-OE, No. 2021-ANE-29-OE, and FAA Advisory Circular AC No. 70/7460-1 M, Obstruction Marking and Lighting. These documents are contained in the Appendix. FAA has determined equipment that is 100 feet tall or less (above ground level at the waterline crossings) may be used on this project with special marking and/or lighting; see documents noted in this paragraph. Any equipment or part of equipment that exceeds 100 feet above ground level will require an additional application process, review, and approval of the FAA before the equipment can be used.

e. Contractor shall contact the FAA (Portland International Jetport), including PWM Air Traffic Control Tower at 207-552-1415, and PWM Manager at 207-756-8310, as noted in these documents, at least 3 business days prior to use of construction equipment at the three waterline crossings AND when the construction is complete.

f. Contractor must submit FAA Form 7460-2 Notice of Actual Construction or Alteration to the Resident within 3 days of when construction equipment is removed from the site.

g. The Contractor shall complete the work as shown on the maintenance of traffic plans and in accordance with Section 652 of the Specifications. The MOT layouts as shown in the Plans and described in the Special Provisions provide guidance for construction sequencing. All Contractor MOT layouts, including any and all changes to the Plan MOT Layouts, or changes to the Special Provisions, shall be submitted to the Resident for review and approval prior to implementation. These will be considered a Shop Drawing Review and are required to be submitted at least 20 days prior to proposed implementation.

h. Care shall be taken when working near catch basins to ensure foreign material and contaminants do not enter. If foreign material and/or contaminants do enter the basin

they shall be removed prior to the material exiting the basin into a waterway. Removal shall be completed to the satisfaction of the Resident and payment shall be incidental to the Contract.

i. There shall be no pile driving during non-daylight hours. Pile driving will not be allowed within 10 feet of traffic.

j. Lane closures, ramp closures, shoulder closures, and stoppages of all kinds are prohibited during an Interstate 295 closure for MaineDOT project WIN 21745, Interstate 295 over Veranda Street. The planned I-295 Closure, and weather alternate, is tentatively scheduled for either: the period Noon October 22, 2021 thru Noon October 25, 2021 with an alternate weather period of Noon October 29, 2021 thru Noon November 1, 2021, OR Noon April 15, 2022 thru Noon April 18, 2022, with an alternate weather period of Noon April 22, 2022 thru Noon April 25, 2022.

k. The Contractor shall maintain existing drainage during construction as needed for temporary use and as identified on the plans. This includes, but not limited to, making temporary pipe connections, grading temporary ditch, or bypass pumping of stormwater. Payment for temporary stormwater and ditch drainage shall be incidental to the Contract and no additional payment will be made for required labor, fittings, seals, etc. Payment for final ditch grading shall be paid for under the applicable Bid Items.

SPECIAL PROVISION

SECTION 203

EXCAVATION AND EMBANKMENT

203.01 Description

The following paragraph is added:

This work shall consist of cutting, removing and disposing of the full depth of existing bituminous concrete pavement, including at the approaches to the bridge structures, within the limits of work as shown on the Plans or as approved by the Resident. The pavement shall be sawcut to the full depth of pavement at the limits of the excavation to provide a clean, vertical cut surface.

203.04 General

The following sentence is added to the end of the third paragraph.

There are no approved waste storage areas or waste areas within the Project limits unless shown on the Plans. Unsuitable materials shall be disposed of off-site in accordance with Subsection 203.06.

All excavations shall be accomplished in accordance with the applicable OSHA Standards. The Resident reserves the right to request the Contractor to prepare an excavation plan. This plan shall include, but not necessarily be limited to, the limit and depth of excavation, side slope, shoring, trench box and utility support.

203.10 Embankment Construction - General

The thirteenth and fourteenth paragraphs are deleted and replaced with the following:

All portions of the embankment shall be compacted in accordance with the designated embankment compaction requirements specified for the Project.

The existing slopes should be benched as shown on the drawings prior to placing additional fill. Embankment fill should be placed in lifts which extend laterally beyond the limits of the design side slopes such that the specified degree of compaction is achieved within the limits of the completed embankment. The slopes should then be trimmed back to design dimensions.

203.16 Winter Construction of Embankments

The word “core” is deleted from the first and second sentences in the first paragraph.

203.18 Method of Measurement

The following paragraphs are added:

There will be no additional payment for the required excavation plan, and costs shall be incidental to the Excavation items.

SPECIAL PROVISION

SECTION 206

STRUCTURAL EXCAVATION

206.02 Construction Methods

The following paragraphs are added:

There are no approved waste storage areas or waste areas within the Project limits. Unsuitable materials shall be disposed of off-site in accordance with Subsection 203.06.

SPECIAL PROVISION

SECTION 401

HOT MIX ASPHALT PAVEMENT

Section 401 of the Maine Turnpike Authority 2016 Supplemental Specifications is modified as follows:

401.01 Description

The following paragraph is added:

A Quality Control Plan (QCP) is required.

401.02 Materials

Section 401.02 is deleted in its entirety and replaced with the following:

Aggregates for HMA Pavements Coarse Aggregate and fine aggregate for HMA pavements shall be graded such that when combined in the proper proportions, including filler if required, the resultant blend will meet the composition of mixture for the type of pavement specified. Materials shall meet the requirements specified in Section 700 – Materials:

Asphalt Cement	702.01
Aggregates for HMA Pavement	703.07
RAP for HMA Pavement	703.08
HMA Mixture Composition	703.09

Mainline Surface HMA Coarse aggregate: The material retained on the No. 4 sieve, shall consist of angular fragments obtained from crushed quarry stone and be free of dirt or other objectionable materials. Coarse aggregate shall have a Micro-Deval value of 15.0 percent or less as determined by AASHTO T 327. The crushed stone shall have a maximum of 1.5% material finer than the No. 200 mesh when tested in accordance with AASHTO T-11. Flat and elongated particles shall not exceed a maximum of 8% at a 5:1 ratio in accordance with ASTM D-4791. Coarse aggregate angularity shall be a minimum of 95/90 in accordance with AASHTO T-335.

Mainline Surface HMA Fine aggregate: The material passing the No. 4 sieve, shall be crushed manufactured sand free from dirt, clay balls, or other objectionable material. Natural sand may be incorporated into the mix at a rate no greater than 10 percent by weight of total aggregate. The unconfined void content of the fine aggregate blend shall be a 45 minimum value when tested in accordance with AASHTO T-304, method A. AASHTO T-176 sand equivalent value shall be 45 minimum.

Asphalt Low Modulus Joint Sealer: Asphalt Low Modulus Joint Sealer shall be a modified asphalt and rubber compound designed for sealing and improving the strength and performance of

the base asphalt cement and shall conform to ASTM D6690 Type IV and the following specifications:

Cone Penetration	90-150
Flow @ 60°C [140ºF]	3.0mm [1/8 in] max
Bond, non-immersed	Three 12.7mm [½ in] specimens pass 3 cycles @ 200% extension @ -29°C [-20ºF]
Resilience, %	60 min
Asphalt Compatibility, ASTM D5329	pass*

* There shall be no failure in adhesion, formation of any oily exudate at the interface between the sealant and asphaltic concrete or other deleterious effects on the asphaltic concrete or sealant when tested at 60°C [140ºF].

The contractor shall provide the Resident or authorized representative with a copy of the material manufacturer's recommendations pertaining to heating, application, and reheating prior to the beginning of operations or the changing of materials.

Section 401.021 Recycled Asphalt Materials

Delete the second paragraph and replace with the following:

In the event that RAP source or properties change, the Contractor shall notify the Authority of the change and submit new documentation stating the new source or properties. A plant produced test batch meeting all requirements including Hamburg Wheel Tracker results.

Section 401.03 Composition of Mixtures

Section 401.03 is deleted in its entirety and replaced with the following:

HMA pavement mixtures for base, intermediate, shim and local road bridge projects shall be a currently approved MDOT design unless otherwise noted. A maximum of 20% RAP may be used. VMA shall meet the requirements listed in Table 1.

HMA pavement mixtures for Mainline surface paving projects shall conform to the following requirements:

The Contractor shall compose the Hot Mix Asphalt Pavement with aggregate, Performance Graded Asphalt Binder (PGAB), and mineral filler if required. HMA shall be designed and tested according to AASHTO R35 and the volumetric criteria in Table 1. The Contractor shall size, uniformly grade, and combine the aggregate fractions in proportions that provide a mixture

meeting the grading requirements of the Job Mix Formula (JMF). The Contractor may use a maximum of 15 percent reclaimed asphalt pavement (RAP) in any mainline surface course.

The Contractor shall submit a job mix formula (JMF) developed for each specified mixture at least 30 days prior to placement.

The JMF shall establish a single percentage of aggregate passing each sieve size within the limits shown in Subsection 703.09. The mixture shall be designed and produced, including all production tolerances, to comply with the allowable control points for the particular type of mixture as outlined in Subsection 703.09. The JMF shall state the original source, gradation, and percentage to be used of each portion of the aggregate and mineral filler if required. It shall also state the proposed PGAB content, the name and location of the refiner, the supplier, the source of PGAB submitted for approval, the type of PGAB modification if applicable, and the location of the terminal if applicable.

In addition, the Contractor shall provide the following information with the proposed JMF:

- Properly completed JMF indicating all mix properties (Gmm, VMA, VFB, etc.).
- Stockpile Gradation Summary.
- Test reports for individual aggregate consensus properties
- Design Aggregate Structure Consensus Property Summary.
- Design Aggregate Structure Trial Blend Gradation Plots (0.45 power chart).
- Trial Blend Test Results for at least three different aggregate blends.
- Selected design aggregate blend.
- Test results for the selected design aggregate blend at a minimum of three binder contents.
- Test results for final selected blend compacted to $N_{max.}$
- Specific Gravity for the PGAB to be used.
- Recommended mixing and compaction temperatures from the PGAB supplier.
- Data Sheets (SDS) For PGAB.
- Asphalt Content vs. Air Voids trial blend curve.
- Test report for Contractor’s Verification sample.

- Summary of RAP test results (if used), including count, average and standard deviation of binder content and gradation.

At the time of JMF submittal, the Contractor shall identify and make available the stockpiles of all proposed aggregates at the plant site. There must be a minimum of 150 ton for coarse aggregate stockpiles, 75 ton for fine aggregate stockpiles before the JMF may be submitted. The Authority shall obtain samples for laboratory testing. The Contractor shall also make available to the Authority the PGAB proposed for use in the mix in enough quantity to test the properties of the asphalt and to produce samples for testing of the mixture. Before the start of paving, the Contractor and the Authority's representative shall test a production sample in the Contractor's laboratory for evaluation. If the Authority finds the mixture acceptable, an approved JMF will be forwarded to the Contractor. The Authority will then notify the Contractor that paving may commence. The first day's production shall be monitored, and the approval may be withdrawn if the mixture exhibits undesirable characteristics such as checking, shoving or displacement. The Contractor shall be allowed to submit aim changes within 24 hours of receipt of the first Acceptance test result for an individual JMF. Adjustments will be allowed of up to 2% on the percent passing the 2.36 mm sieve through the 0.075 mm and 3% on the percent passing the 4.75 mm or larger sieves. Adjustments will be allowed on the %PGAB of up to 0.2 percent. Adjustments will be allowed on GMM of up to 0.010.

Approved mix designs from the previous calendar year may be carried over, however no aim changes will be granted for a carryover mix design and the initial design must not be older than the previous paving season.

The Contractor shall submit a new JMF for approval each time a change in material source or materials properties is proposed. The same approval process shall be followed. The cold feed percentage of any aggregate except natural sand may be adjusted up to 10 percentage points from the amount listed on the JMF, however no aggregate listed on the JMF shall be eliminated. Natural sand may be adjusted up to 5 percent from the amount listed on the JMF but shall not exceed 10% by weight of total aggregates. The cold feed percentage for RAP may be reduced up to five percentage points from the amount listed on the JMF and shall not exceed the percentage of RAP approved in the JMF or for the specific application.

TABLE 1
VOLUMETRIC DESIGN CRITERIA

Design ESAL's (Millions)	Required Density (Percent of G_{mm})			Voids in the Mineral Aggregate (VMA)(Minimum Percent) Nominal Maximum Aggregate Size (mm)				Voids Filled with Binder (VFB) (Minimum %)	Fines/Eff. Binder Ratio
	$N_{initial}$	N_{design}	N_{max}	19	12.5	9.5	4.75		
10 to <30	≤89.0	96.0	≤98.0	13.5	14.5	15.5	15.5	65-80	0.6-1.2

As part of the JMF submittal, there are Hamburg Wheel Tracker requirements, the Contractor shall provide the Authority the test results in accordance with AASHTO T324. The results shall be generated by a third-party independent testing laboratory as approved by the Authority. The test results for each individual specimen as well as the average shall meet the requirements of Table 1A

TABLE 1A
HAMBURG WHEEL TRACKER REQUIREMENTS

Specified PG Binder Grade	Test Temperature (ºC)	Maximum Rut Depth (mm)	Minimum Number of Passes	Minimum Allowable SIP*
64-28	45	12.5	20,000	15,000
64E-28	45	8.0	20,000	15,000
70E-34	45	6.3	20,000	15,000

Section 401.031 Warm Mix Technology

Add the following to the end of the first paragraph:

Weather and seasonal limitations as outlined in section 401.06 may be reduced by a maximum 5ºF with the use of WMA except for HMA being placed over bridge deck membrane.

Section 401.04 Temperature Requirements

Add the following line item after the third bullet:

- Any HMA placed over bridge deck membrane shall have a minimum temperature of 300° F measured directly behind the screed in the uncompacted mat.

Add the following paragraph:

No vehicular loads shall be permitted on newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to prevent distortion or loss of fines. The newly paved area may be opened to traffic after the internal temperature of the pavement has cooled to 120° F. The Resident will test the internal temperature of the pavement and shall be the sole judge as to the opening to traffic. The period of time before opening to traffic may be extended at the discretion of the Resident. The lane closure may not be removed until the internal temperature has cooled to 120° F.

Section 401.06 Weather and Seasonal Limitations

The first paragraph shall be deleted and replaced with:

The Contractor may place Hot Mix Asphalt Pavement for use other than a traveled way wearing course, provided that the air temperature as determined by an approved thermometer (placed in the shade at the paving location) is 45°F or higher and the area to be paved is not frozen. The Contractor may place Hot Mix Asphalt Pavement as traveled way wearing course, provided the air temperature determined as above is 50°F or higher. For the purposes of this Section, the traveled way includes truck lanes, ramps, approach roads, shoulders, and auxiliary lanes. The atmospheric temperature for all courses on bridge decks shall be 50°F or higher.

Section 401.08 Hauling Equipment Trucks for Hauling HMA

Add the following paragraphs:

The undercarriage of haul units actively hauling HMA to the site shall be relatively free of dust / mud agglomerations. Haul units found to be contaminating the paving surface shall be removed from the site and cleaned prior to returning.

The contractor shall supply enough haul units such that paving is continuous and without any stops or paver speed changes during the installation of ramp or mainline wearing courses utilizing an MTV. or any course placed on a bridge deck. The contractor will be charged a fee of $1000 for every occurrence if paving is either stopped or the paver must slow down to avoid stopping due to inadequate number of haul units at the sole discretion of the Authority.

Section 401.09 Pavers

Add the following to the end of the fourth paragraph:

The forward operating speed of the paver shall be limited based on the course being placed. A shim or leveling course shall have a maximum speed of 50 feet per minute (fpm). Any base, intermediate, or surface course shall have a maximum paver speed of 40 fpm. The limited speed is not to be calculated on an average basis over time but shall be the actual limitation at any moment during the paving operation.

Section 401.091 Material Transfer Vehicle (MTV)

The first paragraph shall be deleted and replaced with:

When required by Special Provision Section 403, the paver shall be supplied mixture by a material transfer vehicle (Roadtec SB2500 or approved equal) capable of receiving and storing bituminous mixture from haul trucks, remixing, and delivering the mix to the paver hopper in a consistently uniform manner.

The fourth paragraph shall be deleted and replaced with:

The MTV shall be designed so that the mix receives additional mixing action.

Section 401.11 Preparation of Existing Surface

Add the following paragraph:

The contractor will be permitted to be generally innovative in methods to dry existing wet or damp pavement. Any method which causes damage or burning of the existing pavement, or which causes debris to fly into traffic shall be discontinued.

Section 401.111 Layout

The contractor shall layout the site prior to any pavement course or final striping. Layout shall be achieved by physical measurements obtained every 50’ along the length to be paved or striped from a fixed reference point. The contractor shall transfer the measurements to the pavement surface every 50’ and apply a paint mark at each location. The marks shall then be connected by a smoothed string line and subsequent paint marks applied along the string at no greater than 10’ intervals. The Resident will inspect the layout line before associated activities may begin.

Section 401.165 Longitudinal Joint Density

The first paragraph shall be deleted and replaced with:

When noted in Special Provision Section 403, the Authority will measure the pavement density of longitudinal joints between adjoining mainline travel lanes in both the unconfined and confined condition as determined by the days paving operation.

The eighth paragraph shall be deleted and replaced with:

The minimum density of the completed pavement shall be 92.0 percent of the theoretical maximum density obtained. Two consecutive failing tests shall result in production shut down. Prior to resuming paving operations, the contractor quality control unit shall satisfy the Authority that the paving operation will produce joint densities in compliance with the Specifications.

The eleventh paragraph and associated table shall be deleted and replaced with:

Payment reduction will be applied to each sublot that has a density lower than 92.0% as outlined below.

PERCENT COMPACTION	PERCENT PAY
92.0 or greater	100
91.9 to 90.0	95
89.9 to 88.5	90
88.4 or less	80

Section 401.17 Joints

Delete the following sentence from the third paragraph:

"The Authority may allow feathered or "lap" joints on lower base courses or when matching existing base type pavements."

The fourth paragraph shall be deleted and replaced with:

When required by Special Provision Section 403, Mainline Longitudinal joints shall be constructed as notched-wedge joint and constructed in a manner that will best ensure joint integrity.

Section 401.18 Quality Control

Add the following paragraph v. to the QCP requirements

v. The contractor shall provide a detailed plan outlining how the number of haul units will be determined and supplied to the project to prevent the paver from stopping on mainline wearing course and bridge deck paving over membrane

The following shall be added to section c. Quality Control Technician(s) QCT:

The QCT shall be on site during paving operations performing quality control activities. QCT's shall not act as equipment operators, trainers or laborers.

Section 401.191 Inspection/Testing

In paragraph nine delete and replace Item #8 with:

8. Secure High-Speed Internet Access

401.21 Method of Measurement

The second paragraph shall be deleted and replaced with:

A reduction in payment will occur when the voids, asphalt content, and density are other than the limits specified below for 100 percent payment. The payment reduction for voids and PGAB content and density will be based upon each sublot (500 tons) of production as specified in Subsections 401.162, 401.163, 401.164, and 401.165. The Contractor may request one retest for each failing sublot for core density only. The original core density and the recut core density shall be averaged together to determine payment for the sublot. No retest will be allowed for voids or asphalt content. The Contractor shall pay $250.00 for each additional core tested. Pavement restoration will not be measured separately for payment but shall be incidental to the respective pay item.

SPECIAL PROVISION

SECTION 403

HOT MIX ASPHALT PAVEMENT

Course	HMA Grading	Item Number	Total Thickness	No. of Layers	Complimentary Notes

Northbound and Southbound Shoulder Construction

Intermediate	**12.5mm**	**403.213**	**2.0”**	**1**	**C,I,**
Base	**12.50mm**	**403.213**	**2.0”**	**1**	**C,I**

COMPLEMENTARY NOTES

A. The required PGAB for this mixture shall be **64E-28.**
B. RAP may not be used.
C. The Maine DOT will conduct the job mix verification. The aggregate qualities shall meet the design traffic level of 10 to <30 million ESALS for mix placed under this contract. Minimum and Maximum PGAB content limits from 401.21 shall not apply.
D. The MTA will conduct the job mix verification. The aggregate qualities shall meet the design traffic level of 10 to <30 million ESALS for mix placed under this contract. The design verification, Quality Control, and Acceptance tests for this mix will be performed at **75 gyrations**. (N design)
E. A material transfer vehicle (MTV) shall be used for the placement of Hot Mix Asphalt wearing surface on all roadways including acceleration and deceleration lanes and all ramps.
F. Joints shall be constructed as the “notched wedge” type in accordance with Subsection 401.17.
G. Joint density will be measured in accordance with Subsection 401.165.
H. PGAB shall conform to the provisions of 403.02 – Polymer Modified PGAB for HMA
I. The contractor shall furnish a quality control technician equipped with an approved densometer to ensure density requirements are met.
J. Hydrated Lime shall be incorporated into the mixture.
K. The antistrip additive Zycotherm manufactured by Zydex Industries shall be incorporated into the PGAB at a rate of 0.1%.

SPECIAL PROVISION

SECTION 409

BITUMINOUS TACK COAT

409.01 Description

This Subsection is deleted and replaced with the following:

This work consists of furnishing and applying one uniform application of Emulsified Asphalt RS-1 or RS-1h conforming to the specifications of AASHTO M-140. The application rate shall be 0.04 gal/yd^2

This work consists of furnishing and applying one uniform application of UltraTack (NTSS-1HM) by Blacklidge as indicated in this specification and as per manufacturers' recommendation. The application rate shall be 0.06 gal/yd^2

409.05 Equipment

Add "or as determined by the Resident", after the words "gal/yd^2]" in the fourth line of the second paragraph of this Subsection.

409.06 Preparation of Surface

The following paragraph is added:

All existing pavement and shoulder areas on which bituminous concrete mixtures are to be placed shall receive a tack coat. The surface area where the tack coat is to be applied shall be dry and cleaned of all dirt, sand, and loose material. Cleaning shall be accomplished by use of revolving brooms or mechanical sweepers. Undesirable material not removed by the above means shall be cleaned by hand sweeping or scraping, or a combination of both. Small areas otherwise inaccessible may be swept with hand brooms. The tack coat shall be applied only when the existing surface is dry.

409.08 Method of Measurement

The following paragraphs are added:

Measurement will be based on delivery slips made out in duplicate by the Contractor and signed by the Resident, or his representative, at the point of delivery. One of these slips shall be retained by the Resident and one by the Contractor. Delivery slips shall be furnished by the Contractor and shall provide space for identifying the vehicle and driver, for stating the volume of material carried, the source of the material, the date, and the Resident or his representative's signature.

Material included in the delivery slips and not used or rejected shall be deducted from the amount being measured for payment. Each day's delivery slips shall be reconciled by the Contractor and the Resident within 24-hours.

Cleaning of the surface area where tack coat is to be applied shall be incidental to Item 409.152, Bituminous Tack Coat - Applied.

409.09 Basis of Payment

The following pay items are added:

Pay Item		Pay Unit
409.15	Bituminous Tack Coat RS-1 or RS1h– Applied	Gallon
409.152	Bituminous Tack Coat NTSS-1HM Trackless– Applied	Gallon

SPECIAL PROVISION

SECTION 419

SAWING AND SEALING JOINTS IN BITUMINOUS PAVEMENT

(Sawing Bituminous Pavement)

419.01 Description

This work consists of sawing bituminous concrete pavement as shown on the Plans, as specified herein or as approved by the Resident.

419.02 General

The bituminous concrete pavement to be sawed shall be accurately marked before cutting. The marking shall be in accordance with the locations as shown on the Plans or as approved by the Resident. Cutting shall be with an approved power-driven saw with an abrasive blade.

Unless otherwise noted or directed, the sawcut shall be vertical, a minimum of 3/8 inch wide, and extend to the depth as shown on the Plans.

Residue or debris from the sawing operation shall be removed immediately and legally disposed of by the Contractor.

419.03 Method of Measurement

Sawing Bituminous Pavement will be measured by the linear foot of pavement actually cut and accepted. No additional payment will be made for variations in the pavement thickness.

419.04 Basis of Payment

Sawing Bituminous Pavement will be paid for at the Contract unit price per linear foot which shall be full compensation for all materials, tools, equipment labor, and all incidentals necessary for the completion of the work to the satisfaction of the Resident. The disposal of sawcut residue shall be incidental to this item.

Payment will be made under:

Pay Item		Pay Unit
419.30	Sawing Bituminous Pavement	Linear Foot

SPECIAL PROVISION

SECTION 511

COFFERDAMS

(Temporary Earth Support Systems)

Section 511, Cofferdams, is deleted in its entirety and replaced with the following:

511.01 Description

This work shall consist of the complete design, construction, maintenance and removal of temporary earth support systems and other related work, including dewatering and inspection, required to allow for the excavation required to construct the concrete utility vault extensions, and to protect adjacent roadways, adjacent public or private rights-of-way, embankments, or other structural units, in accordance with the Contract.

Temporary earth support structures may require pumping or dewatering to complete the Project work. The locations of temporary earth support structures may, or may not, be shown on the Plans whether required for the completion of the Contract or not.

511.02 Materials

The Contractor shall submit Working Drawings for the proposed temporary earth support systems for review and acceptance. The submission shall include plans, details and calculations designed and sealed by a Professional Engineer licensed in the State of Maine. This Professional Engineer may be directly employed by, or otherwise retained by, the Contractor. Working drawings shall consist of plan views and cross sections to illustrate clearances, limits, and retainment heights as applicable at roadway cuts, cofferdams, foundations, and phased construction areas. Construction shall not be started on temporary earth support systems until such submittals are accepted. Any review of or comment on, or any lack of review of or comment on, these Working Drawings by the Department shall not result in any liability upon the Department and it shall not relieve the Contractor of the responsibility for the satisfactory functioning of the temporary earth support system.

Temporary earth retaining structures shall be designed to support all appropriate combinations of earth, hydrostatic, and surcharge loads (from traffic, construction equipment, material stockpiles, and other sources) imposed on the system during all phases of construction. Temporary earth support systems adjacent to traveled ways, shall additionally be designed to resist any vibration or impact forces due to traffic and shall incorporate sufficient protection against impact by errant vehicles. Sufficient redundancy shall be designed into the support system so that failure of one member will not cause the collapse of the entire system. The Contractor's design shall consider the means and methods and construction sequencing proposed by the Contractor.

The Working Drawings shall also show the Contractor’s proposed method of excavation, water diversion and dewatering methods (sumps, wells, seal concrete, or well points) to minimize the flow of groundwater into the excavation. Such methods should preserve the undisturbed condition of the subgrade and permit foundation construction in-the-dry.

Design computation shall be in accordance with the AASHTO LRFD Bridge Design Specifications, Latest Edition.

Following construction of each temporary earth support system the Professional Engineer responsible for the design of the system shall inspect the installation and provide a certification to the Resident stating that construction was completed in conformance with the accepted working drawings. The certification shall be signed and sealed by the Professional Engineer responsible for the design of the system.

511.03 Temporary Earth Support System Construction

Temporary earth support systems shall, in general, be carried well below the elevation of the bottom of slabs, and shall be well braced and watertight. In cases where pile foundations contain batter piles, the temporary earth support system shall be installed to accommodate, without obstruction, the proper placement and alignment of the batter piles, either by staggering the depth of the support system or by increasing the annulus between the foundation and the support system. The interior dimensions of temporary earth support systems shall provide sufficient clearance for the construction and inspection of forms and to permit pumping outside of forms. Exterior dimensions of the temporary earth support system shall be limited to the size shown on the Plans or those illustrated in the Project permits, whichever is more stringent.

Temporary earth support systems shall be constructed such that water will not come in contact with concrete as required in Section 502, Structural Concrete.

Temporary earth support systems, including all sheeting and bracing involved, shall be completely removed after the completion of the work unless otherwise noted on the Contract Drawings. Care shall be taken not to disturb or otherwise injure the finished masonry or foundation elements.

No timber or other bracing shall be used in temporary earth support systems in such a way as to remain in the substructure masonry.

511.04 Pumping

Pumping from the interior of any foundation enclosure shall be done in such a manner as to prevent any current of water that would carry away or segregate the concrete.

Pumping to dewater a sealed temporary earth support system shall not commence until the seal concrete has set sufficiently to withstand the hydrostatic pressure. In no case will pumping be permitted until a minimum of five (5) days has elapsed since the completion of the installation of the seal concrete, when the temperature of the water body outside the temporary earth support system is greater than 4°C [40°F], or a minimum of seven (7) days has elapsed since the completion of the installation of the seal concrete, when the temperature of the water body outside the temporary earth support systems is less than 4°C [40°F].

Sediment laden water will not be allowed to leave the Project area. The Contractor shall be required to install appropriate erosion and sedimentation control devices as approved by the

Resident. Erosion and sedimentation control devices may include plain riprap, haybales, silt fence and sedimentation basins.

All water and materials pumped from excavation shall be pumped into a sedimentation basin which is of sufficient volume to detain the pumped water and materials. The water and materials removed from the excavation shall be pumped at a rate that permits infiltration of the water into the earth, preventing any overland flow or direct discharge into a stream or other waterbody.

511.05 Method of Measurement

Temporary Earth Support Systems shall be measured for payment as one lump sum per Contract, regardless of the number of Temporary Earth Support structures required at the Project site or sites, which price shall include full compensation for design, furnishing materials, excavation beyond the pay limits, installation, removal, tools, equipment and labor necessary to construct, maintain and remove the work in accordance with the Plans or as called for in the Contract.

If Temporary Earth Support Systems is not required due to the acceptance of a Value Engineering Proposal in accordance with Subsection 109.6, the cost of the deleted Temporary Earth Support Systems shall be included as part of the Value Engineering Proposal.

511.06 Basis of Payment

The accepted quantity of Temporary Earth Support Systems will be paid for at the Contract lump sum price, per Contract. Such payment shall be full compensation for furnishing and installing all materials required to construct the Temporary Earth Support Systems including, but not limited to steel sheeting and shoring, timber bracing and cribbing, seal concrete, crushed stone. Payment will also be full compensation for excavation, dewatering, erosion control and other incidentals required to construct, maintain, and remove the Temporary Earth Support Systems.

All costs of constructing, maintaining, and removing sedimentation basins; water testing; and pumping or transporting water and other materials to the sedimentation basin will not be measured separately for payment, but shall be incidental to the Temporary Earth Support Systems pay item.

All costs of related temporary soil erosion and water pollution controls, including inspection and maintenance, will not be measured separately for payment, but shall be incidental to the Temporary Earth Support Systems item.

Payment will be made under:

Pay Item		Pay Unit
511.091	Temporary Earth Support Systems	Lump Sum

SPECIAL PROVISION

SECTION 526

CONCRETE BARRIER

(Temporary Barrier Markers)

526.01 Description

The following paragraphs are added:

This work shall consist of furnishing, installing, and maintaining temporary barrier markers on all temporary barrier supplied by the Contractor and the Authority.

526.02 Materials

The following paragraphs are added:

Temporary barrier markers shall be "Big Dog" barrier markers manufactured by Custom Products Corporation or approved equal. Markers shall be bi-directional with a minimum effective reflective area of 96 square inches (48 square inches each side) as approved by the Resident. The reflectors shall meet MUTCD reflectivity requirements and shall be orange in color.

526.03 Construction Requirements

The following paragraphs are added:

Temporary barrier markers shall be mounted as follows:

1. One on every sixth barrier in tangents and one on every two barriers in tapers, including all barrier furnished by the Contractor.

2. Delineators shall be physically adhered to withstand the force of throw from a snow plow.

3. If more than 25% of delineators in any 200-foot section of barrier fall off for any reason, the Contractor will be responsible for reinstalling all the delineators in that run at that their own cost.

4. Contractor is required to submit the installation method for review and approval to the Resident.

526.04 Method of Measurement

The following paragraphs are added:

Temporary barrier markers shall not be measured for payment separately but shall be incidental to the temporary barrier item.

526.05 Basis of Payment

The following paragraphs are added:

Temporary barrier markers shall not be paid for separately but shall be incidental to the temporary barrier item.

SPECIAL PROVISION

SECTION 526

CONCRETE BARRIER

(Temporary Concrete Barrier Type I - Supplied by Authority)

526.01 Description

The following paragraphs are added:

This work shall consist of loading, transporting, setting, resetting, removing, transporting, and stacking Temporary Concrete Barrier Type I – Supplied by Authority. The barrier shall have attachments allowing individual sections to be connected into a continuous barrier.

The work also includes supplying connecting pins and furnishing and mounting retro-reflective delineators, per Subsection 526.02 and 526.03.

Concrete barriers supplied by Authority shall be available at the following location(s):

Maintenance Area	Linear Feet of Barrier
Crosby Maintenance Area Mile 45.8 Southbound	1,460

Upon substantial completion of work, the Contractor shall remove and transport the barrier back to its maintenance area of origin. All barrier shall be returned, sorted, and stacked according to type in locations directed by the project Resident or maintenance area foreman.

526.02 Materials

The following paragraphs are added:

e. Delineators shall be bi-directional with a minimum effective reflective area of eight square inches as approved by the Resident. The reflectors shall be methyl methacrylate and the housing of acrylonitrile butadiene styrene. Color shall be in accordance with the MUTCD.

526.021 Acceptance

The Resident shall have the authority to accept or reject all Temporary Concrete Barrier Type I – Supplied by Authority used on the Project that does not meet the requirements of this specification

526.03 Construction Requirements

The following paragraphs are added:

The Contractor shall notify the Resident prior to the scheduled pick-up and delivery of concrete barrier. No barrier shall be removed from or stacked at the Turnpike Maintenance Area without approval of the Resident.

The Contractor shall move and place barrier-utilizing methods that will not damage the barrier. Barrier that is damaged by the Contractor by failing to use proper methods shall be replaced by the Contractor at no additional cost to the Maine Turnpike Authority.

Concrete barrier supplied by the Authority consists of several different styles. Not all barriers may be compatible. The Contractor shall utilize caution when setting barrier to use identical barrier types as adjacent barrier. Non-compatible barrier that cannot be attached together shall be overlapped by a minimum of 10 feet with the blunt end on the non-traffic side of the barrier. This work will not be measured separately for payment but shall be incidental to the concrete barrier.

Concrete barrier placed at roadway low points shall be shimmed on 1" by 2" by 2' long wood planks to allow drainage to pass under the barrier. In addition, the Resident may direct the Contractor to shim the concrete barrier at other locations to provide for proper roadway drainage. All labor, material, and equipment necessary to shim the barrier will not be measured separately for payment but shall be incidental to the Concrete Barrier.

The removal of concrete barrier from adjacent to the travel lane may be conducted without a lane closure if it is accomplished in accordance with the following requirements:

1. Barrier is removed from the trailing end and the workmen and equipment involved in the operation are always behind the barrier. No workmen or equipment shall enter the travel lane.
2. Barrier shall be dragged away from the travel lane to at least a 30-degree angle by the use of a cable.
3. Barrier shall be lifted no more than six inches while within 10 feet of the travel lane.

Retro-Reflective Delineators shall be mounted as follows:

4. One on top of each barrier.
5. One on the traffic side of every barrier used in a taper.
6. One on the traffic side of every other barrier at regularly spaced intervals and locations.
7. Delineators shall be installed on both sides of the barrier if barrier is used to separate opposing traffic.
8. Delineators shall be physically adhered to withstand the force of throw from a snow plow.
9. If more than 25% of delineators in any 50-foot section of barrier fall off for any reason, the Contractor will be responsible for reinstalling all the delineators in that run at that their own cost.
10. Contractor is required to submit the installation method for review and approval to the Resident.

526.04 Method of Measurement

The following paragraphs are added:

Temporary Concrete Barrier Type I – Supplied by Authority shall be measured for payment by the lump sum.

The loading, transporting, setting, resetting, removing, transporting, sorting and stacking of the barrier, the furnishing, installation and maintenance of the barrier delineators, and furnishing and installing connector pins will not be measured separately for payment, but shall be incidental to the cost of the Barrier. Temporary storage of Concrete Barrier between construction phases, if required, will not be measured separately for payment, but shall be incidental to the cost of the Barrier. All equipment required to load, unload, transport and stack Concrete Barrier shall be supplied by the Contractor.

Any Barrier lost or damaged by the Contractor shall be replaced by the Contractor at no additional cost to the Authority.

526.05 Basis of Payment

The second and fifth paragraph are deleted and not replaced.

The following paragraphs are added:

Temporary Concrete Barrier Type I – Supplied by Authority will be paid for at the Contract lump sum price, complete in place. Such payment shall be full compensation for loading, transporting, setting, resetting, temporary storage, removing, transporting, and stacking at the area designated, furnishing all materials, and all other incidentals necessary to complete the work. Temporary Concrete Barrier Type I – Supplied by Authority and all connecting pins shall remain the property of the Authority and shall be returned to the Turnpike Maintenance Area as designated in Subsection 526.01.

Payment of Temporary Concrete Barrier, Type I – Supplied by Authority shall be based on a percentage of the work accomplished during that pay period.

Payment will be made under:

Pay Item		Pay Unit
526.306	Temporary Concrete Barrier, Type I – Supplied by Authority	Lump Sum

SPECIAL PROVISION

SECTION 527

ENERGY ABSORBING UNIT

(Work Zone Crash Cushion)

527.01 Description

The first paragraph is deleted in its entirety and replaced with the following:

The Contractor shall furnish and install work zone crash cushions where shown on the Plans, as specified herein, in Special Provision 652, or as approved by the Resident. Work zone crash cushions are required at each exposed end of temporary concrete barrier or guardrail.

The exposed end of the concrete barrier within 30 feet of the mainline travel lane shall be protected at all times. Barrier shall not be reset until after the work zone crash cushion(s) has been set to protect the exposed end of the barrier.

527.02 Materials

The following paragraph is added:

Only work zone crash cushions meeting the MASH TL-3 crash test requirements may be used on the turnpike and local roadways with posted speeds of 45 MPH or greater. Work zone crash cushions meeting the MASH TL-2 crash test requirements may be used on local roadways with posted speeds of 40 MPH or less. The Contractor shall provide the Resident with documentation of the proposed work zone crash cushion's MASH Crash Test Results prior to installation at the jobsite.

527.03 Construction Requirements

The following is added to the end of the first paragraph:

The design speeds for work zone crash cushions shall be 45 mph for local road and 70 mph for turnpike roadways unless otherwise noted on the Plans.

527.04 Method of Measurement

Replacement barrels, after collisions, will be paid for as a percentage of the individual barrels damaged to the total barrels in the complete system. The removal of impacted barrels and debris will be considered incidental to the replacement barrels. Barrels on hand, but unused will not be paid for directly.

527.05 Basis of Payment

Payment will be made under:

Pay Item		Pay Unit
527.341	Work Zone Crash Cushions – TL-3	Unit

SPECIAL PROVISION

SECTION 603

PIPE CULVERTS AND STORM DRAINS

(Reinforced Concrete Pipe)
(Concrete Collar)
(Corrugated Polyethylene Pipe)

603.01 Description

The following paragraphs are added:

This work shall also consist of furnishing and installing Class III, IV or Class V reinforced concrete pipe at the locations as shown on the Plans or as approved by the Resident.

This work also consists of furnishing and installing a concrete collar to join existing concrete pipe to the proposed concrete or Corrugated High Density Polyethylene (HDPE) pipe in accordance with the details as shown on the Plans. The Contractor shall note that the concrete pipe ends may be of different sizes and may not fit snugly together.

This work shall also consist of furnishing and installing various sizes of corrugated HDPE pipe, including a dual wall adaptor fitting by Hancor or an approved equal as shown on the plans. No other pipe types within the Option III alternatives will be accepted.

This work shall also consist of furnishing and installing various sizes of Class III RCP or corrugated HDPE pipe for temporary pipe connections and temporary pipe extensions to temporarily maintain existing drainage.

603.02 Materials

All Corrugated High-Density Polyethylene (HDPE) pipe for storm water and drainage systems shall meet the requirements of Subsection 706.06.

603.11 Method of Measurement

The following paragraph is added:

The Concrete Collar shall be measured by each unit installed, complete in place and accepted. This shall be full compensation for furnishing labor and materials to construct a Concrete Collar to connect the existing and proposed pipe ends in a working like manner.

Dual Wall Adapter Fitting shall be included for payment as three additional linear feet of the largest pipe involved.

Temporary pipe connections and temporary pipe extensions will be measured by the linear foot of the type specified, installed, and accepted.

603.12 Basis of Payment

Concrete Collars will be paid for at the Contract unit price each regardless of the size of the existing and proposed pipes.

Corrugated HDPE pipe will be paid for under the appropriately sized Culvert Pipe Option III pay items

Temporary pipe connections and temporary pipe extensions will be paid for at the contract unit price per linear foot in place, and shall be full compensation for furnishing all labor, equipment and materials necessary to complete the work consisting of, but not necessarily limited to, the installation, temporary connections, excavation and backfill, disassembly, and all other items necessary to maintain and disassemble temporary drainage or as approved by the Resident.

Payment will be made under:

Pay Item		Pay Unit
603.155	12 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.165	15 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.1653	15 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.175	18 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.1753	18 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.195	24 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.1953	24 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.205	30 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.2053	30 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.215	36 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.2153	36 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.225	42 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.2253	42 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.235	48 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.2353	48 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.245	54 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.2453	54 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.255	60 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.2553	60 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.265	66 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.2653	66 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.275	72 inch Reinforced Concrete Pipe - Class III	Linear Foot
603.2753	72 inch Reinforced Concrete Pipe - Class V	Linear Foot
603.28	Concrete Collar	Each

SPECIAL PROVISION

SECTION 604

MANHOLES, INLETS, AND CATCH BASINS

(Utility Vault Extensions)

604.01 Description

The following sentences are added:

This work shall also include the partial demolition of the existing utility vaults and manholes and construction of the utility vault extensions as shown on the Contract Plans. This work shall also include developing and submitting for approval, a construction procedure, temporary water main support system, and temporary earth support to protect the water main, and coordination with Portland Water District as described in the Contract Plans and these Specifications. This work also includes the installation of new manholes as Manufactured by Neenah Foundry Company, Catalog Number R-6660-NH.

604.02 Materials

The following sentence is added:

Except as otherwise provided on the plans, reinforcing steel shall be epoxy coated reinforcing bars meeting the requirements of Section 503 – Reinforcing Steel. All concrete work shall be in accordance with the requirements of Section 502 – Structural Concrete.

604.03 Construction Requirements

The following sentences are added:

The Contractor shall develop a construction procedure, temporary water main support, and temporary support systems that will protect, at all times, the 42” Cast Iron Pipe (1912, leaded joint) – at station 2360+02.55 and the 42” Reinforced Concrete Cylinder Pipe (1931, rubber and steel joint) – at station 2340+50.81, during construction of the tunnel extensions. Each water main will be removed from service by Portland Water District (PWD) during the work by closing valves on each side of the work area.

The Contractor is required to fully complete the work on one utility vault before work can begin on the other utility vault. Water mains can be removed from service between April 15th and October 15th and all work shall be completed within those dates. Winter shut offs are not permitted.

The maximum pipe support spacing shall be 6’ along the pipeline. The temporary watermain support system and temporary earth support shall be designed by a professional engineer licensed in the State of Maine and reviewed by the Resident Engineer and PWD prior to the start of construction.

PWD shall receive at least 30-days advance notice of work to be performed within the PWD's easements or Rights-of-Way. No work shall be performed within the PWD pipeline easements or Rights-of-Way without prior approval of PWD and a PWD representative being on-site for inspection purposes.

The vault structure shall follow the horizontal alignment of the existing water main.

Bars broken during removal of existing concrete shall be replaced at the Contractors expense by drilling and anchoring. Material used for drilling and anchoring dowels shall be selected from MaineDOT's Qualified Products list of Epoxy and Resin Bonding Agents.

Concrete demolition required to construct the utility vault extensions, as shown in the Contract Plans, shall be completed in accordance with Standard Specification 202 Removing Existing Structural Concrete. The Contractor shall use extreme care during demolition to avoid damaging components to remain. Any damage to components to remain shall be repaired to MTA's and PWD's satisfaction at no additional cost to the MTA. Structural Excavation and backfill, as shown in the Contract Plans, shall be completed in accordance with Standard Specification 206 Structural Earth Excavation – Drainage & Minor Structures Below Grade.

604.05 Method of Measurement

The following sentences are added:

Utility vault extensions shall be measured as one lump sum, per location, satisfactorily completed and in place as shown on the Contract Plans.

Where required on the Plans, installation of steel H-piles and all related pay items shall be paid for under their respective 501 pay items.

Where required on the Plans, removal of the existing concrete buttress wall shall be paid for under item 202.12 Remove Existing Structural Concrete.

604.06 Basis of Payment

The following sentences are added:

Payment shall be full compensation for partial demolition of existing utility vaults and manholes, furnishing all labor, equipment and materials including excavation, foundation material, backfill material, temporary supports, structural concrete, epoxy coated reinforcing, and all incidentals required to complete the construction of the Utility Vault Extensions in accordance with the Plans and these Specifications.

Payment will be made under:

Pay Item		Pay Unit
604.1581	Utility Vault Extension – STA 2360+02.55 NB	Lump Sum
604.1582	Utility Vault Extension – STA 2340+52.81 NB	Lump Sum
604.1583	Utility Vault Extension – STA 2340+52.81 SB	Lump Sum

SPECIAL PROVISION

SECTION 613

EROSION CONTROL BLANKET

613.01 Description

This work shall also include seeding, mulching, and watering the median swale and/or longitudinal flow line to the limits and width as shown on the Plans or as directed by the Resident.

613.02 Materials

The following sentences are added:

Seeding shall meet the requirements of Section 618, Seeding, Method Number 2.

Mulch shall meet the requirements of Section 619.

The following Subsection is added:

613.041 Maintenance and Acceptance

See Section 618.10 for maintenance and acceptance of seeding.

613.042 Mulch

All mulch shall be placed after the area has been seeded and prior to the installation of the Erosion Control Blanket.

613.09 Basis of Payment

The following "and mulch" is added after the words "initial seeding" in the second sentence.

SPECIAL PROVISION

SECTION 619

MULCH

(Mulch – Plan Quantity)
(Temporary Mulch)

619.01 Description

The first paragraph is modified by the addition of the following:

"as a temporary or permanent erosion control measure" after the word "mulch".

Add the following sentence at the end of the first paragraph:

Refer to Section 656 Temporary Soil and Water Pollution Control, for more information on Temporary Mulch.

619.03 General

The first paragraph is deleted and replaced with the following:

Cellulose fiber mulch shall not be used within 200 feet of a wetland or stream. The limits shall be 200 feet up station and down station of the wetland or streams as well as the slopes adjacent to the stream. The application of hay or straw mulch with an approved binder shall be used at these locations to prevent erosion.

The use of cellulose fiber mulch will only be allowed at other areas with the approval of the Resident. The Contractor may be required to demonstrate that the material may be applied in a manner that will prevent erosion and will aid in the establishment of permanent vegetation. The Resident reserves the right to require the use of hay or straw mulch at all locations if he determines that the cellulose mulch is ineffective. Cellulose fiber mulch is not acceptable for winter stabilization.

619.06 Method of Measurement

The following sentence is added:

Temporary Mulch will be paid for by the lump sum.

619.07 Basis of Payment

Temporary Mulch will be paid for at the Contract price per lump sum which shall be full compensation for furnishing and spreading the Temporary Mulch as many times as necessary as determined by the Contractor's operations and staging. The price shall also include the additional mulch netting and snow removal necessary during the winter months.

Payment will be made under:

Pay Item		Pay Unit
619.1201	Mulch – Plan Quantity	Unit
619.1202	Temporary Mulch	Lump Sum

SPECIAL PROVISION

SECTION 627

PAVEMENT MARKINGS

(White or Yellow Pavement Marking Line)

627.01 Description

The following sentences are added:

This work shall consist of furnishing and placing the final pavement markings at locations as shown on the Plans or as directed by the Resident.

This work shall consist of furnishing, placing, and maintaining pavement marking paint and temporary pavement marking paint at locations as shown on the Plans or as directed by the Resident.

627.02 Materials

The following is added before the last paragraph:

The paint for pavement markings shall be 100% acrylic water base paint.

627.04 General

The following is added to the third paragraph:

Dotted white lines (DWL) shall consist of alternate 3-foot painted line segments and 9-foot gaps.

Permanent pavement marking paint shall be applied at the end of each work week prior to opening the work area to traffic or as approved by the Resident.

Temporary pavement marking paint and temporary pavement markers shall be applied daily prior to opening the work area to traffic during non-work hours or as approved by the Resident. Temporary pavement markings shall be maintained, including restriping as required to provide clearly visible and useful lines at all times.

627.05 Preparation of Surface

The following is added:

Surface preparation for application of pavement marking paint shall conform to the manufacturer's recommendations including weather and temperature limitations. The surface shall not be frozen or covered in frost.

627.08 Removing Lines and Markings

The last sentence is deleted and is not replaced.

627.09 Method of Measurement

The second and third sentences in the second paragraph are deleted and replaced with the following:

The measurement of broken white lines, both permanent and temporary and dotted white lines, will include the gaps when painted. Temporary painted pavement marking lines will be measured for payment by the linear foot.

627.10 Basis of Payment

This Subsection is deleted and replaced with the following:

The accepted quantity of white or yellow pavement marking lines will be paid at the Contract price per linear foot. This price shall include all labor and materials to furnish and install the paint line.

The accepted quantity of broken and dotted white pavement marking lines will be paid at the Contract price per linear foot. This price shall include all labor and materials to furnish and install the paint line.

The accepted quantity of temporary white or yellow pavement marking lines will be paid at the Contract price per linear foot. This price shall include all labor and materials to furnish, install, and maintain the paint marking, including restriping as determined by the resident engineer.

Payment will be made under:

Pay Item		Pay Unit
627.712	White or Yellow Pavement Marking Line	Linear Foot

SPECIAL PROVISION

SECTION 627

PAVEMENT MARKINGS

(Temporary 6 Inch Pavement Marking Tape)
(Temporary 6 Inch Black Pavement Marking Tape)

627.01 Description

The following sentence is added:

This work shall also consist of furnishing, placing, maintaining, and removing temporary pavement marking tape at locations shown on the Plans or as directed by the Resident.

This work shall also consist of furnishing, placing, maintaining, and removing temporary black pavement marking tape at locations shown on the Plans or as directed by the Resident. Temporary 6 Inch Black Pavement Marking Tape shall be used to cover conflicting existing pavement marking paint.

627.02 Materials

The following paragraph is added:

Temporary pavement marking tape shall be Stamark Wet Reflective Removable Pavement Marking Tape Series 710 as manufactured by 3M of St. Paul, Minnesota or an approved equal.

Temporary pavement marking tape shall be Stamark Removable Black Line Mask Tape Series 715 as manufactured by 3M of St. Paul, Minnesota or an approved equal.

627.04 General

The following paragraphs are added:

Work under this item shall be in accordance with the manufacturer's recommendations. A factory representative from 3M shall be present for the first application of all temporary pavement marking tape to insure proper application and product performance.

The pavement markings shall be applied mechanically to clean dry pavement as recommended by the manufacturer and approved by the Resident.

Temporary pavement markings shall consist of applying six-inch solid white, six inches broken white, and six-inch yellow reflectorized pavement marking tape for traffic maintenance during construction as shown on the Plans or as directed by the Resident.

Temporary pavement marking tape that loses reflectivity, becomes broken, dislodged or missing during the life of the Contract shall be replaced by the Contractor at no additional cost to

the Authority.

627.06 Application

The following paragraphs are added:

For application of the tape, when the pavement temperature is below 50^{o}F, heat shall be applied to the pavement surface, if deemed necessary by the factory representative or as directed by the Resident, at no additional cost to the Authority. Proper primer for the temperatures shall be used as directed by the manufacture.

The pavement mark tape shall be rolled over with a vehicle once application is complete and then scored every 20 feet when placed in long runs to prevent full length unraveling.

627.08 Removing Lines and Markings

The following sentence is added:

Removal of temporary pavement marking tape shall be accomplished without the use of heat, solvents, grinding or sandblasting and in such a manner that no damage to the pavement results.

627.09 Method of Measurement

The following paragraph is added:

Temporary Pavement Markings - Tape will be measured for payment by the linear foot. The measurement of broken lines will not include the gaps.

627.10 Basis of Payment

The following paragraphs are added:

Payment for the Temporary Pavement Markings - Tape will be made at the Contract bid price per linear foot, which price shall include furnishing, installing, maintaining, and removing the temporary tape and all materials, labor, equipment, and incidentals necessary to accomplish the work. Replacement of Temporary Pavement Markings - Tape, as described above, will be incidental and no separate payment will be made.

Payment for the Temporary 6 Inch Black Pavement Marking Tape will be made at the Contract bid price per linear foot installed, which price shall include furnishing, installing, maintaining and removing the temporary tape and all materials, labor, equipment and incidentals necessary to accomplish the work. Replacement of 6 Inch Black Temporary Pavement Marking Tape, as described above, will be incidental and no separate payment will be made.

Payment will be made under:

Pay Item		Pay Unit
627.73	Temporary 6 Inch Pavement Marking Tape	Linear Foot
627.731	Temporary 6 Inch Black Pavement Marking Tape	Linear Foot

SPECIAL PROVISION

SECTION 652

MAINTENANCE OF TRAFFIC
(October 8, 2020)

MaineDOT Standard Specification 2014 Edition Section 652 – Maintenance of Traffic and the Maine Turnpike Authority 2016 Supplemental Specification Section 652 – Maintenance of Traffic are deleted in their entirety and replaced with the following:

652.1 Description

This work shall consist of furnishing, installing, maintaining, and removing traffic control devices necessary to provide reasonable protection for motorists, pedestrians, and construction workers in accordance with these Specifications, the applicable provisions of Section 105.4.5 - Special Detours, and the plans.

Traffic control devices include signs, signals, lighting devices, markings, barricades, channelizing, and hand signaling devices, portable light towers, truck mounted impact attenuators, traffic officers, and flaggers.

652.2 Materials

All traffic control devices shall conform to the requirements of the latest edition of the MUTCD, NCHRP 350 guidelines **and all Traffic control devices shall meet Manual for Assessing Safety Hardware (MASH) 16 guidelines if date of manufacture was after December 31, 2019**.

All signs shall be fabricated with high intensity fluorescent retroreflective sheeting conforming to ASTM D 4956 - Type VII, Type VIII, or Type IX (prismatic). All barricades, drums, and vertical panel markers shall be fabricated with high intensity orange and white fluorescent retroreflective sheeting conforming ASTM D 4956 - Type VII, Type VIII, or Type IX (prismatic).

Construction signs shall be fabricated from materials that are flat, free from defects, retroreflectorized, and of sufficient strength to withstand deflections using a wind speed of 80 miles/hr.

652.2.2 Signs

Only signs with symbol messages conforming to the design of the Manual of Uniform Traffic Control Devices(MUTCD) shall be used unless the Resident approves the substitution of word messages.

Any proposed use of temporary plaques to cover text or to change text shall be approved by the resident. All signs or proposed plaques shall have a uniform face and be constructed from similar sheeting.

All signs shall be new, or in like new condition and maintained in like new condition throughout the project duration. Signs shall be cleaned just prior to installation and throughout the project utilizing a method that will not damage the reflective sign sheeting.

652.2.3 Flashing Arrow Board

Flashing Arrow Boards must be of a type that has been submitted to AASHTO's National Transportation Product Evaluation Program (NTPEP) for evaluation and placed on the Maine Department of Transportations' Approved Products List of Portable Changeable Message Signs & Flashing Arrow Panels.

Flashing Arrow Boards units shall meet requirements of the current Manual on Uniform Traffic Control Devices (MUTCD) for Type "C" panels as described in Section 6F.56 - Temporary Traffic Control Devices. Flashing Arrow Boards shall have matrix of a minimum of 15 low-glare, sealed beam, Par 46 elements capable of either flashing or sequential displays as well as the various operating modes as described in the MUTCD, Chapter 6-F. If a Flashing Arrow Board consisting of a bulb matrix is used, each element should be recess-mounted or equipped with an upper hood of not less than 180 degrees. The color presented by the elements shall be yellow.

Flashing Arrow Board elements shall be capable of at least a 50 percent dimming from full brilliance. Full brilliance should be used for daytime operation and the dimmed mode shall be used for nighttime operation. Flashing Arrow Board shall be at least 96 inches x 48 inches and finished in non-reflective black. The Flashing Arrow Board shall be interpretable for a distance not less than 1 mile.

Operating modes shall include, flashing arrow, sequential arrow, sequential chevron, flashing double arrow, and flashing caution. In the three arrow signals, the second light from the arrow point shall not operate.

The minimum element on-time shall be 50 percent for the flashing mode, with equal intervals of 25 percent for each sequential phase. The flashing rate shall be not less than 25 nor more than 40 flashes per minute. All on-board circuitry shall be solid state.

Primary power source shall be 12 volt solar with a battery back-up to provide continuous operation when failure of the primary power source occurs, up to 30 days with fully charged batteries. Batteries must be capable of being charged from an onboard 110 volt AC power source and the unit shall be equipped with a cable for this purpose.

Controller and battery compartments shall be enclosed in lockable, weather-tight boxes.

The Flashing Arrow Board shall be mounted on a pneumatic-tired trailer or other suitable support for hauling to various locations, as directed. The minimum mounting height of an arrow panel should be 7 feet from the roadway to the bottom of the panel.

The face of the trailer shall be delineated on a permanent basis by affixing retro-reflective material, known as conspicuity material, in a continuous line as seen by oncoming drivers.

A portable changeable message sign may be used to simulate an arrow panel display.

652.2.4 Other Devices

Vertical panel markers shall be orange and white striped, 8 inches wide by 24 inches high. On the Interstate System, vertical panel markers shall be orange and white striped, 12 inches wide by 36 inches high.

Cones shall be orange in color, a minimum of 28 inches high, and retro-reflectorized. Retro- reflection shall be provided by a white bands of retro-reflective sheeting conforming to the MUTCD. **All cones utilized on the project shall be new or in like new condition and shall have a consistent design/appearance.**

Drums shall be of plastic or other yielding material and shall be a minimum of 36 inches high and a minimum of 18 inches in diameter. There shall be at least two retro-reflectorized orange and at least two retro-reflectorized white stripes a minimum of 4 inches wide on each drum. **All drums utilized on the project shall be new or in like new condition and shall have a consistent design/appearance.**

Flaggers shall use a STOP / SLOW handheld paddle as the primary and preferred hand signaling device. Flags shall only be limited to emergencies. STOP / SLOW paddles shall have high intensity prismatic retro reflective sheeting, have an octagonal shape on a rigid handle and shall be at least 18 inches wide with letters at least 6 inches high and shall be constructed from light semi-rigid material. The STOP (R1-1) face shall have white letters and a white border on a red background. The SLOW (W20-8) face shall have black letters and a black border on an orange background.

STOP / SLOW paddles shall also incorporate either white or red flashing lights on the STOP face and white or yellow flashing lights on the SLOW face of the paddle and always be in use.

Paddles must conform to any of the following patterns:

A. Two white or red lights (colors shall be all white or all red), one centered vertically above and one centered vertically below the STOP legend; and/or two white or yellow lights (colors shall be all white or all yellow), one centered vertically above and one centered vertically below the SLOW legend;

B. Two white or red lights (colors shall be all white or all red), one centered horizontally on each side of the STOP legend; and/or two white or yellow lights (colors shall be all white or all yellow), one centered horizontally on each side of the SLOW legend;

C. One white or red light centered below the STOP legend; and/or one white or yellow light centered below the SLOW legend;

D. A series of eight or more small all white or all red lights no larger than 1/4 inch in diameter along the outer edge of the paddle, arranged in an octagonal pattern at the eight corners of the border of the STOP face; and/or a series of eight or more small all white or all yellow lights no larger than 1/4 inch in diameter along the outer edge of the paddle, arranged in a diamond pattern along the border of the SLOW face; or

E. A series of white lights forming the shapes of the letters in the legend. Flashing light patterns shall be compliant with Section 6E.03 Hand Signaling Devices in the most current version of the Manual on Uniform Traffic Control Devices.

All flashing light patterns on the STOP / SLOW paddle shall be visible from a minimum distance of 1000 feet.

Type I barricades shall be 2 feet minimum, 8 feet maximum in length with an 8 inch wide rail mounted 3 feet minimum above the ground. Type II barricades shall be 2 feet in length with two 8 inch wide rails, and the top rail shall be mounted 3 feet minimum above the roadway. Type III barricades shall be 8 feet in length with three 8 inch wide rails, and the top rail shall be mounted 5 feet minimum above the roadway. The cross members of all barricades shall be of ½ or ⅝ inch thick plywood or other lightweight rigid material such as plastic, fiberglass or fiber wood as approved by the Resident. The predominant color for supports and other barricade components shall be white, except that unpainted galvanized metal or aluminum components may be used.

652.2.5 Portable Changeable Message Sign

Portable-Changeable Message Signs (PCMS) will be furnished by the Contractor and shall be Ver-Mac PCMS-1210 or an approved equal. **The face of the PCMS trailer shall be delineated on a permanent basis by affixing retro-reflective material, known as conspicuity material, in a continuous line as seen by oncoming drivers.** PCMS's shall be located and relocated to locations approved by the Resident within the Project limits for the duration of the Project.

Features to the Ver-Mac PCMS shall include:

- An all LED display.
- Be legible from a distance of 1,000 feet.
- Have three (3) lines available for messages.
- Be NTCIP compliant (NTCIP 1203 & 1204).
- Be capable of being programmed by a remote computer via a data (IP over Cell) cellular modem connection.
- Have GPS location capability by adding on a GPS device capable of providing GPS location remotely to the MTA Communications' Center.
- Be programmable by Vanguard Software by Daktronics.

The Contractor shall complete and/or provide the following:

- Submit a catalog cut shop drawing to the Resident of all proposed equipment for review and approval.
- Establish and pay for a data cellular account so that PCMS may be remotely programmed and operated from the MTA Communications' Center.

- Provide to the Authority technical support from the PCMS manufacturer that may be necessary to integrate the PCMS into the MTA software platform (Vanguard Software by Daktronics).

- Provide the manufacturer's software necessary to change the PCMS messages remotely from the MTA Communications' Center and the Resident's computer if necessary or requested.

- Provide training on the operation of the PCMS to the Resident and the MTA Communications' Center representative.

- Make all PCMS on the Project work site available to the MTA for any/all emergency situations as defined by the MTA. This shall include the preemption of any messages running at the time of need as approved by the MTA and the Resident.

The Contractor shall also:

- Furnish, operate, relocate, and maintain the PCMS as approved or requested by the Resident.

- Be responsible for the day to day programming and operation of the PCMS for Project purposes.

The PCMS(s) shall be on-site, with data cellular account established, GPS location capable, and all training required complete within one month after mobilization or seven days prior to implementing traffic shifts, detours, or stoppages, whichever is sooner. Implementation of traffic shifts, detours, or stoppages of traffic will not be allowed without PCMS boards on-site with the specified MTA Communications' Center Software Platform integration and training.

652.2.5 Truck Mounted Attenuator

When a pay item for a Truck Mounted Attenuator (TMA) is included in the contract or otherwise required in contract at least one TMA will be required in use on the project. If at least one is not used as described above, then it will be considered a Traffic Control Plan violation and result in a reduction of payment as outlined in Section 652.

The truck mounted attenuator system shall conform to the following requirements:

- Truck and attached attenuator shall conform to the NCHRP Report 350, Test Level 3 criteria **or MASH if manufactured after 2019**.
- Amber strobe lights with 360-degree visibility.
- An arrow light bar fixed to the vehicle.
- The attenuator shall be mounted to a vehicle with a minimum weight of 10,000 lbs.
- **The attenuator shall be mounted to a vehicle with a minimum weight of 24,000 lbs. for Items 652.4501 – Truck Mounted Attenuator – 24, 000 LB.**

The Contractor shall manage the operation of the truck mounted attenuator. The truck mounted attenuator should be utilized in lane closures and other construction operations where workers are exposed to traffic and not protected by positive means. The operation of the vehicle

shall be in accordance with the Manual of Uniform Traffic Control Devices and the manufacturer's recommendation.

Installation: The chart below identifies the distance from the work zone or hazard where the TMA shall be deployed. If the work zone is within a marked lane closure, the barrier truck distances shall apply and if the work is mobile, then shadow truck distances shall apply. The TMA shall not be located in the buffer zone. The shadow vehicle shall have its front wheels turned away the work area and from traffic, have parking brake set, and be put in park if an automatic transmission; or if a manual transmission it shall have its front wheels turned away the work area and from traffic, have parking brake set and should be placed in gear and shut off if possible while still maintaining warning lights. If length of time or weather are a concern for the battery since the warning lights must be maintained the engine should be started and run periodically for battery recharging. No other vehicles or equipment shall park in front of the shadow vehicle or within the buffer space behind the shadow vehicle. For placement details, reference the Manual of Uniform Traffic Control Devices (MUTCD).

Weight of Truck	Barrier Truck Distance from Work Zone of Hazard	Shadow Truck Distance from Work Vehicle or Work Zone
10,000 lbs	250 ft	300 ft
15,000 lbs	200 ft	250 ft
>24,000 lbs	150 ft	200 ft

652.2.6 Sequential Flashing Warning Lights

When included in contracts as a bid item Sequential Flashing Warning Lights on drums used for merging tapers and shifting tapers during nighttime operation for project use. The purpose of these lights is to assist the motorist in determining which direction to merge or shift and to reduce the number of late merges resulting in devices being struck and having to be reset to maintain positive guidance at the merge point. The successive flashing of the lights shall occur from the upstream end of the taper to the downstream end of the taper in order to identify the desired vehicle path.

The Sequential Flashing Warning Lights shall meet all of the requirements for warning lights within the current edition of the MUTCD. Each light unit shall be capable of operating fully and continuously for a minimum of 500 hours when equipped with a standard battery set. Each light in sequence shall be flashed at a rate of not less than 55 times per minutes and not more than 75 times per minute. The flash rate and flash duration shall be consistent throughout the sequence.

Sequential Flashing Warning Lights shall be "Pi-Lit" Sequential Barricade Warning Lamps or an approved equal.

Sequential Flashing Warning lights are to be used for merging and shifting tapers that are in place during the nighttime hours (12-hours when ambient light is dimmed). These lights shall flash sequentially beginning with the first light and continuing until the final light at the beginning of a tangent section.

The Sequential Flashing Warning Lights shall automatically flash in sequence when placed on the drums that form the merging or shifting tapers.

The number of lights used in the drum taper shall equal one half the number of drums used in the taper.

Drums are the only channelizing device permitted for mounting the Sequential Flashing Warning Lights.

The Sequential Flashing Warning Lights shall be weather independent and visual obstruction shall not interfere with the operation of the lights.

The Sequential Flashing Warning Lights shall automatically sequence when placed in line in an open area with a distance between lights of 25 to 150 feet. A 10-foot stagger in the line of lights shall have no adverse effect on the operation of the lights.

If one light fails, the flashing sequence shall continue. Non-sequential flashing is prohibited.

652.2.7 Automated Trailer Mounted Speed Sign

When included in the contract as a pay item Automated Trailer mounted speed signs requires furnishing, operating, and maintaining an Automated Trailer Mounted Radar Speed Limit Sign for project use. When a pay item for an Automated Trailer Mounted Radar Speed Limit Sign is included in the Contract at least one will be required on the project when there is a Work Zone Speed Limit in place. The Contractor shall furnish, operate, and maintain the Automated Trailer Mounted Radar Speed Limit Signs during the project operations

Trailer mounted speed limit signs shall be self-contained units including sign assembly, flashing lights, directional radar to measure speed limits, a regulatory speed limit sign, and power supply specifically constructed to operate as a trailer-mounted sign. The preferred color of the unit shall be “construction orange”.

Base material for the regulatory speed limit signs shall be weatherproof, rigid substrate specifically manufactured for highway signing and meet the retro-reflective sheeting application requirements of the sheeting manufacturer.

Sign text shall consist of the letters, digits and symbols either applied by stick-on or silk screen, to conform to the dimensions and designs indicated in the Contract, MUTCD and/or FHWA Standard Highway Signs. The materials and methods shall be in accordance with standard commercial processes.

“Work Zone” construction signs shall be mounted on the trailer unit above the regulatory speed limit sign. (see attached graphic details).

Signs and secondary signs shall follow the MUTCD for minimum mounting heights.

The power supply shall be either full battery power with solar panel charging (capable of maintaining a charged battery level) and 135 ampere, 12 volt deep cycle batteries, or diesel powered generator with a fuel capacity sufficient for 10 hours of continuous operation.

Each unit shall be equipped with two mono-directional flashing lights, placed in accordance with the MUTCD, with amber lenses and reflectors, which are visible through a range of 120 degrees when viewed facing the sign. The lights shall be a minimum of **8-inch diameter**, either LED, halogen, or incandescent lamps, and shall be visible for a minimum distance of one mile under daylight conditions and shall have a minimum flash rate of 40 flashes per minute. An "On" indicator light shall be mounted on the back of the signs, which is visible for at least 500 feet to provide confirmation that the flashing lights are operating.

The directional radar shall monitor approaching traffic only. The radar shall be capable of measuring speeds from 5 to 70 MPH at a distance of up to 1500 feet and shall have a high speed cut off thresh hold. **Speed data shall be recorded and stored on the sign and must be made available to the Authority as requested.**

All existing speed limit signs, which conflict with the construction zone trailer mounted speed limit signs shall be covered completely when the work zone speed limit is in place.

Automated Trailer Mounted Speed Limit Signs shall only be used when a work zone speed limit is in place. The Contractor shall manage the utilization and operation of the Automated Trailer Mounted Speed Limit Signs and if at least one is not used when work zone speed limits are in place then it will be considered a Traffic Control Plan violation and result in a reduction of payment as outlined in Section 652.

The Resident will record the actual time and location for the signs on a daily basis when the Automated Trailer Mounted Speed Limit Signs are in use.

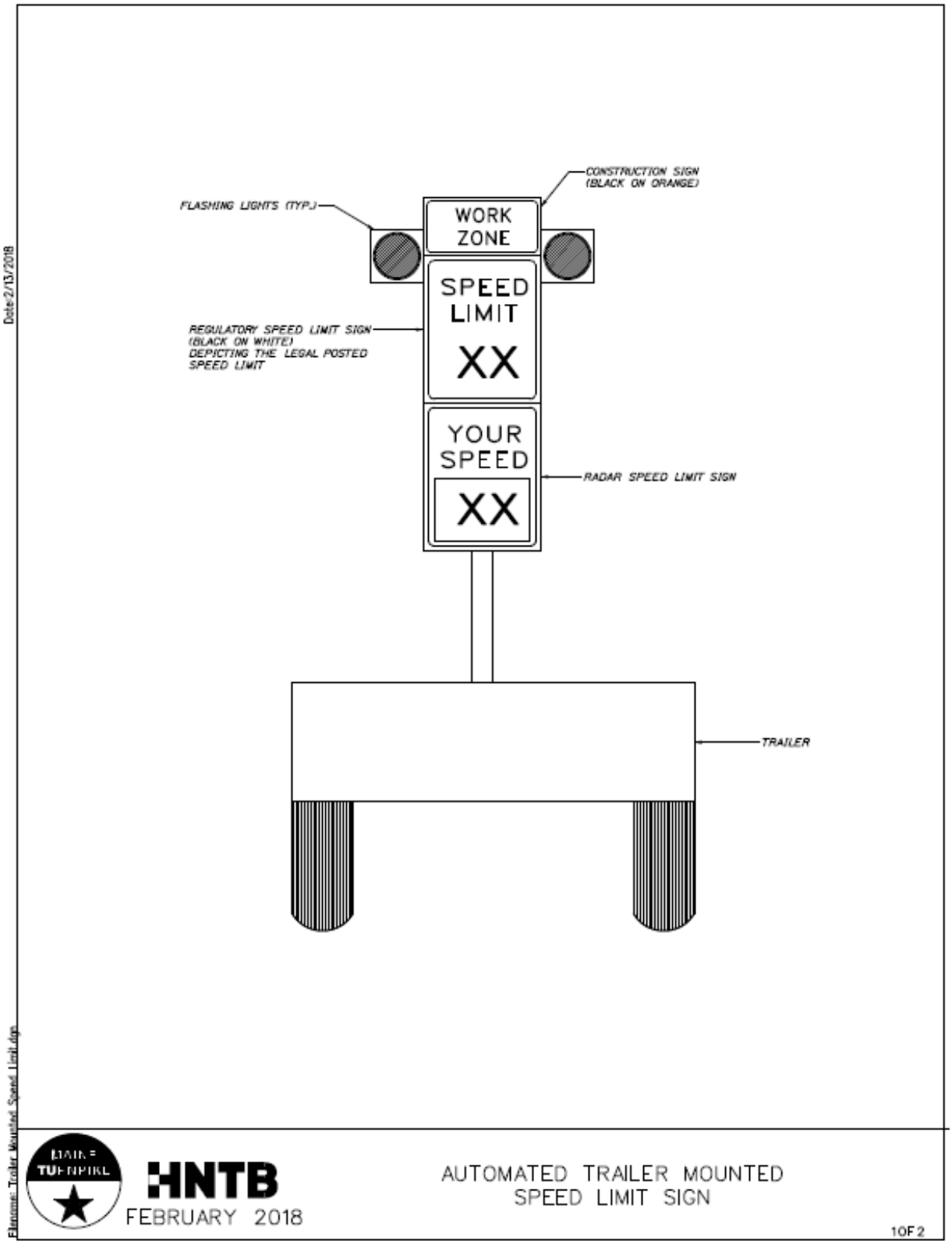
The Automated Trailer Mounted Radar Speed Limit Sign may be placed as shown on the plans, or may replace the posted regulatory speed limit signs, or may be placed at a location within the closed lane that has a reduced speed limit.

Automated Trailer Mounted Speed Limit Signs shall be delineated with retro-reflective temporary traffic control devices while in use and shall also be delineated by affixing a retro-reflective material directly on the trailer.

Upon delivery of the Automated Trailer Mounted Speed Limit Sign and before acceptance by the Authority, the Contractor shall have a representative of the manufacturer review the condition and notify the Resident in writing, of all deficiencies noted.

The Contractor shall arrange to have all necessary repairs performed at no cost to the Authority.

To avoid impairing driver vision, the Contractor shall dim the lighted speed limit readings by 50 percent during nighttime use and restore full power lighting during daytime operation.


CONSTRUCTION SIGN
(BLACK ON ORANGE)
FLASHING LIGHTS (TYP.)
WORK
ZONE
SPEED
LIMIT
XX
REGULATORY SPEED LIMIT SIGN
(BLACK ON WHITE)
DEPICTING THE LEGAL POSTED
SPEED LIMIT
YOUR
SPEED
XX
RADAR SPEED LIMIT SIGN
TRAILER
Date: 2/13/2018
Filename: Trailer Mounted Speed Limit.dgn
MAINE TURNPIKE
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AUTOMATED TRAILER MOUNTED
SPEED LIMIT SIGN
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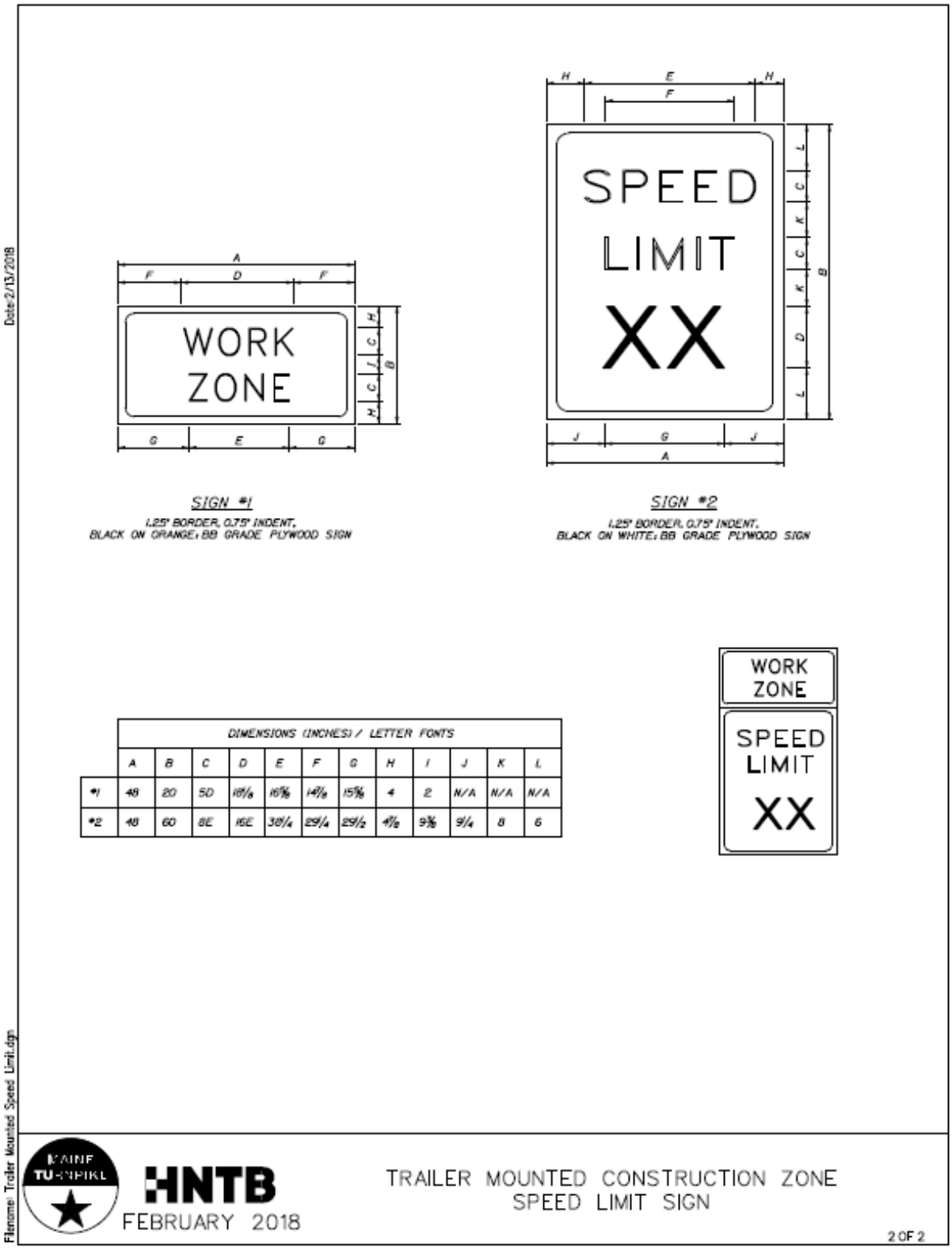


652.2.8 Temporary Portable Rumble Strips

If a pay item is included in the contract or the Contract desires to utilize Temporary Portable Rumble Strips this work consists of furnishing and placing temporary portable rumble strips RoadQuake 2F TPRS or an approved equal. Furnishing a temporary portable rumble strip system includes a method to transport and move these to on-site locations where they will be used. The Contractor shall submit for approval, literature and all necessary certifications to the Maine Turnpike prior to procurement of the product.

If used, Temporary Portable Rumble Strips may not be practicable in areas where the roadway has more than two travel lanes, where volume windows do not allow for breaks in traffic to set up and monitor and adjust, or during nighttime lane closures.

Provide rumble strips where the plans show or as directed by the Resident as follows:

Prior to placing rumble strips, clean the roadway of sand and other materials, that may cause slippage.

Place one end of the rumble strips 6 inches from the roadway centerline. Extend the strips perpendicular to the direction of travel. Ensure strips lay flat on the roadway surface.

Only one series of rumble strips, placed before the first work zone, is required per direction of travel for multiple work zones spaced 1 mile or less apart. Work zones spaced greater than 1 mile apart require a separate series of rumble strips. Each lane shall use one group of temporary rumble strips.

Bracketed “Rumble Strip Ahead” and “Bump” signs shall be utilized and will be paid for under the respective construction sign pay items.

Maintain rumble strips as follows:

If rumble strips slide, become out of alignment, or are no longer in the wheel path of approaching vehicles during the work period, thoroughly clean both sides of the rumble strips and reset on a clean roadway.

Repair or replace damaged rumble strips immediately.

652.3.1 Responsibility of the Authority

The Authority will provide Project specific traffic control requirements and traffic control plans for use by the Contractor. The specific traffic control requirements for the Project are identified in Special Provision Section 652, Maintenance of Traffic (Specific Project Maintenance of Traffic Requirements). No revisions to these requirements or Plans will be permitted unless the Contractor can thoroughly demonstrate an overall benefit to the public and a Contract Modification is approved.

The Maine Turnpike Authority may erect lane closures on the mainline within the Project area to collect survey, provide layout, and for any other reasons deemed necessary by the Authority.

652.3.2 Responsibility of the Contractor

The Contractor shall provide continuous and effective traffic control and management for the Project that is appropriate to the construction means, methods, and sequencing allowed by the Contract and selected by the Contractor:

The Contractor shall ensure all jobsite personnel shall wear a safety vest labeled as ANSI 107-2004 standard performance for Class 3 risk exposures at all times. This requirement also applies to truck drivers and equipment operators when out of an enclosed cab.

652.3.3 Submittal of Traffic Control Plan

The Contractor shall provide continuous and effective traffic control and management for the Project that is appropriate to the means, methods and sequencing allowed by the Contract; and consistent with the Traffic Control Plans and Maintenance of Traffic Specifications. The Contractor is responsible for ensuring a safe environment for the Contract workforce, local road users, and turnpike users; and maintaining the safe efficient flow of traffic through the construction zone at all times during the Contract. The protocols and requirements outlined in the Contract shall be strictly enforced. The Contractor shall submit, at or before the Preconstruction Meeting, a Traffic Control Plan (TCP) that provides the following information to the Authority:

a. The name, telephone number, and other contact numbers (cellular phone, pager, if any) of the Contractor's Traffic Control Supervisor (TCS). The TCS is the person with overall responsibility for insuring the contractor follows the TCP, and who has received Work Zone Traffic Control Training commensurate with the level of responsibility shown in the requirements of the Contract, and who is empowered to immediately resolve any work zone traffic control deficiencies or issues. Provide documentation that the Traffic Control Supervisor has completed a Work Zone Traffic Control Training Course (AGC, ATSSA, or other industry- recognized training), and a Supervisory refresher training every 5 years thereafter. Submit training certificates or attendance roster that includes the course name, training entity, and date of training. **State how the traffic control devices will be maintained including a frequency of inspection for both temporary and permanent traffic control devices.**

Traffic Control Training Course curriculum must be based on the standards and guidelines of the MUTCD and must include, at a minimum, the following:

1. Parts of Temporary Traffic Control Zone
2. Appropriate use and spacing of signs
3. Use and spacing of channelizing devices
4. Flagging basics
5. Typical examples and applications

The Traffic Control Supervisor, or designee directly overseeing physical installation, adjustment, and dismantling of work zone traffic control, will ensure all personnel performing those activities are trained to execute the work in a safe and proper manner,

in accordance with their level of decision-making and responsibility. The emergency contact list shall contain a listing of individuals who may be contacted during non-work hours and shall adequately respond to the request.

b. Proposed revisions to the construction phasing or sequencing that reasonably minimizes traffic impacts.

c. A written narrative and/or plan explaining how traffic and pedestrians will be moved through the Project Limits, including transitions during the change from one phase of construction to the next, as applicable.

d. Temporary traffic control treatments at all intersections with roads, rail crossings, businesses, parking lots, pedestrian ways, bike paths, trails, residences, garages, farms, and other access points, as applicable.

e. A list of all Contractor or Subcontractor certified flaggers to be used on the Project, together with the number of flaggers which will be used for each type of operation that flagging is needed. If the Contractor is using a flagging Subcontractor, then the name and address of the Subcontractor may be provided instead of a list of flaggers.

f. A procedure for notifying the Resident of the need to change the traffic control plan or the need to remove a lane restriction.

g. A description of any special detours including provisions for constructing, maintaining, signing, and removing the detour or detours, including all temporary bridges and accessory features and complete restoration of the impacted land.

h. The maximum length of requested contiguous lane closure. The Contractor shall not close excessive lengths of traffic lane to avoid moving traffic control devices.

i. The proposed temporary roadway surface conditions and treatments. The Contractor shall provide an adequate roadway surface at all times, taking into account traffic speed, volume, and duration.

j. The coordination of appropriate temporary items (drainage, concrete barriers, barrier end treatments, impact attenuators, and traffic signals) with the TCP.

k. The plan for unexpected nighttime work, the contractor shall provide a list of emergency nighttime lighting equipment and safety personnel available on-site or have the ability to have them on site within an hour of the time of need.

l. The plan for meeting any project specific requirements contained in special provision 105 and/or 107, and/or Section 656

m. The lighting plan if night work is anticipated.

The Authority will review the TCP for completeness and conformity with Contract provisions, the current edition of the MUTCD, and Authority policy and procedures. The Authority will review and provide comments to the Contractor within 14 days of receipt of the TCP. No review or comment by the Authority, or any failure to review or comment, shall operate to absolve

the contractor of its responsibility to design and implement the plan in accordance with the Contract, or to shift any responsibility to the Authority. If the TCP is determined by the Authority to be operationally ineffective, the Contractor shall submit modifications of the TCP to the Authority for review and shall implement these changes at no additional cost to the Contract. Nothing in this Section shall negate the Contractor's obligations set forth in Section 110 - Indemnification, Bonding, and Insurance. The creation and modification of the TCP will be considered incidental to the related 652 items.

652.3.4 General

Prior to starting any work on any part of the project adjacent to or being used by the traveling public, the Contractor shall install the appropriate traffic control devices in accordance with the plans, specifications and the latest edition of Manual of Uniform Traffic Control Devices, Part VI. The Contractor shall continuously maintain the traffic control devices in their proper position, and they shall be kept clean, legible and in good repair throughout the duration of the work. If notified that the traffic control devices are not in place or not properly maintained, the Contractor may be ordered to immediately suspend work until all deficiencies are corrected.

No equipment or vehicles of the Contractor, their subcontractors, or employees engaged in work on this contract shall be parked or stopped on lanes carrying traffic, or on lanes or shoulders adjacent to lanes carrying traffic, at any time, except as required by ongoing work operations. Contractor equipment or vehicles shall never be used to stop, block, or channelize traffic.

Vehicles parked on the shoulder shall be located so all portions of the vehicle(s) are a minimum of one foot from the traveled way. No operation shall be conducted on or near the traveled lanes or shoulders without first setting up the proper lane closure and traffic control devices. These precautions shall be maintained at all times while this Work is being performed. The Contractor shall keep all paved areas of the highway as clear as possible at all times. No materials shall be stored on any paved area of the highway or within 30 feet of the traveled way (unless protected by concrete barriers and specifically approved by the Resident). Private vehicles owned by Contractor's employees shall be parked close together in a group no closer than 30 feet from the traveled way in pre-approved areas.

Channelization devices shall include Vertical Panel Markers, Barricades, Cones, and Drums shall be in accordance with the MUTCD. These devices shall be installed and maintained at the spacing determined by the MUTCD through the work area.

The Contractor shall maintain existing guardrails and/or barriers until removal is necessary for construction. The Contractor shall use a temporary barrier or appropriate channelizing devices, as approved by the Resident, while the guardrails and/or barriers are absent. Permanent guardrails and barriers shall be installed as soon as possible to minimize risk to the public.

When Contractor operations or shoulder grading leave a continuous 3 inch or less exposed vertical face at the edge of the traveled way, **including the shoulder, or when traffic is shifted into the shoulder adjacent to the edge of pavement where an existing 3 inch or less exposed vertical face creates a safety hazard**, channelization devices should be placed 2 feet outside the edge of the pavement at intervals not exceeding 600 feet and, depending on type and location of the exposed vertical face, a 48 inch by 48 inch W8-9 Low Shoulder, or W8-11 Uneven Lane, and/or a W8-17P Shoulder Drop-Off sign should be placed at a maximum spacing of ½ mile. When

Contractor operations or shoulder grading leave greater than a 3 inch exposed continuous vertical face at the edge of the traveled way, **including the shoulder, or when an existing condition of an exposed vertical face of 3 inches or more is adjacent to active traffic shifted into shoulder**, the Contractor shall place shoulder material at a slope not exceeding 3 horizontal to 1 vertical to meet the pavement grade, before the lane is opened to traffic.

Special Detours and temporary structures, if used, shall meet applicable AASHTO standards, including curve radii and grade.

Maine Turnpike Traffic Control Requirements

This Section outlines the minimum requirements that shall be maintained for working on, over, or adjacent to the Maine Turnpike roadway.

General

Two travel lanes in each direction (each direction being 24 feet wide including/excluding shoulder) in the two lane portion of the turnpike, and three travel lanes in each direction (each direction being 36 feet wide including/excluding shoulder) in the three lane portion of the turnpike (Mile 0.0 to mile 44.3) shall be maintained at all times except while performing work in a designated lane, directly over or adjacent to traffic, and during the placement and removal of traffic control devices.

Unless otherwise specified in the contract documents the minimum main line width for a single travel lane shall be 14 ft and minimum ramp widths of 16 ft which must be maintained at all times, from ½ hour before sunrise and ½ hour after sunset as indicated on the Sunrise/Sunset Table at: http://www.sunrisesunset.com/usa/Maine.asp . If the Project town is not listed, the closest town on the list will be used as agreed at the Preconstruction Meeting.

Shoulder closures, lane closures, and lane shifts meeting the MUTCD guidelines, other than those shown in the plans, must be submitted for approval from the MTA prior to use in the construction operations.

No lane closures will be allowed during non-working hours, weekends and/or holiday periods unless included in the Contract as long-term traffic control requirement as outlined in Section 652 – Specific Project Maintenance of Traffic Requirements **unless written permission is obtained from the Authority.**

Any special signs, barricades or other devices deemed necessary by the Resident shall be furnished and maintained by the Contractor. Extra care shall be taken so that the traffic flow will not be disturbed. The use of construction signs and warning devices not shown on the Plans or in the MUTCD is prohibited unless approved by the Resident

The Contractor's personnel and equipment shall avoid crossing traffic whenever possible. No Contractor's vehicle may slow down or stop in a traffic lane unless said lane has previously been made safe with signs and barricades as required by the Resident.

No vehicle will move onto the traveled way at such a time or in such a manner so as to cause undue concern or danger to traffic approaching from either direction. The Contractor or his employees are not empowered to stop traffic.

The Contractor shall take necessary care at all times, in all operations and use of his equipment, to protect and facilitate traffic. During periods of idleness, the equipment shall not be left in a way to obstruct the traffic artery or to interfere with traffic.

The Contractor shall furnish approved signs reading "Construction Vehicle - Keep Back" to be used on trucks hauling to the Project. The signs shall be a minimum of 30 inch by 60 inch, Black and Orange, and meet construction sign retro reflectivity requirements

All vehicles used on the Project shall be equipped with amber flashing lights, by means of a single or multiple, flashing LED or strobe lights mounted so as to be visible 360 degrees. **In addition, vehicles operating under direction of the Maine Turnpike Authority may be equipped with auxiliary lights that are green, white or amber or any combination of green, white or amber.** Auxiliary lighting shall have sufficient intensity to be visible at 500 feet in normal daylight and a flash rate between 1Hz and 4Hz. The vehicle flashing system shall be in continuous operation while the vehicle is on any part of the project and positioned or mounted in such a way to not be obstructed by vehicle mounted or other equipment. Dump trucks, **concrete trucks** and utility trucks **at a minimum** shall have a strobe light mounted on each side of the vehicle. **The use of motorcycles is not permitted within a construction site or as a means to arrive at or leave a work zone**.

Where space is available pavement striping for all tapers shall create a minimum buffer of 250 feet to the point where the temporary concrete barrier taper ends and becomes parallel to the travelway. Temporary concrete barrier shall be tapered at a minimum 8:1 unless space is available and then it should be tapered at 15:1 or 100 feet whichever is longest.

Milling and paving of interchange ramps shall be done between 9:00 p.m. and 5:00 AM, unless otherwise shown on the Maintenance of Traffic Phasing Plans or as directed by the MTA. Only a single ramp at an interchange may be closed at once. Ramp closures will not be permitted the day before or after holidays, on holidays, or on Saturdays or Sundays. The Contractor shall request approval from the Resident/Authority two weeks prior for all ramp closures. Portable changeable message signs shall be used to provide advance notice and warning of the ramp closure. PCMS's shall be operational a minimum of 1 week prior to ramp closure to notify Patrons. The contractor shall coordinate PCMS locations with the Resident and the MTA.

Access to, and egress from, the construction area shall be with the direction of travel without crossing traffic. Construction vehicles are prohibited from merging with mainline traffic during the AM and PM peak traffic hours unless approved in writing from the MTA. The contractor shall develop work zone access/egress with acceleration and deacceleration areas and should utilize interchange ramp areas whenever feasible.

Temporary Mainline Lane Closures

A lane closure may be required whenever personnel will be actively working within four feet of a travel lane.

Loading/unloading trucks shall not be closer than six feet from an open travel lane. Temporary lane closures will only be allowed at the times outlined in Special Provision, Section 652, Specific Project Maintenance of Traffic Requirements. These hours may be adjusted based on the traffic volume each day by the Resident.

A lane closure is required when a danger to the traveling public may exist. The following is a partial list of activities requiring lane closures. Lane closures may be required for other activities as well:

- Milling and Paving Operations
- Bridge work
- Drainage Installation and/or Adjustment
- Clear Zone Improvements
- Pavement Markings Layout and Placement
- **Work directly over traffic within six feet of a travel lane as measured from the painted pavement marking line or traffic control device will require a lane closure. This work includes but is not limited to the following:**

    1. **Unbolting structural steel**
    2. **Removing structural steel**
    3. **Erecting structural steel**
    4. **Erecting or moving sign panels on bridges or sign structures**
    5. **Bolting structural steel**
    6. **Loading and unloading trucks**
    7. **Light pole removal or installation**
    8. **Snow fence installation**

Lane closures shall be removed if work requiring the lane closure is not ongoing unless included in the Contract as a long-term traffic control requirement or approved by the Resident.

During adverse weather condition when the speed limit on the Maine Turnpike has been reduced to 45 MPH, or during fog or when there is less than ½ mile of visibility, shoulder/lane closures cannot be set up and any currently in place shall be removed. Only work on the turnpike mainline that is behind temporary concrete barrier will be allowed when speed is reduced to 45 MPH or fog/visibility conditions exist.

Daytime lane closures shall be a maximum of three (3) miles. Only one daytime lane closure will be permitted per direction. Nighttime lane closures may extend through the entire length of the Project.

Temporary single lane closures are allowed upon approval of the Resident. **Lane and/or ramp** closure setup may not begin until the beginning time specified. Closures that are setup early or that remain in place outside of the approved time period shall be subject to a lane rental fee of **$1,000** per five minutes for every five minutes outside of the approved time. The installation of

the construction signs will be considered setting up the lane closure. Removal of the last construction sign will be considered removal of the closure. Construction signs shall be installed immediately prior to the start of the closure and shall be promptly removed when no longer required. The installation and removal of a closure, including signs, channelizing devices, and arrow boards shall be a continuous operation. The Authority reserves the right to order the removal of an approved closure.

The Authority desires to minimize the number of daytime lane closures and the number of times that a complete stoppage of traffic is required. The Contractor is encouraged to schedule work so that the interference with the flow of traffic will be minimized. Lane closures will not be allowed until traffic associated with complete stoppages of traffic has cleared. Complete stoppages of traffic or lane closures may not be allowed on a particular day if another complete stoppage of traffic has been previously approved for another project.

The Resident is required to receive approval from the Maine Turnpike Authority for all lane closures. **The Resident is required to submit a request for lane closures by noon on Thursday for any lane closures needed for the following week.** The Contractor shall plan the work accordingly.

Mainline Shoulder Closures

Shoulder closures are anticipated at locations where Contractor access to the mainline is required.

Shoulder closures with plastic drums shall be removed at the end of the workday. Temporary shoulder closures with plastic drums will not be allowed during periods of inclement weather as determined by the Authority.

The location (limits) of shoulder closures with concrete barrier are shown on the Plans. The barrier must be placed prior to the start of the work requiring concrete barrier and shall remain in place until the work activity is complete.

Equipment Moves

The complete stoppage of traffic for an equipment move (including delivery of materials to the median) will be considered for approval if the action cannot reasonably be completed with the erection of a lane closure. Contractor shall be responsible for the installation of Signs CS-3, "Expect Stopped Traffic" and Signs W3-4 "Be Prepared to Stop", in accordance with the Single Lane Closure Detail immediately prior to the equipment move. **Signs will be required on any adjacent ramps within proximity to the stoppage**. These signs shall be covered when not applicable.

State Police will be used to stop traffic. Cost for State Police will be the responsibility of the Authority. The times requested for trooper assisted equipment moves by on-duty troopers cannot be guaranteed. The MTA will not be held responsible for any delays or costs associated with the delay, postponement or cancellation of an on-duty trooper assisted equipment move.

The maximum time for which traffic may be stopped and held for an equipment move at any single time shall be five (5) minutes. The duration shall be measured as the time between the

time the last car passes the Resident until the time the Resident determines that all travel lanes are clear. The traffic shall only be stopped for the minimum period of time required to complete the approved activity. The Contractor shall reimburse the Authority at a rate of $500 per minute for each minute in excess of the five-minute allowance.

Unapproved movement of equipment or materials across the travel lanes shall be considered a violation of the Maintenance of Traffic Requirements and is subject to a minimum fine of $500 per occurrence with an additional $500 per minute thereafter.

Request for Complete Stoppage of Traffic

A request for a complete stoppage of traffic must be submitted to the Resident for approval. The Resident is required to receive approval from the Maine Turnpike Authority for all stoppages. The request shall be submitted to the Authority by the Resident at least five (5) working days prior to the day of the requested stoppage of traffic and two (2) days for a stoppage less than five minutes. All requests must be received by 12:00 p.m. noon to be considered as received on that day. Requests received after 12:00 p.m. shall be considered as received the following day. The Contractor shall plan the work accordingly.

During the erection or removal of overhead structures or signs traffic shall be stopped and may be held for periods of up to 25 minutes during these operations. Before the roadway is reopened, all materials shall be secured so they will not endanger traffic passing underneath. The Contractor will reimburse the Authority at the rate of $2,500.00 per five-minute period for each roadway not reopened (northbound and southbound), in excess of the 25-minute limit. Total penalty shall be deducted from the next pay estimate.

Blasting of Ledge The maximum time for which traffic may be stopped at any single time shall be six (6) minutes. This duration shall be measured as the time between the time that the last car passes the Resident, until the time the Resident determines that all travel lanes are cleared of blast debris. The Contractor shall reduce the size of the blast, change the design and method of the blast, use more mats, or otherwise alter the blasting so that the traffic is not stopped for more than six minutes. If, due to the throw of rock onto the highway or other blasting related activities, traffic is stopped for more than six minutes, the Contractor shall pay a penalty of $1,000.00 per minute for every minute traffic is stopped in excess of the six-minute limit. The penalty shall be measured separately on the northbound and southbound roadway (or eastbound and westbound roadway). Total penalties will be deducted from the next pay estimate. Whenever the volume of traffic is excessive such that a six-minute interruption would cause objectionable congestion, in the opinion of the Authority, the hours during which blasting may occur may be further restricted. A detailed blasting plan shall be submitted as required in Supplemental Specific or Special Provision Sections 105 or 107.

652.3.5 Installation of Traffic Control Devices

All traffic control devices shall be in conformance with NCHRP 350 requirements **and MASH 16 requirements if manufactured after December 31, 2019** and installed as per manufactures recommendations.

Portable signs shall be erected on temporary sign supports approved crashworthy devices so that the bottom of the sign is either 1) 12 inches or 2) greater than 5 feet above the traveled way. **The bottom of all regulatory signs and ramp exit signs shall be a minimum of 5 feet above the traveled way.** Post-mounted signs shall be erected so the bottom of the sign is no less than 5 feet above the traveled way, and 7 feet above the traveled way in business, commercial, and residential areas. Post-mounted signs must be erected so that the sign face is in a true vertical position. All signs shall be placed so that they are not obstructed in any manner and immediately modified to ensure proper visibility if obstructed.

The bottom of mainline and ramp traffic control signs intending to remain longer than 3 days, except as provided in 2009 MUTCD Section 6F.03 paragraph 12, shall be mounted 5 feet or greater above the edge of pavement on posts or portable sign supports.

The Resident will verify the exact locations of the construction signs in the field.

Construction signs behind guardrail shall be mounted high enough to be visible to traffic.

Vertical panel markers shall be mounted with the top at least 4 feet above the traveled way.

Drums shall not be weighted on the top. Drain holes shall be provided to prevent water from accumulating in the drums During winter periods, drums shall be placed on the grass shoulder or removed from the roadway so winter maintenance operations will not be impacted. This requires the placement of drums behind the median guardrail. Drums shall not be placed on snowbanks.

The Contractor shall operate and maintain the flashing arrow board unit and for dependable service during the life of the contract. The units shall remain in continuous night and day service at locations designated until the Resident designates a new location or discontinuance of service.

The Contractor shall maintain the devices in proper position and clean them as necessary. Maintenance shall include the covering and uncovering of all signs when no longer applicable (even if for a very short duration). The sign shall be considered adequately covered when no part of the sign face is visible either around or through the covering.

The Contractor shall replace damaged traffic control devices with devices of acceptable quality, as directed by the Resident.

The Contractor is required to cover all existing signs, including regulatory and warning signs, within the Work zone which may conflict with the proposed construction signs. The Contractor is also required to cover all permanent construction signs when they conflict with a daily traffic control setup. The method of covering existing signs must be approved by the Resident. The use of adhesives on the sign face is prohibited.

Work Zone Speed Limits

Work Zone Speed (Fines Doubled) is a regulatory speed limit that indicates the maximum legal speed through a work zone which is lower than the normal posted speed. The speed limit shall be displayed by black on white speed limit signs in conjunction with a black on orange “Work Zone” plate. Speed limit signs shall be installed at each mile within the work zone. Any existing

regulatory speed limit signs within the reduced speed zone shall be covered once the reduced speed signs have been erected.

Two orange fluorescent flags shall be attached to all speed limit signs that are uncovered for a period of time exceeding one week. This work shall be incidental. Signs that are covered and uncovered on a regular basis are not required to have the supplemental flags.

The reduced speed limit signs shall be used when workers are adjacent to traffic, when travel lane(s) are closed, when indicated on Maintenance of Traffic Control Plans provided or other times as approved by the Resident:

The signs shall be covered or removed when not applicable. The covering and uncovering of signs shall be included for payment under Maintenance of Traffic. Signs relating to reduced speed shall be installed in accordance with the details. **The Contractor shall note that all signs including those behind concrete barrier or guardrail are required to be clearly visible to all drivers at all times.**

Lane Closure Installation and Removal Procedure

The Contractor will follow the following procedures when closing any travel lanes on the turnpike roadways:

1. The sign package shall be erected starting with the first sign and proceeding to the start of the taper. The sign crew shall erect signs with the vehicle within the outside shoulder;

2. Position the arrow board with the proper arrow at the beginning of the taper; and,

3. When arrow board is in place, continue with the drums/cones to secure the work area.

To dismantle the lane closure, start with last drums/cone placed and work in reverse order until all the drums are removed. The arrow board which was installed first shall be the final traffic control device removed, excluding the sign package. The remaining sign package shall be picked up starting with the first sign placed and continuing in the direction of traffic and with the vehicle in the outside shoulder.

Trucking Plan

The Contractor shall submit a trucking plan to the Resident within 10 working days of the award of the Contract. The trucking plan shall consist of at least the following:

- Date of anticipated start of work per each location.
- Haul routes from plant/pit to work area and return.
- Haul routes from work area to disposal area and return.
- Entering / exiting the work area.
- Vehicle safety equipment and Vehicle inspection.

- Personal safety equipment.
- Communications equipment and plan.

The trucking plan will not be paid for separately but shall be incidental to the Contract.

652.3.6 Traffic Control

The existing travel way width shall be maintained to the maximum extent practical.

Vertical panel markers, drums, cones, or striping shall be used to clearly delineate the roadway through the construction area. Two-way traffic operation shall be provided at all times that the Contractor is not working on the project. One- way traffic shall be controlled through work areas by flaggers, utilizing radios, field telephones, or other means of direct communication.

The traffic control devices shall be moved or removed as the work progresses to assure compatibility between the uses of the traffic control devices and the traffic flow.

Pavement markings shall be altered as required to conform to the existing traffic flow pattern. Repainting of pavement marking lines, if required to maintain the effectiveness of the line, shall be considered **incidental to the** maintenance of traffic control devices, no separate payment will be made. Inappropriate pavement markings shall be removed whenever traffic is rerouted, and temporary construction pavement markings shall be placed. Removal of non-applicable markings and **initial** placement of temporary construction pavement markings will be paid for under the appropriate Contract items. Traffic changes shall not be made unless there is sufficient time, equipment, materials, and personnel available to complete the change properly before the end of the workday. This provision will not be required when traffic is rerouted for brief periods and the route can be clearly defined by channelizing devices, or flaggers, or both.

All vehicles used during the installation and removal of traffic control devices, including lane closures, shall be equipped with a vehicle-mounted lighted arrow board **or high intensity LED full width light bar** acceptable to the Resident. The arrow board **or full width light bar** shall be capable of displaying a left arrow, right arrow, double arrow, and light bar **patterns**.

652.4 Flaggers

The Contractor shall furnish flaggers as required by contract documents or as otherwise specified by the Resident. **Flaggers shall not stop traffic on Turnpike mainline or interchange ramps. Only State Police are allowed to stop traffic on mainline or interchange ramps.**

All flaggers must have successfully completed a flagger test approved by the Maine Department of Transportation and administered by a Maine Department of Transportation approved Flagger-Certifier. All flaggers must carry an official certification card with them at all times while flagging.

For daytime conditions, flaggers shall wear a top (vest, shirt, or jacket) that is orange, yellow, yellow-green, or fluorescent versions of these colors meeting ANSI 107-2004, Class 3, along with a hat with 360 ˚ retro-reflectivity.

For nighttime conditions, flaggers shall wear all Class 3 apparel, meeting ANSI 107-2004, including a Class 3 top (vest, shirt or jacket) and a Class E bottom (pants or coveralls), shall be worn along with a hardhat with 360 ˚ retro-reflectivity and shall be visible at a minimum distance of 1000 ft. Flagger stations must be illuminated in nighttime conditions to assure visibility and will be specifically addressed in detail in the Contractor's TCP.

Flagger stations shall be located far enough in advance of the workspace so that approaching road users will have sufficient distance to stop at the intended stopping point. While flagging, the flagger should stand either on the shoulder adjacent to the traffic being controlled, or in the closed lane. At a spot obstruction with adequate sight distance, the flagger may stand on the shoulder opposite the closed sections to operate effectively. Under no circumstances shall the flagger stand in the lane being used by moving traffic or have their back to oncoming traffic. The flagger should be clearly visible to approaching traffic at all times and should have a clear escape route.

When conditions do not allow for proper approach sight distance of a flagger or storage space for waiting vehicles, additional flaggers shall be used at the rear of the backlogged traffic or at a point where approaching vehicles have adequate stopping sight distance to the rear of the backlogged traffic. All flagger stations shall be signed, even when in close proximity. The signs shall be removed or covered when flagger operations are not in place, even if it is for a very short duration.

Flaggers shall be provided as a minimum, a 10-minute break, every 2 hours and a 30 minute or longer lunch period away from the workstation. Flaggers may only receive 1 unpaid break per day; all other breaks must be paid. Sufficient certified flaggers shall be available onsite to provide for continuous flagging operations during break periods. If the flaggers are receiving the appropriate breaks, breaker flagger(s) shall be paid starting 2 hours after the work begins and ending 2 hours before the work ends. A maximum of 1 breaker per 6 flaggers will be paid. (1 breaker flagger for 2 to 6 flaggers, 2 breaker flaggers for 7 to 12 flaggers, etc.). If a flagger station is manned for 10 hours or more, then ½ hour for lunch will be deducted from billable breaker flagger hours.

652.41 Traffic Officers

Local road traffic officers, if required, shall be uniformed police officers. State Police officers and vehicles shall be used to warn and stop traffic on the Maine Turnpike. All State Police shall be scheduled through the Maine Turnpike Authority. The Authority will make payment for the State Police officers and vehicles directly to the State Police.

The Contractor will not be entitled to additional compensation if scheduled Work is not completed due to the unavailability of State Police.

652.5.1 Rumble Strip Crossing

When lane shifts or lane closures require traffic to cross a permanent longitudinal rumble strip for 7 calendar days or less, the Contractor shall install warning signs that read "RUMBLE STRIP CROSSING" with a supplemental Motorcycle Plaque, (W8-15P).

When lane shifts or lane closures require traffic to cross a permanent longitudinal rumble strip for more than 7 calendar days, the Contractor shall pave in the rumble strips in the area that traffic will cross, unless otherwise directed by the Resident. Rumble strips shall be replaced prior to the end of the project, when it is no longer necessary to cross them.

652.6.1 Daylight Work Times

Unless otherwise described in the Contract, the Contractor is allowed to commence work and end work daily according to the Sunrise/Sunset Table at: http://www.sunrisesunset.com/usa/Maine.asp . If the Project town is not listed, the closest town on the list will be used as agreed at the Preconstruction Meeting. Any work conducted before sunrise or after sunset will be considered Night Work.

652.6.2 Night work

When Night Work occurs (either scheduled or unscheduled), the Contractor shall provide and maintain lighting on all equipment, at all workstations, and all flagger stations.

The lighting facilities shall be capable of providing light of sufficient intensity to permit good workmanship, safety, and proper inspection at all times. The lighting shall be cut off and arranged on stanchions at a height that will provide perimeter lighting for each piece of equipment and will not interfere with traffic, including commercial vehicles, approaching the work site from either direction.

The Contractor shall have available portable floodlights for special areas.

The Contractor shall utilize padding, shielding or other insulation of mechanical and electrical equipment, if necessary, to minimize noise, and shall provide sufficient fuel, spare lamps, generators, etc. to maintain lighting of the work site.

The Contractor shall submit a lighting plan prior to any night work for review showing the type and location of lights to be used for night work. The Resident may require modifications be made to the lighting set up in actual field conditions.

Prior to beginning any Night Work, the Contractor shall furnish a light meter for the Residents use that is capable of measuring the range of light levels from 5 to 20 foot-candles.

Horizontal illumination, for activities on the ground, shall be measured with the photometer parallel to the road surface. For purposes of roadway lighting, the photometer is placed on the pavement. Vertical illumination, for overhead activities, shall be measured with the photometer perpendicular to the road surface. Measurements shall be taken at the height and location of the overhead activity.

Night Work lighting requirements:

Mobile Operations: For mobile-type operations, each piece of equipment (paver, roller, milling machine, etc.) will carry indirect (i.e. balloon type) lights capable of producing at least 10 foot- candles of lighting around the work area of the equipment.

Fixed Operations: For fixed-type operations (flaggers, curb, bridge, pipes, etc.), direct (i.e. tower) lighting will be utilized capable of illuminating the work area with at least 10 foot-candles of light.

Hybrid Operations: For hybrid-type operations (guardrail, sweeping, In-slope excavation, etc.), either direct or indirect lighting may be utilized. The chosen lights must be capable of producing at least 10 foot-candles of light around the work area of the equipment

Inspection Operations: Areas required to be inspected by the Authority will require a minimum of 5 foot-candles of lighting. This may be accomplished through direct or indirect means.

The Contractor shall apply 2- inch wide retro-reflective tape, with alternating red and white segments, to outline the front back and sides of construction vehicles and equipment, to define their shape and size to the extent practicable. Pickup trucks and personal vehicles are exempt from this requirement.

The Resident or any other representative of the Authority reserves the right to suspend the work at any time and request a meeting to discuss violations and remedies. The Authority shall not be held responsible for any delay in the work due to any suspension under this item.

Failure to follow the approved Lighting Plan will result in a Traffic Control violation.

Payment for lighting, vehicle mounted signs and other costs accrued because of night work will not be made directly but will be considered incidental to the related contract items.

652.6.3 Traffic Coordinator and Personnel

The Contractor shall submit to the Resident for approval a list of traffic control personnel assigned to the Project including qualifications, certifications, and experience.

The Traffic Coordinator duties shall include, but are not necessarily limited to:

a. Developing, in conjunction with the Resident and Project superintendent, a traffic control program for the days' work activities which will facilitate traffic in a safe and efficient manner;

b. Ensure that all traffic control implements (signs, arrow boards, barrels, etc.) are on-site so the traffic program can be implemented effectively;

c. Ensure a safe and effective setup or take-down of all signing implements to least impact the traveling motorist; and,

d. Working knowledge of construction signing/traffic control requirements in conformance with the latest issued Manual on Uniform Traffic Control Devices.

e. The Contractor shall supplement the traffic control plan with a daily plan, which includes schedules for utilizing traffic coordinators and flaggers. This plan shall be submitted daily and agreed upon cooperatively with the Resident.

652.7 Method of Measurement

Signs, signs supplied by the Authority, and panel markers will be measured by the square foot for all signs authorized and installed. Flashing arrow boards, portable-changeable message signs, and flashing and steady burn lights, will be measured by each unit authorized and installed on the project. Barricades and cones will be measured by each unit authorized. Drums will be measured by each or as a lump sum authorized and installed, as indicated on the plans and specifications. No additional payment will be made for devices that require replacement due to poor condition or inadequate retroreflectivity.

Flaggers or traffic officers used during the Contract, for the convenience of the Contractor, will not be measured separately for payment, but shall be incidental to the various pay items. **This includes use of Flaggers for the delivery of materials and equipment to the project or other Flagger use that is for the Contractor's convenience, as determined by the Resident Engineer. If flaggers are required to maintain traffic and there is not a pay item in the contractor for flaggers, then flaggers shall be incidental to the other Section 652 contract items and no separate payment shall be made.**

The accepted quantity of traffic officer and flagger time will be the number of hours the designated station is occupied. The number of hours authorized for payment, **if any**, will be measured to the nearest ¼ hour.

The Authority will make payment for the State Police officers and vehicles directly to the State Police when utilized for mainline traffic control activities. State Police escorts, if required to move oversize material or equipment loads to the jobsite, will not be paid separately, but shall be incidental to the various pay items.

Maintenance of traffic control devices will be measured by the calendar day or as one lump sum, as indicated in the plans and specifications, for all authorized and installed traffic control devices. Traffic control devices will only be measured for payment the first time used. Subsequent uses shall be incidental to Item 652.36 or 652.361.

The vehicle mounted arrow board, mounted on trucks used for installation and removal of lane closures, will not be measured separately for payment, but shall be incidental to Item 652.36 or 652.361.

The traffic coordinator(s) will not be measured separately for payment, but shall be incidental to Item 652.36 or 652.361.

Portable light towers, lighting on equipment and lighting plan will not be measured separately for payment, but shall be incidental to the related Contract items.

Truck mounted attenuator shall be measured for payment by the calendar day for each calendar day that the unit is used on a travel lane or shoulder on the project, as approved by the Resident.

Sequential Flashing Warning Lights shall be measured for payment by the maximum number of sequential flashing warning lights satisfactorily installed and properly functioning at

any one time during the life of the project. Payment shall include all materials and labor to install, maintain and remove all Sequential Flashing Warning Lights.

Automated Trailer Mounted Speed Limit Sign shall be measured for payment by the calendar day for each calendar day that the unit is used on a travel lane or shoulder on the project or per each for the continued use for the duration of the project. Payment shall include the Trailer, Radar Speed Limit Sign, flashing beacon amber lights, regulatory speed limit sign, fuel, necessary maintenance, and all checking of Radar Speed Limit Signs by manufacturer and all project moves including the transporting and delivery of the unit.

The accepted quantity of temporary portable rumble strips shall be measured by the unit complete in place, per lane closure application. A unit shall consist of 1 group of 3 full-lane width of rumble strips. As shown in the plans, a maximum of 3 units may be used at each lane closure. A unit shall be measured for each group of rumble strips, each time they are used for a lane closure.

652.8 Basis of Payment

The accepted quantity of signs, signs supplied by the Authority, and panel markers will be paid for at the contract unit price per square foot. Such payment will be full compensation for furnishing (or retrieving from the Authority) and installing all signs, sign supports, and all incidentals necessary to complete the installation of the signs.

The accepted quantity of flashing arrow boards, barricades, battery operated flashing and steady burn lights, and cones will be paid for at the contract unit price each for the actual number of devices authorized, furnished, and installed. Such payment shall be full compensation for all incidentals necessary to install and maintain the respective devices.

The Sequential Flashing Warning Lights will be paid for at the Contract unit price per each. This price shall include all costs associated with furnishing, installing, operating, maintaining, relocating, and removing the Sequential Flashing Warning Lights.

The Truck Mounted Attenuator(s) will be paid for at the Contract unit price per calendar day for each TMA used. This price shall include all costs associated with the use of the vehicle. Payment shall include operator, fuel, truck, maintenance, flashing lights, arrow board and all other incidentals necessary to operate the vehicle.

Failure by the contractor to reinstall cones, barrels, signs, covered/uncovered signs and similar traffic control devices within an hour of them being displaced, moved, knocked over, un-covered and etc. will result in a $150 fine per traffic control device if the issues is not resolved within 1 hour of notification by the resident. An additional $150 will be assessed for each additional hour that the device has not been corrected. If the traffic control device is critical to the maintenance of traffic creating an actual or potential safety issue with traffic and is not corrected immediately then it will result in a violation letter as described below.

Failure by the contractor to follow the Contracts 652 Supplemental Specifications, Special Provisions and Standard Specification and/or the Manual on Uniform Traffic Control Devices (MUTCD) and/or the Contractors own Traffic Control Plan, or failure to correct a

violation, will result in a violation letter and result in a reduction in payment as shown in the schedule below. The Resident or any other representative of the Authority reserves the right to suspend the work at any time and request a meeting to discuss violations and remedies. The Authority shall not be held responsible for any delay in the work due to any suspension under this item. Any reduction in payment under this Special Provision will be in addition to forfeiting payment of maintenance of traffic control devices for that day.

Amount of Penalty Damages per Violation		
1st	2nd	3rd & Subsequent
$500	$1,000	$2,500

652.8.1 Maintenance of Traffic Control Devices

Maintenance of Traffic Control Devices will be paid at the contract unit price per calendar day or lump sum price, as indicated in the plans and specifications. Such payment will be full compensation for all days that the Contractor maintains traffic as specified herein, and for moving devices as many times as necessary; for replacing devices damaged, lost, or stolen; and for cleaning, maintaining, and removing all devices used for traffic control, including replacing temporary pavement marking lines.

The contract price for Maintenance of Traffic Control Devices shall be full compensation for all days for such maintenance, encompassing all areas of the contract, regardless of whether or not the work areas or projects are geographically separated.

652.8.2 Other Items

The accepted quantities of flagger hours will be paid for at the contract unit price per hour for each flagging station occupied excluding lunch breaks, and for each approved breaker flagger. Overtime hours, as reported on the certified payrolls, will be paid an additional 30% of the bid price for 652.38. The computation and additional payment for overtime hours will occur during the project close-out process and will be paid as additional hours of 652.38 to the nearest ¼ hour. The contract unit price shall be full compensation for hiring, transporting, equipping, supervising, and the payment of flaggers and all overhead and incidentals necessary to complete the work.

There will be no payment made under any 652 pay items after the expiration of the adjusted total contract time.

The accepted quantities of traffic officer hours will be paid for at the contract unit price per ¼ hour for each station occupied, with no additional payment for overtime. This price shall be full compensation for supplying uniformed officers with police cruisers, and all incidentals necessary to complete the work; including transportation, equipment, and supervision.

Payment for temporary pavement marking lines and pavement marking removal will be made under the respective pay item in Section 627 - Pavement Markings.

Payment for temporary traffic signals will be made under Section 643 - Traffic Signals.

The accepted quantity of Portable Changeable Message Signs will be paid for at the Contract unit price each. This price shall be full compensation for furnishing, relocating, maintaining and removing the PCMS. The price also includes all costs associated with setting-up and paying for a data cellular account, technical support, training, and any costs associated with the GPS location device.

Progress payment of each PCMS shall be pro-rated over the duration of the Contract. Contract duration shall be from the specified Contract start date to substantial completion or Contract completion, whichever is sooner.

For a PCMS that fails to operate when required, the Contractor will be given 24-hours to repair or replace the PCMS. For periods longer than 24-hours, payment will be reduced based on the pro-rated time that the PCMS is out of service.

Drums will be paid for at the contract unit price each, or at the Contract lump sum price, as designated in the Plans and specifications. Such payment shall be full compensation for all drums as shown on the Plans or required to complete the work.

The Truck Mounted Attenuator(s) will be paid for at the Contract unit price per calendar day. This price shall include all costs associated with the use of the vehicle. Payment shall include operator, fuel, truck, maintenance, flashing lights, arrow board and all other incidentals necessary to operate the vehicle.

The Automated Trailer Mounted Speed Limit Sign(s) will be paid for at the Contract unit price per calendar day or per each. This price shall include all costs associated with the use of the Automated Trailer Mounted Speed Limit Sign.

The accepted quantity of temporary portable rumble strips will be paid for at the contract unit price per unit which shall include the transport device. Payment is full compensation for providing, relocating, maintaining, or replacing, and removing temporary portable rumble strips. If the pay item is not included in the contract quantities, then the Authority does not anticipate the use of this item on the contract. If contractor wishes to utilize temporary portable rumble strips and the item is not in the contract, then the contractor may propose use of them to the Authority for consideration.

Payment will be made under:

Pay Item		Pay Unit
652.30	Flashing Arrow	Each
652.31	Type I Barricade	Each
652.311	Type II Barricade	Each
652.312	Type III Barricades	Each
652.32	Battery Operated Light	Each
652.33	Drum	Each
652.331	Drum	Lump Sum
652.34	Cone	Each
652.35	Construction Signs	Square Foot
652.351	Construction Signs-Supplied by Authority	Square Foot

652.36	Maintenance of Traffic Control Devices	Calendar Day
652.361	Maintenance of Traffic Control Devices	Lump Sum
652.38	Flaggers	Hour
652.381	Traffic Officers	Hour
652.41	Portable-Changeable Message Sign	Each
652.45	Truck Mounted Attenuator	Calendar Day
652.4501	**Truck Mounted Attenuator – 24,000 LB**	**Calendar Day**
652.451	**Automated Trailer Mounted Speed Limit Sign**	**Calendar Day**
652.452	**Automated Trailer Mounted Speed Limit Sign**	**Each**
652.46	**Temporary Portable Rumble Strips**	**Unit**
652.47	**Sequential Flashing Warning Lights**	**Each**

SPECIAL PROVISION

SECTION 652

MAINTENANCE OF TRAFFIC

(Specific Project Maintenance of Traffic Requirements)

This Specification describes the specific project maintenance of traffic requirements for this Project.

The following minimum traffic requirements shall be maintained. These requirements may be adjusted based on the traffic volume when authorized by the Authority.

All maintenance of traffic control devices shall meet current MUTCD guidelines and NCHRP 350 guidelines, and MASH guidelines if date of manufacture was after 2019.

See Maintenance of Traffic Details in Appendix.

Maine Turnpike Mainline

Mainline travel lanes, interchange acceleration lanes, deceleration lanes, and ramps shall be maintained fully functional during the project or as approved by the MTA. Maintenance of traffic signage shall take into consideration the visibility of all permanent and temporary roadway guide signs. All roadway guide signs shall be maintained during construction including the temporary resetting of such signs to provide visibility to Turnpike patrons while also providing contractor access.

Ramp closures are only allowed at the Exit 48 interchange as single night closures and intended to give the Contractor time to setup the work zones, including installing temporary traffic control signage and temporary concrete barrier.

Setup of temporary traffic control signage and temporary concrete barrier for the work zones at Utility Vaults, are intended to be done at night when the mainline can be reduced to a single lane and the adjacent ramp can be shifted to keep the ramp open and operational.

Maine Turnpike Traffic Control Requirements

This Section outlines the minimum requirements that shall be maintained for work on, over, or adjacent to the Maine Turnpike roadway. Operations are allowed as outlined below:

Maintenance of traffic plans have been developed for the work on the mainline and ramps. Minimum main line width for a single travel lane shall be 14 ft and minimum ramp widths of 16 ft (12 ft lane and two 2 ft shoulders) must be maintained at all times, unless otherwise noted. Shoulder closures, lane closures, and lane shifts meeting the MUTCD guidelines, other than those shown in the plans, must be submitted for approval from the MTA prior to use in the construction operations. Requests for all closures shall be submitted to the MTA for approval before proceeding.

Where space is available pavement striping for all tapers shall create a minimum buffer of 250 feet to the point where the temporary concrete barrier taper ends and becomes parallel to the travelway. Temporary concrete barrier shall be tapered at a minimum 8:1 unless space is available and then it should be tapered at 15:1 or 100 feet whichever is longest.

Lane shifts and maintenance of traffic layouts merging with Adjacent Contracts, including the layouts contained in this Contract, shall be coordinated with the Adjacent Contractor and the Resident Engineer to ensure work zones are not impacted and that traffic is shifted smoothly from one work zone to the other. Contractor shall provide a 30-day notice to the Resident of all proposed changes to the maintenance of traffic layouts affecting Adjacent Work Zones. Precedence will be given to the Contract(s) executed before this contract, for all potential work zone overlaps.

Sawcutting and paving of mainline shoulders and interchange ramps shall be done between 9:00 p.m. and 5:00 AM, unless otherwise shown on the Maintenance of Traffic Phasing Plans or as directed by the MTA. Only a single ramp at an interchange may be closed at once. Ramp closures will not be permitted the day before or after holidays, on holidays, or on Saturdays or Sundays. The Contractor shall request approval from the Resident/Authority two weeks prior for all closures. Portable changeable message signs shall be used to provide advance notice and warning of the ramp closure. PCMS's shall be operational a minimum of 1 week prior to ramp closure to notify Patrons. The contractor shall coordinate PCMS locations with the Resident and the MTA.

Construction vehicles will not be allowed to cross active ramps. Equipment moves across ramps will require a short-term ramp closure (i.e. 5-minute maximum timeframe) utilizing State Police and must be approved by the Authority in advance. Ramp closures for equipment moves will not be permitted between 6:00 a.m. and 10:00 a.m. and between 3:00 p.m. and 7:00 p.m. All State Police shall be coordinated through the Maine Turnpike Authority. The Authority will make payment for the State Police officers and vehicles directly to the State Police.

Lane and/or ramp closure setup may not begin until the beginning time specified. Closures that are setup early or that remain in place outside of the approved time period shall be subject to a lane rental fee of $1,000 per five minutes for every five minutes outside of the approved time. The installation of the construction signs will be considered setting up the lane closure. Removal of the last construction sign will be considered removal of the closure. Construction signs shall be installed immediately prior to the start of the closure and shall be promptly removed when no longer required. The installation and removal of a closure, including signs, channelizing devices, and arrow boards shall be a continuous operation. The Authority reserves the right to order the removal of an approved closure.

Access to, and egress from, the construction area shall be with the direction of travel without crossing traffic. Construction vehicles are prohibited from merging with mainline traffic between 6:00 a.m. and 10:00 a.m. and between 3:00 p.m. and 7:00 p.m. unless approved in writing from the MTA. The contractor shall develop work zone access/egress with acceleration and deacceleration areas and should utilize interchange ramp areas whenever feasible.

Loading/unloading trucks shall not be closer than six feet from an open travel lane.

Portable light towers will be required to illuminate the night construction work area(s) and shall be incidental to the Contract.

Work directly over traffic or within six feet of a travel lane as measured from the painted pavement marking line or traffic control device will require a lane closure. This work includes but is not limited to the following:

1. Unbolting structural steel
2. Removing structural steel
3. Erecting structural steel
4. Erecting or moving sign panels on bridges or sign structures
5. Bolting structural steel
6. Loading and unloading trucks
7. Light pole removal or installation

Lane and Shoulder Closure Details

Mainline Northbound Exit 46 to Exit 49 May 16, 2021 to September 18, 2021 May 15, 2022 to September 17, 2022				
		Equipment Moves	**Temporary Lane Closures**	**Temporary Shoulder Closures**
Days of Week:	Sunday night through Friday morning			
Time of Day:	9:00 p.m. to 6:00 a.m. following day	Allowed	Allowed	Allowed
Day of Week:	Friday night through Saturday morning			
Time of Day:	10:00 p.m. to 7:00 a.m. following day	Allowed	Allowed	Allowed

Mainline Northbound Exit 46 to Exit 49 Project Start to May 15, 2021 September 19, 2021 to May 14, 2022 September 18, 2022 to Project Completion				
		Equipment Moves	**Temporary Lane Closures**	**Temporary Shoulder Closures**
Days of Week:	Sunday night through Friday morning			
Time of Day:	8:00 p.m. to 6:00 a.m. following day	Allowed	Allowed	Allowed
Day of Week:	Friday night through Saturday morning			

Time of Day:	9:00 p.m. to 8:00 a.m. following day	Allowed	Allowed	Allowed

Mainline Northbound Exit 46 to Exit 49 May 16, 2021 to September 18, 2021 May 15, 2022 to September 17, 2022				
		Equipment Moves	**Temporary Lane Closures**	**Temporary Shoulder Closures**
Days of Week:	Sunday night through Friday morning			
Time of Day:	9:00 p.m. to 6:00 a.m. following day	Allowed	Allowed	Allowed
Day of Week:	Friday night through Saturday morning			
Time of Day:	10:00 p.m. to 7:00 a.m. following day	Allowed	Allowed	Allowed

Mainline Northbound Exit 46 to Exit 49 Project Start to May 15, 2021 September 19, 2021 to May 14, 2022 September 18, 2022 to Project Completion				
		Equipment Moves	**Temporary Lane Closures**	**Temporary Shoulder Closures**
Days of Week:	Sunday night through Friday morning			
Time of Day:	7:00* p.m. to 6:00 a.m. following day	Allowed	Allowed	Allowed
Day of Week:	Friday night through Saturday morning			
Time of Day:	9:00 p.m. to 8:00 a.m. following day	Allowed	Allowed	Allowed
* Sunday night temporary lane closures cannot start until 8:00 PM				

SPECIAL PROVISION

SECTION 659

MOBILIZATION

659.01 Description

The following paragraphs are added:

Mobilization shall be consist of two parts:

- That portion related to the Utility Vault Extensions at Station 2340+50+/- Left and Right, and station 2360+00+/- Right
- That portion related to the Water Line Replacement at the Exit 48 Interchange.

659.02 Basis of Payment

Payment will be made under:

Pay Item		Pay Unit
659.10	Mobilization (Utility Vaults)	Lump Sum
659.11	Mobilization (Waterline)	Lump Sum

SPECIAL PROVISION

SECTION 719

SIGNING MATERIAL

Section 719.01 Reflective Sheeting

This Subsection is deleted in its entirety and replaced with the following:

Retroreflective sheeting for signs shall meet at a minimum the requirements for ASTM 4956 – Type XI (Prismatic) manufactured by 3M Company, for all signs.

Reflective sheeting, used in sign construction, shall have been manufactured within the six months immediately prior to the fabrication of each sign. Upon delivery at the job site of each shipment of signs, a letter of certification shall be provided that the reflective sheeting conforms to the requirements.

For Type 1 Guide Signs, all reflective sheeting shall be color matched on each sign unit.

All warning signs shall be fluorescent yellow except for Ramp Advisory Speed signs which shall be yellow.

All Construction Series signs that use orange backgrounds shall be fluorescent orange.

All Pedestrian Signs shall be fluorescent yellow-green.

EZ-PASS Purple shall conform to the FHWA Purple color box.

719.02 Demountable High Intensity Reflectorized Letters, Numerals, Symbols, and Borders

This Subsection, including the title, is deleted in its entirety, and replaced with the following:

719.02 Letters, Numerals, Symbols, and Borders

All signs shall be manufactured utilizing Direct Applied letters, numerals, symbols, and borders or be Digitally Printed meeting all sign sheeting manufacturer's (3M) requirements to ensure that the manufacturer's warranty will be in full effect.

All Type 1 overhead signs, Type 1 interchange signs and any other Type 1 signs over 100 square feet shall utilize Direct Applied letters, numerals, symbols, and borders.

Direct Applied

Direct reflectorized applied letters, numerals, symbols, and borders shall consist of cut out sheeting that shall meet at a minimum the requirements for ASTM 4956 – Type XI (Prismatic) sheeting. The sheeting material used for the direct applied legend shall be the same type as used for the background.

Digitally Printed

Digital printing methods may be used to produce the sign copy and borders on retroreflective sheeting. Retroreflective sheeting complying with ASTM D 4956 Type XI and designated by the manufacturer as suitable for digital printing traffic signs along with associated ink and premium overlay film. Digitally Printed signs shall meet all sign sheeting manufacturer's (3M) requirements to ensure that the manufacturer's warranty will be in full effect

Transparent and opaque durable inks used in digital printed sign copy and borders shall be as recommended by the sheeting manufacturer (3M). Digital printed traffic colors shall be properly applied and shall have a warranty life of the base retroreflective sign sheeting. Digitally printed signs shall present a flat surface, free from foreign material, and all copy and borders shall be clear and sharp. Digital printed signs shall conform to 70% of the retroreflective minimum values established for its type and color (applicable to traffic colors only), as required by ASTM D 4956. Digital printed signs shall meet the daytime color and luminance, and nighttime color requirements of ASTM D 4956. Printed traffic colors shall meet the accelerated weathering and colorfastness requirements of ASTM D 4956. Digitally printed black shall remain sufficiently opaque for its intended use for the warranty period of the base sheeting. No variations in color or overlapping of colors will be permitted.

Digitally printed traffic signs shall have an integrated engineered match component clear UV- premium protective overlay recommended by the sheeting manufacturer applied to the entire face of the sign.

All digitally printed traffic signs shall utilize an integrated engineered match component system for materials and printing process and equipment. The integrated engineered match component system shall consist of retroreflective sheeting, durable ink(s), and clear protective overlay film, as specified by the sheeting manufacturer, applied to aluminum substrate.

The sign fabricator shall use an integrated engineered match component system digital printer approved by the sheeting manufacturer. Each approved digital printer shall only use the compatible retroreflective sign sheeting manufacturer's engineered match component system products. The sign fabricator shall maintain their digital printer's color calibration according to the sheeting manufacturer's requirements to help ensure digitally printed signs meet the manufacturer's specifications. The fabricator shall be trained by the sheeting manufacturer to produce digitally printed traffic signs that qualify for the sheeting manufacturer's warranty.

General

Type 1 Guide Signs shall have two-inch-tall, series C text that indicates the sign size, and the sign install date (MM/YY) located two inches above the bottom border of the sign.

Appendix A
Portland Pipe Line Corporation – Construction Practices

PORTLAND PIPE LINE CORPORATION
Safety, Environment, Customer, Community

Dig Safe System, Inc.
It's Smart. It's Free. It's the Law.

811 Know what's below. Call before you dig.

CONSTRUCTION PRACTICES

TO BE OBSERVED BY OTHERS WHEN ON OR NEAR PORTLAND PIPE LINE CORPORATION RIGHTS-OF-WAY

The guidelines and construction practices listed below shall be followed by other pipeline, utility, construction organizations, and others performing work in the Portland Pipe Line Corporation right-of-way:

1. A minimum distance of 50 feet should be maintained between new structures and nearest pipeline (49 CFR 195.210).

2. Crossings of the pipelines should ideally be 90^{o}, but in no case less than 45^{o}.

3. A minimum vertical distance between lines crossing beneath the pipelines shall be 18 inches. Compaction near the pipelines shall be equal to original soil compaction. Certain soil conditions may dictate additional vertical clearance.

4. Lines crossing over the pipelines shall have an 18-inch minimum vertical clearance with 90% or greater Proctor compaction density or pipeline-approved supports on both sides of the pipeline crossed.

5. Excavation in questionable soils conditions, where shear failure or trench collapse might occur, must be investigated by a soils engineering consultant; and where conditions warrant it, suitable plans for soils stabilization shall be designed and carried out by a qualified engineer.

6. No excavation in the vicinity of pipelines is to be made without a pipeline representative being present. Excavation within five (5) feet of a pipeline shall be done with extreme caution and only by hand digging under a Pipe Line representative's direction. The pipelines and the required separation distance must be exposed for observation during trenchless crossings, for example by directional drilling, to ensure safety and clearance.

7. Where heavy construction vehicles must cross a pipeline, suitable compacted cover and padding shall be placed over the pipeline to provide generally not less than four (4) feet of suitable protective material over the pipeline. Pipe Line representative will locate pipelines for landowner or contractor upon request.

8. In no case shall cover be less than that required by the Department of Transportation, Code of Federal Regulation for transportation of hazardous liquids by pipeline (49 CFR 195.248).

9. All blasting is to be kept to an absolute minimum and shall be done according to good construction practices, using experienced, qualified blasting personnel and only then with Pipe Line approval.

10. Be aware of potential interference between Portland Pipe Line's DC electric rectifier systems and AC power line or power cable networks. If a pole line anchor is placed near a ground bed, contact a corrosion department representative for assistance.

11. Portland Pipe Line is to be notified at least 48 hours before work is performed in the vicinity of its pipelines. In extreme emergencies, when this is not possible, notification should be given at the earliest possible time.

12. No spoil, either of a permanent or temporary nature, is to be deposited on the pipelines.

13. Portland Pipe Line should be notified during initial planning stages for future installations located near pipelines so that the best mutually acceptable design practices are adopted.

14. Projects involving grading or access or utility crossings of Portland Pipe Line Corporation pipelines or rights of way must be submitted to PPLC for review and written approval prior to construction, with supporting documentation to demonstrate that the work will comply with the above requirements.

15. Portland Pipe Line Corporation supports the use of the Best Practices for project planning, design, and construction developed by the Common Ground Alliance and available at www.commongroundalliance.com.

Contact Information:

Director of Operations
(207) 767-0440

Maintenance Supervisor – Maine
(207) 767-0437

Maintenance Supervisor – New Hampshire/Vermont
(207) 232-7084

This document is provided for general technical guidance. All site and project specifics should be coordinated with a Portland Pipe Line Corporation representative.

MONTREAL PIPE LINE LIMITED
Safety, Environment, Customer, Community

info excavation
www.info-ex.com
1-800-663-9228 514-286-9228

CONSTRUCTION PRACTICES

TO BE OBSERVED BY OTHERS WHEN ON OR NEAR MONTREAL PIPE LINE LIMITED RIGHTS-OF-WAY

The guidelines and construction practices listed below shall be followed by other pipeline, utility, construction organizations, and others performing work in the Montreal Pipe Line Limited (MPLL) right-of-way:

1. A minimum distance of 15 meters (50 feet) should be maintained between new structures and nearest pipeline.

2. Crossings of the pipelines should ideally be 90^{o}, but in no case less than 45^{o}.

3. A minimum vertical distance between lines crossing beneath the pipelines shall be 45 centimeters (18 inches). Compaction near the pipelines shall be equal to original soil compaction. Certain soil conditions may dictate additional vertical clearance.

4. Lines crossing over the pipelines shall have 45 centimeters (18 inches) minimum vertical clearance with 90% or greater Proctor compaction density or MPLL-approved supports on both sides of the pipeline crossed.

5. Excavation in questionable soils conditions, where shear failure or trench collapse might occur, must be investigated by a soils engineering consultant; and where conditions warrant it, suitable plans for soils stabilization shall be designed and carried out by a qualified engineer.

6. No excavation in the vicinity of pipelines is to be made without a pipeline representative being present. Excavation within 3 meters (10 feet) of a pipeline shall be done with extreme caution and only by hand digging under an MPLL representative's direction. The pipelines and the required separation distance must be exposed for observation during trenchless crossings, for example by directional drilling, to ensure safety and clearance.

7. Where heavy construction vehicles must cross a pipeline, suitable compacted cover and padding shall be placed over the pipeline to provide generally not less than 3 meters (10 feet) of suitable protective material over the pipeline. An MPLL representative will locate pipelines for landowner or contractor upon request.

8. In no case shall cover be less than that required by the National Energy Board.

9. All blasting is to be kept to an absolute minimum and shall be done according to good construction practices, using experienced, qualified blasting personnel and only then with MPLL approval.

10. Be aware of potential interference between MPLL's DC electric rectifier systems and AC power line or power cable networks. If a pole line anchor is placed near a ground bed, contact a corrosion department representative for assistance.

11. MPLL is to be notified at least 72 hours before work is performed in the vicinity of its pipelines. In extreme emergencies, when this is not possible, notification should be given at the earliest possible time.

12. No spoil, either of a permanent or temporary nature, is to be deposited on the pipelines.

13. MPLL should be notified during initial planning stages for future installations located near pipelines so that the best mutually acceptable design practices are adopted.

14. Projects involving grading or access or utility crossings of Montreal Pipe Line Limited pipelines or rights of way must be submitted to MPLL for review and written approval prior to construction, with supporting documentation to demonstrate that the work will comply with the above requirements.

15. Montreal Pipe Line Limited supports the use of the Best Practices for project planning, design, and construction developed by the Quebec Common Ground Alliance, and available at www.apisq-qcga.ca.

Contact Information:

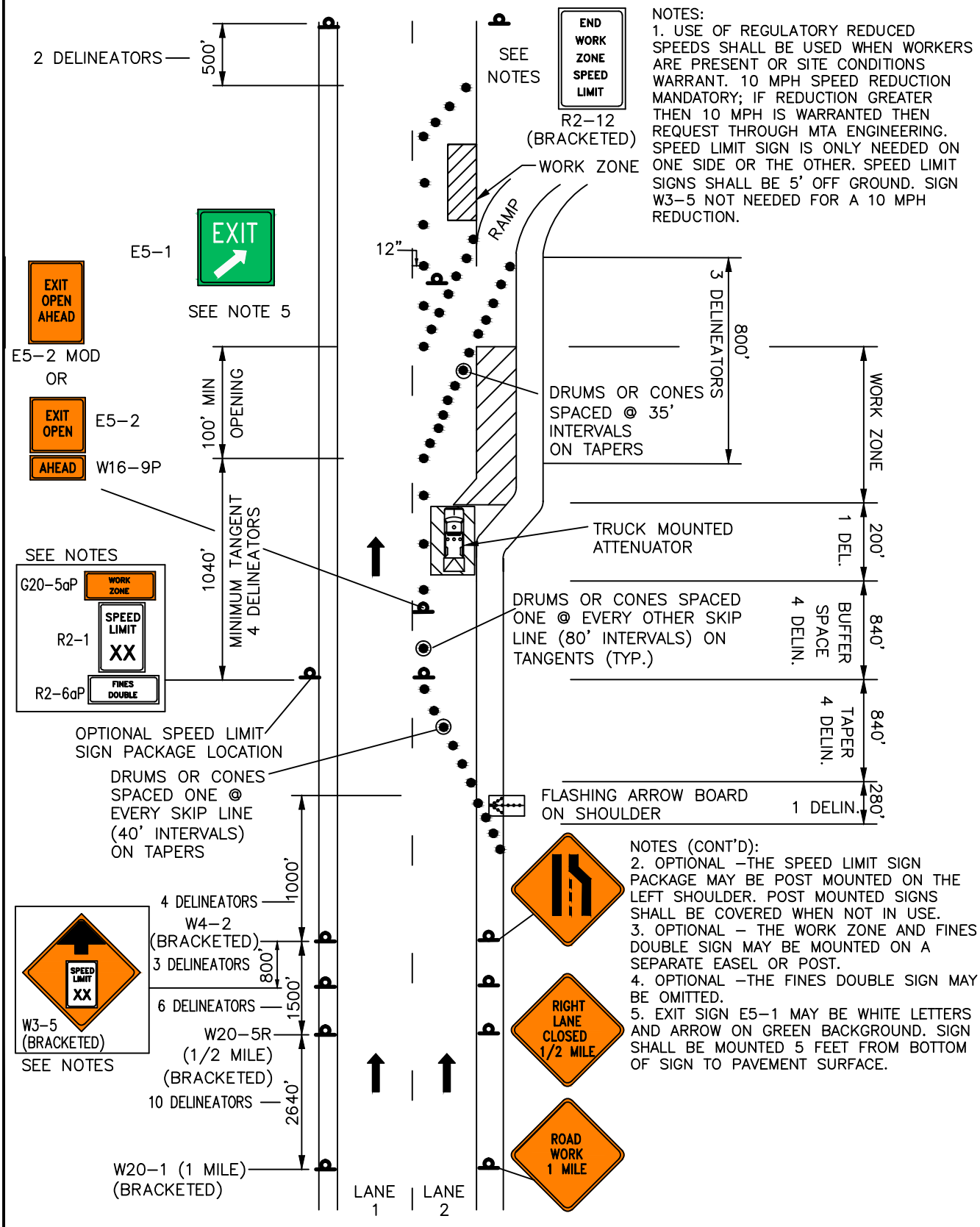
Québec Operations Manager
(514) 645-7268

Emergencies 24/7
1-888-977-4589

Fax
(514) 645-7663

This document is provided for general technical guidance. All site and project specifics should be coordinated with a Montreal Pipe Line Limited representative.

Appendix B
Maintenance of Traffic Details



NOTES:
1. USE OF REGULATORY REDUCED SPEEDS SHALL BE USED WHEN WORKERS ARE PRESENT OR SITE CONDITIONS WARRANT. 10 MPH SPEED REDUCTION MANDATORY; IF REDUCTION GREATER THEN 10 MPH IS WARRANTED THEN REQUEST THROUGH MTA ENGINEERING. SPEED LIMIT SIGN IS ONLY NEEDED ON ONE SIDE OR THE OTHER. SPEED LIMIT SIGNS SHALL BE 5' OFF GROUND. SIGN W3-5 NOT NEEDED FOR A 10 MPH REDUCTION.

NOTES (CONT'D):
2. OPTIONAL –THE SPEED LIMIT SIGN PACKAGE MAY BE POST MOUNTED ON THE LEFT SHOULDER. POST MOUNTED SIGNS SHALL BE COVERED WHEN NOT IN USE.
3. OPTIONAL – THE WORK ZONE AND FINES DOUBLE SIGN MAY BE MOUNTED ON A SEPARATE EASEL OR POST.
4. OPTIONAL –THE FINES DOUBLE SIGN MAY BE OMITTED.
5. EXIT SIGN E5-1 MAY BE WHITE LETTERS AND ARROW ON GREEN BACKGROUND. SIGN SHALL BE MOUNTED 5 FEET FROM BOTTOM OF SIGN TO PAVEMENT SURFACE.

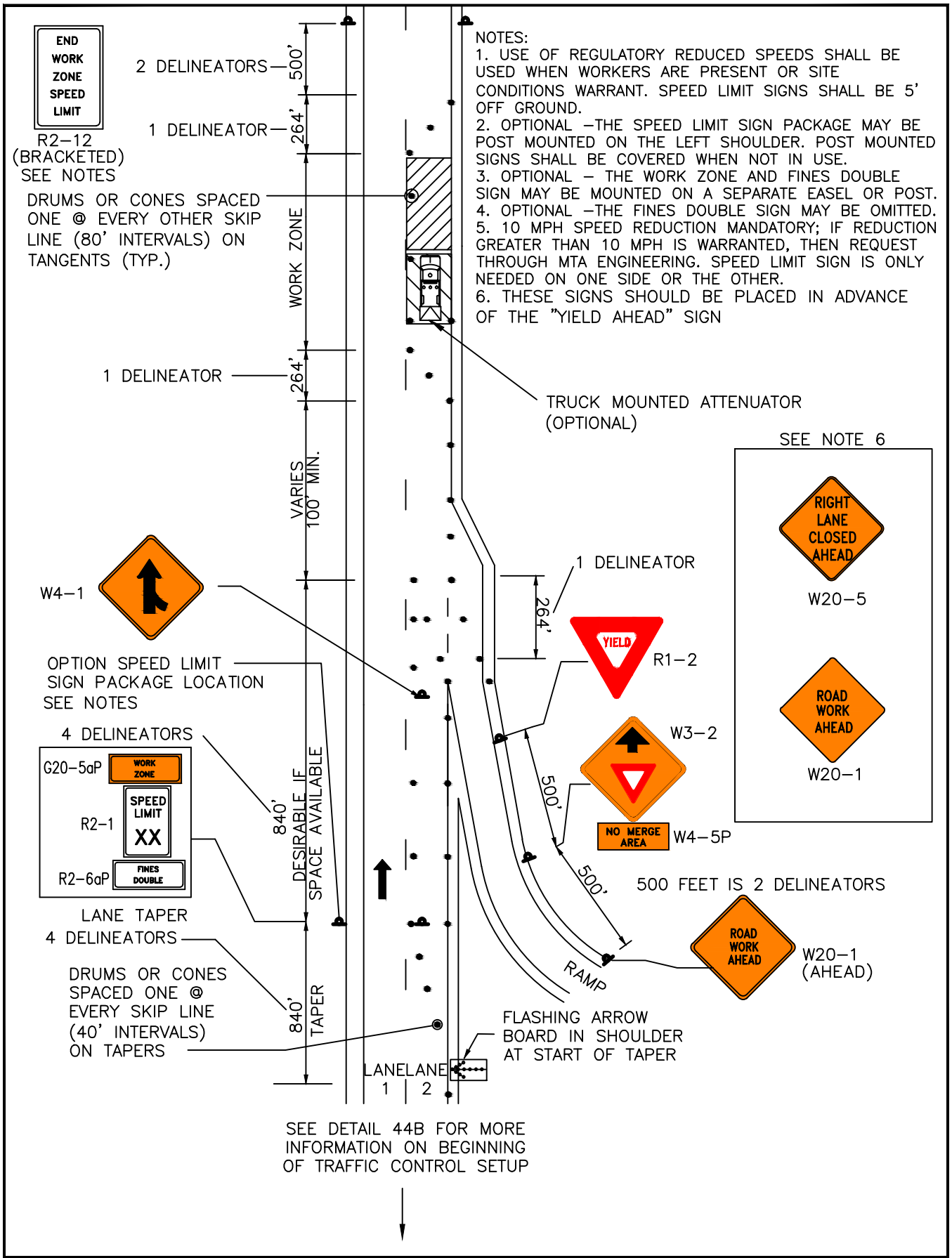
DETAIL 42 NOT TO SCALE

HNTB

DATE: 12-22-2017

MAINE TURNPIKE

MAINE TURNPIKE AUTHORITY
TRAFFIC CONTROL DETAIL
TRAVEL LANE CLOSURE AT AN EXIT RAMP



DETAIL 44A NOT TO SCALE

HNTB

DATE: 12-22-2017

MAINE TURNPIKE

MAINE TURNPIKE AUTHORITY

TRAFFIC CONTROL DETAIL

TRAVEL LANE CLOSURE AT AN ENTRANCE RAMP WITH ACCELERATION LANE

Appendix C
FAA Construction Restrictions

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2021-ANE-18-OE

Issued Date: 03/03/2021

Ralph C. Norwood IV, P.E., PTOE
Maine Turnpike Authority
2360 Congress Street
Portland, ME 04102

****DETERMINATION OF NO HAZARD TO AIR NAVIGATION FOR TEMPORARY STRUCTURE****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Crane Utility Vault - East Crane
Location:	Portland, ME
Latitude:	43-39-40.08N NAD 83
Longitude:	70-19-54.12W
Heights:	65 feet site elevation (SE)
	130 feet above ground level (AGL)
	195 feet above mean sea level (AMSL)

This aeronautical study revealed that the temporary structure does not exceed obstruction standards and would not be a hazard to air navigation provided the condition(s), if any, in this letter is (are) met:

SEE ATTACHMENT FOR ADDITIONAL CONDITION(S) OR INFORMATION

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, effective 21 Nov 2007, will void this determination. Any future construction or alteration, including increase to heights, power or the addition of other transmitters, requires separate notice to the FAA. This determination includes all previously filed frequencies and power for this structure.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of a structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this temporary structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Aviation Administration Flight Procedures Office if the structure is subject to the issuance of a Notice To Airman (NOTAM).

If you have any questions, please contact our office at (202) 267-0105, or j.garver@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2021-ANE-18-OE

Signature Control No: 462455219-472413483 (TMP)
Jay Garver
Specialist

Additional Condition(s) or Information for ASN 2021-ANE-18-OE

Proposal: To construct and/or operate a(n) Crane to a height of 130 feet above ground level, 195 feet above mean sea level.

Location: The structure will be located 1.37 nautical miles northwest of PWM Airport reference point.

Part 77 Obstruction Standard(s) Exceeded and Aeronautical Impacts, if any:

Based on this aeronautical study, the structure would not constitute a substantial adverse effect on aeronautical operations or procedures because it will be temporary. The temporary structure would not be considered a hazard to air navigation provided all of the conditions specified in this determination are strictly met.

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 M, Obstruction Marking and Lighting, a med-dual system-Chapters 4,8(M-Dual),&15.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

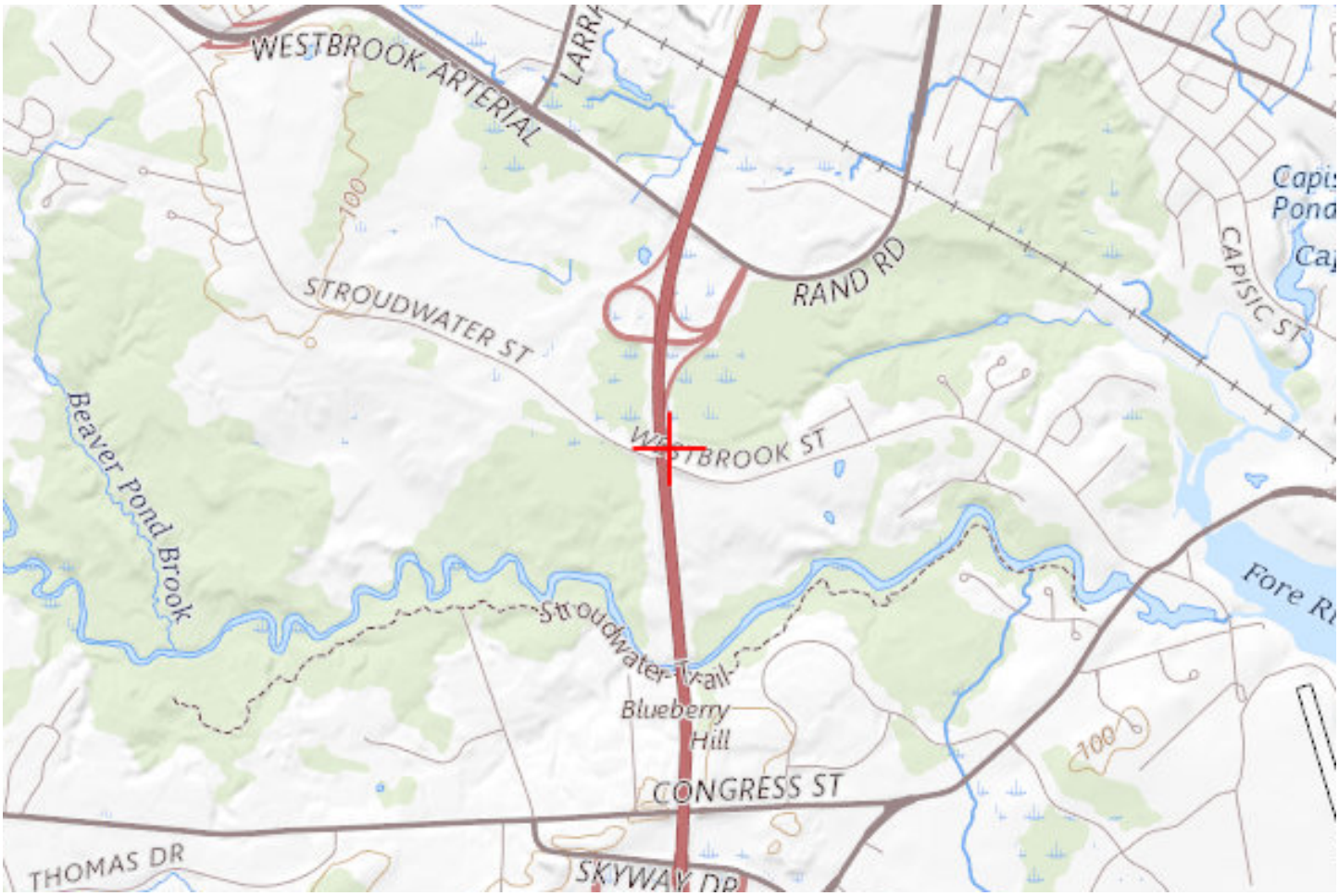
It is required that the manager of PORTLAND INTL JETPORT, (207) 756-8310 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site.

It is required that the manager of PORTLAND INTL JETPORT Air Traffic Control Tower @ (207) 552-1415 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site. Additionally, please provide contact information for the onsite operator in the event that Air Traffic Control requires the temporary structure to be lowered immediately.

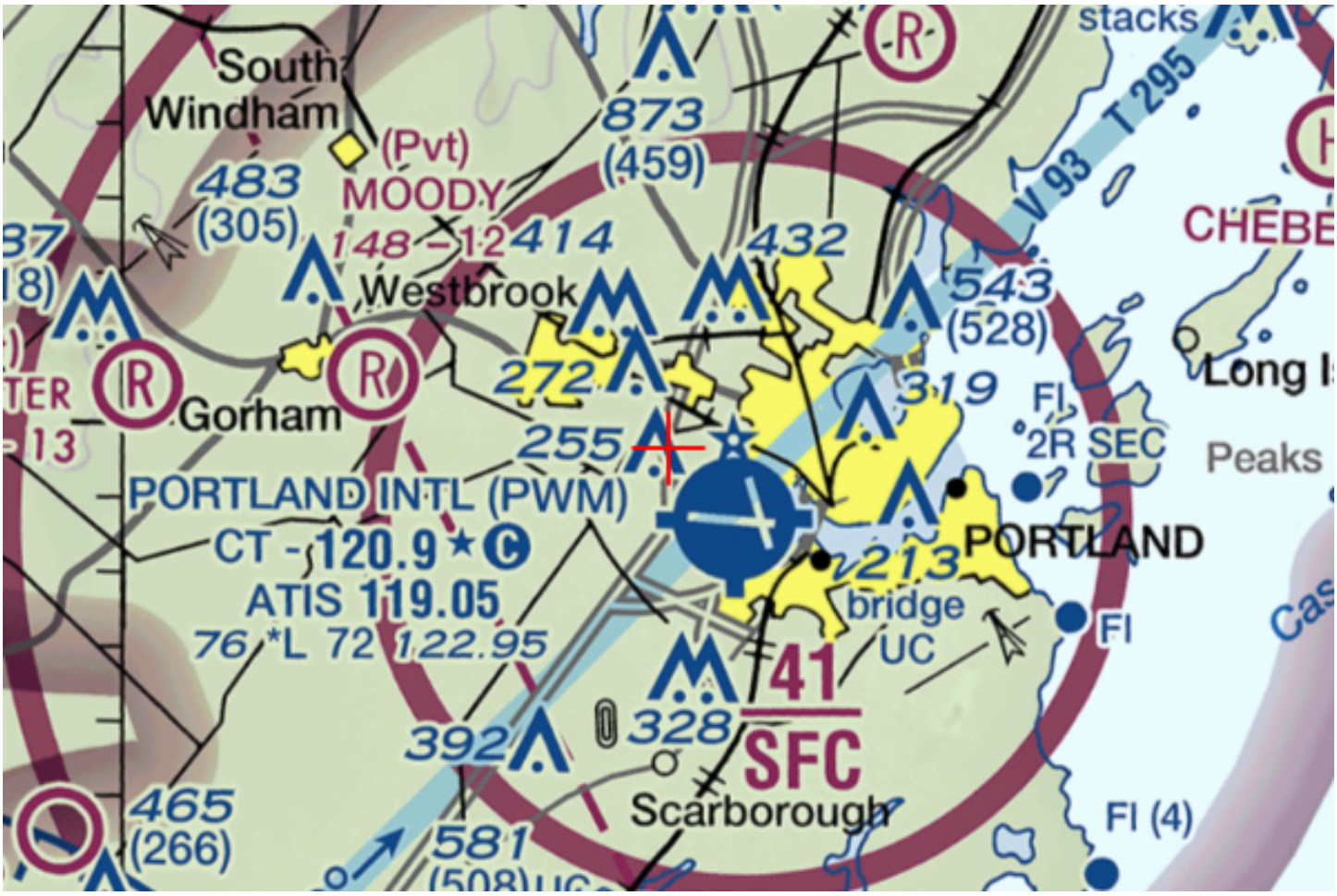
This determination expires on 09/03/2022 unless extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

TOPO Map for ASN 2021-ANE-18-OE



Sectional Map for ASN 2021-ANE-18-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2021-ANE-19-OE

Issued Date: 03/03/2021

Ralph C. Norwood IV, P.E., PTOE
Maine Turnpike Authority
2360 Congress Street
Portland, ME 04102

****DETERMINATION OF NO HAZARD TO AIR NAVIGATION FOR TEMPORARY STRUCTURE****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Crane Utility Vault - West Crane
Location:	Portland, ME
Latitude:	43-39-39.92N NAD 83
Longitude:	70-19-56.39W
Heights:	67 feet site elevation (SE)
	100 feet above ground level (AGL)
	167 feet above mean sea level (AMSL)

This aeronautical study revealed that the temporary structure does not exceed obstruction standards and would not be a hazard to air navigation provided the condition(s), if any, in this letter is (are) met:

SEE ATTACHMENT FOR ADDITIONAL CONDITION(S) OR INFORMATION

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, effective 21 Nov 2007, will void this determination. Any future construction or alteration, including increase to heights, power or the addition of other transmitters, requires separate notice to the FAA. This determination includes all previously filed frequencies and power for this structure.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of a structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this temporary structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Aviation Administration Flight Procedures Office if the structure is subject to the issuance of a Notice To Airman (NOTAM).

If you have any questions, please contact our office at (202) 267-0105, or j.garver@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2021-ANE-19-OE

Signature Control No: 462455220-472413484 (TMP)
Jay Garver
Specialist

Additional Condition(s) or Information for ASN 2021-ANE-19-OE

Proposal: To construct and/or operate a(n) Crane to a height of 130 feet above ground level, 195 feet above mean sea level.

Location: The structure will be located 1.37 nautical miles northwest of PWM Airport reference point.

Part 77 Obstruction Standard(s) Exceeded and Aeronautical Impacts, if any:

Based on this aeronautical study, the structure would not constitute a substantial adverse effect on aeronautical operations or procedures because it will be temporary. The temporary structure would not be considered a hazard to air navigation provided all of the conditions specified in this determination are strictly met.

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 M, Obstruction Marking and Lighting, a med-dual system-Chapters 4,8(M-Dual),&15.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

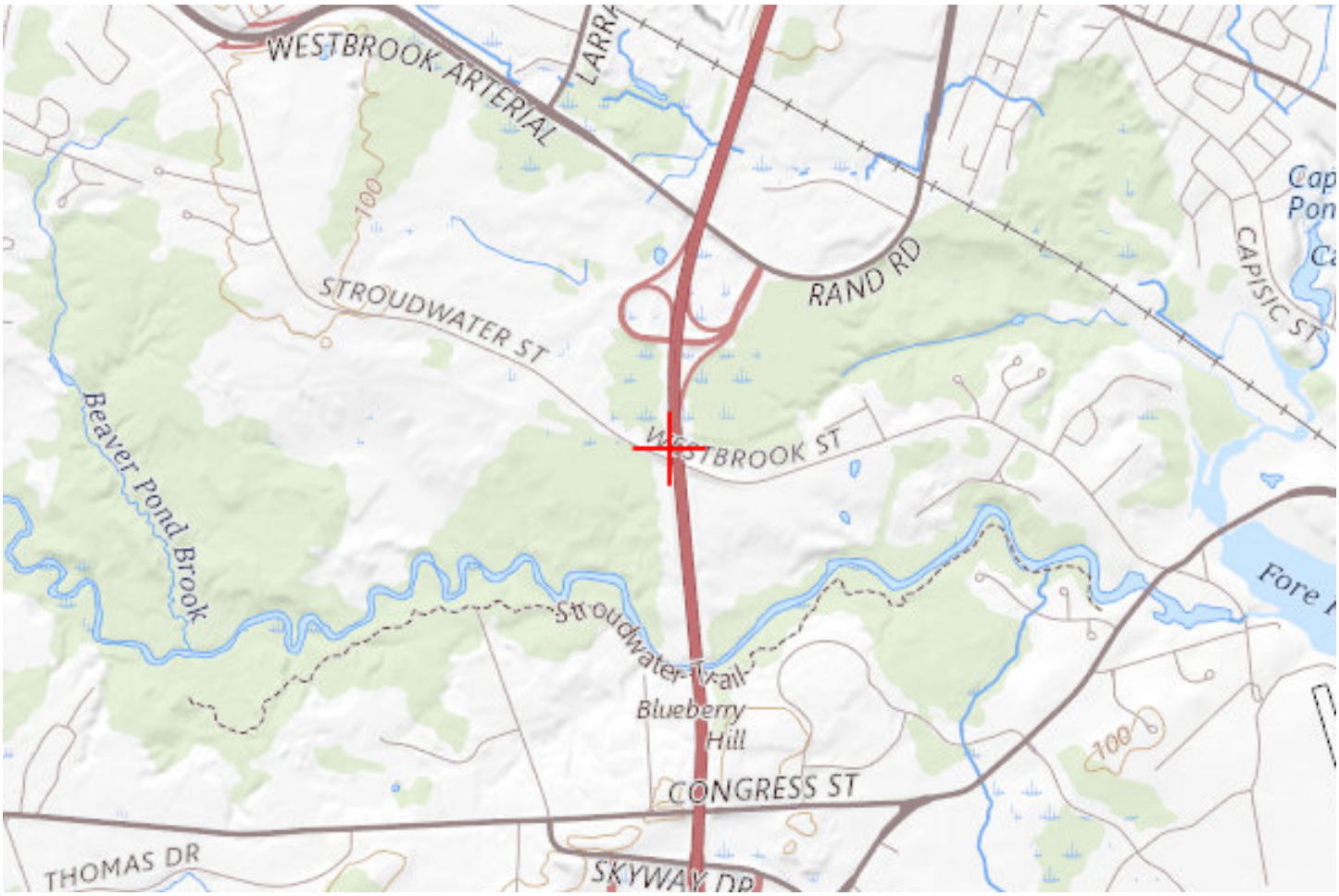
It is required that the manager of PORTLAND INTL JETPORT, (207) 756-8310 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site.

It is required that the manager of PORTLAND INTL JETPORT Air Traffic Control Tower @ (207) 552-1415 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site. Additionally, please provide contact information for the onsite operator in the event that Air Traffic Control requires the temporary structure to be lowered immediately.

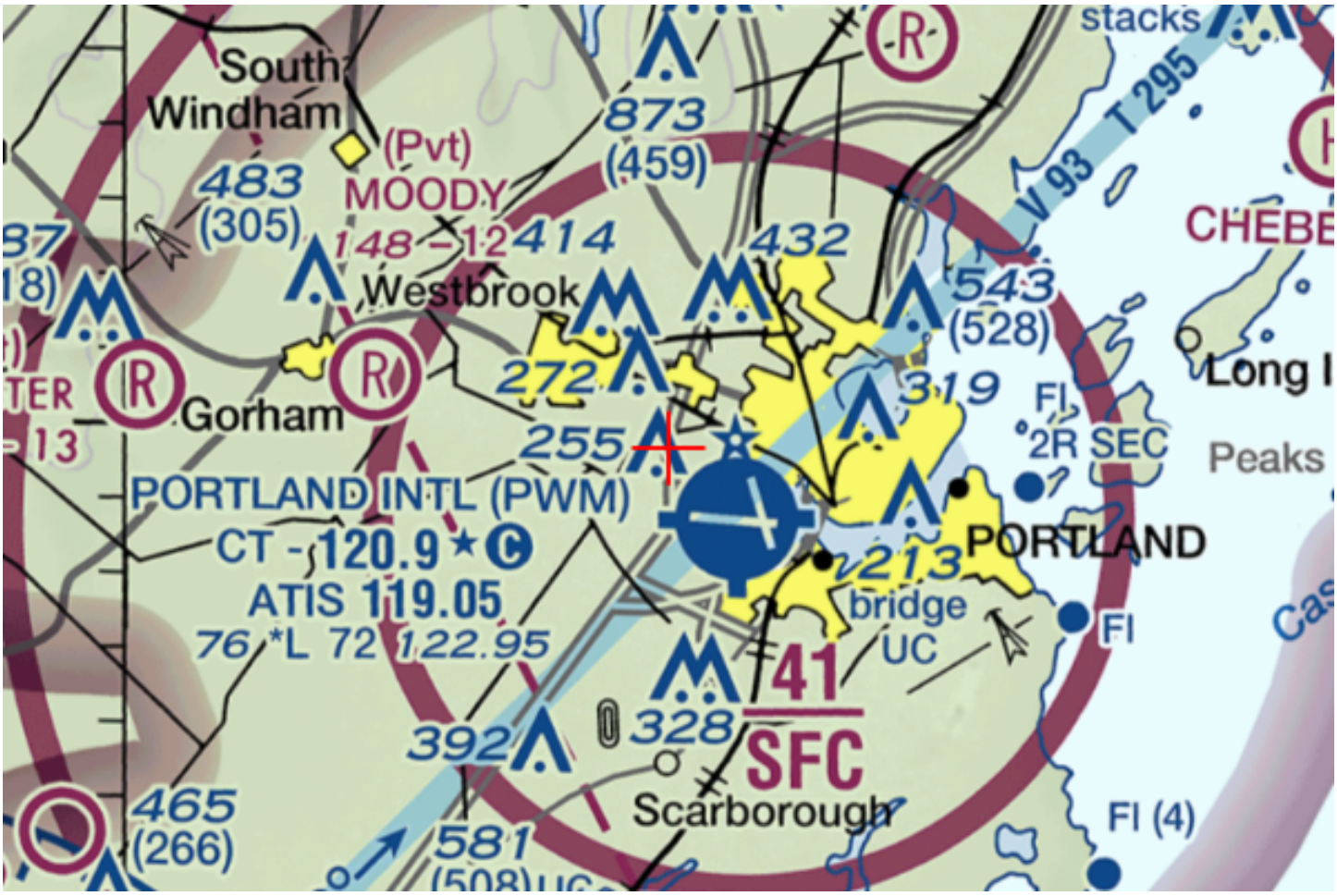
This determination expires on 09/03/2022 unless extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

TOPO Map for ASN 2021-ANE-19-OE



Sectional Map for ASN 2021-ANE-19-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2021-ANE-29-OE

Issued Date: 03/03/2021

Ralph C. Norwood IV, P.E., PTOE
Maine Turnpike Authority
2360 Congress Street
Portland, ME 04102

****DETERMINATION OF NO HAZARD TO AIR NAVIGATION FOR TEMPORARY STRUCTURE****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Construction Equipment Construction Equipment – Sta. 2423+18, 13’ RT
Location:	Portland, ME
Latitude:	43-40-58.82N NAD 83
Longitude:	70-19-26.66W
Heights:	67 feet site elevation (SE) 100 feet above ground level (AGL) 167 feet above mean sea level (AMSL)

This aeronautical study revealed that the temporary structure does not exceed obstruction standards and would not be a hazard to air navigation provided the condition(s), if any, in this letter is (are) met:

SEE ATTACHMENT FOR ADDITIONAL CONDITION(S) OR INFORMATION

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, effective 21 Nov 2007, will void this determination. Any future construction or alteration, including increase to heights, power or the addition of other transmitters, requires separate notice to the FAA. This determination includes all previously filed frequencies and power for this structure.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of a structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this temporary structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Aviation Administration Flight Procedures Office if the structure is subject to the issuance of a Notice To Airman (NOTAM).

If you have any questions, please contact our office at (202) 267-0105, or j.garver@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2021-ANE-29-OE

Signature Control No: 462455230-472419066 (TMP)
Jay Garver
Specialist

Additional Condition(s) or Information for ASN 2021-ANE-29-OE

Proposal: To construct and/or operate a(n) Construction Equipment to a height of 100 feet above ground level, 167 feet above mean sea level.

Location: The structure will be located 2.34 nautical miles north of PWM Airport reference point.

Part 77 Obstruction Standard(s) Exceeded and Aeronautical Impacts, if any:

Based on this aeronautical study, the structure would not constitute a substantial adverse effect on aeronautical operations or procedures because it will be temporary. The temporary structure would not be considered a hazard to air navigation provided all of the conditions specified in this determination are strictly met.

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 M, Obstruction Marking and Lighting, marked-Chapters 3(Marked),14(Temporary),&15.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

As a condition to this determination, the temporary structure must be lowered to the ground when not in use and during the hours between sunset and sunrise.

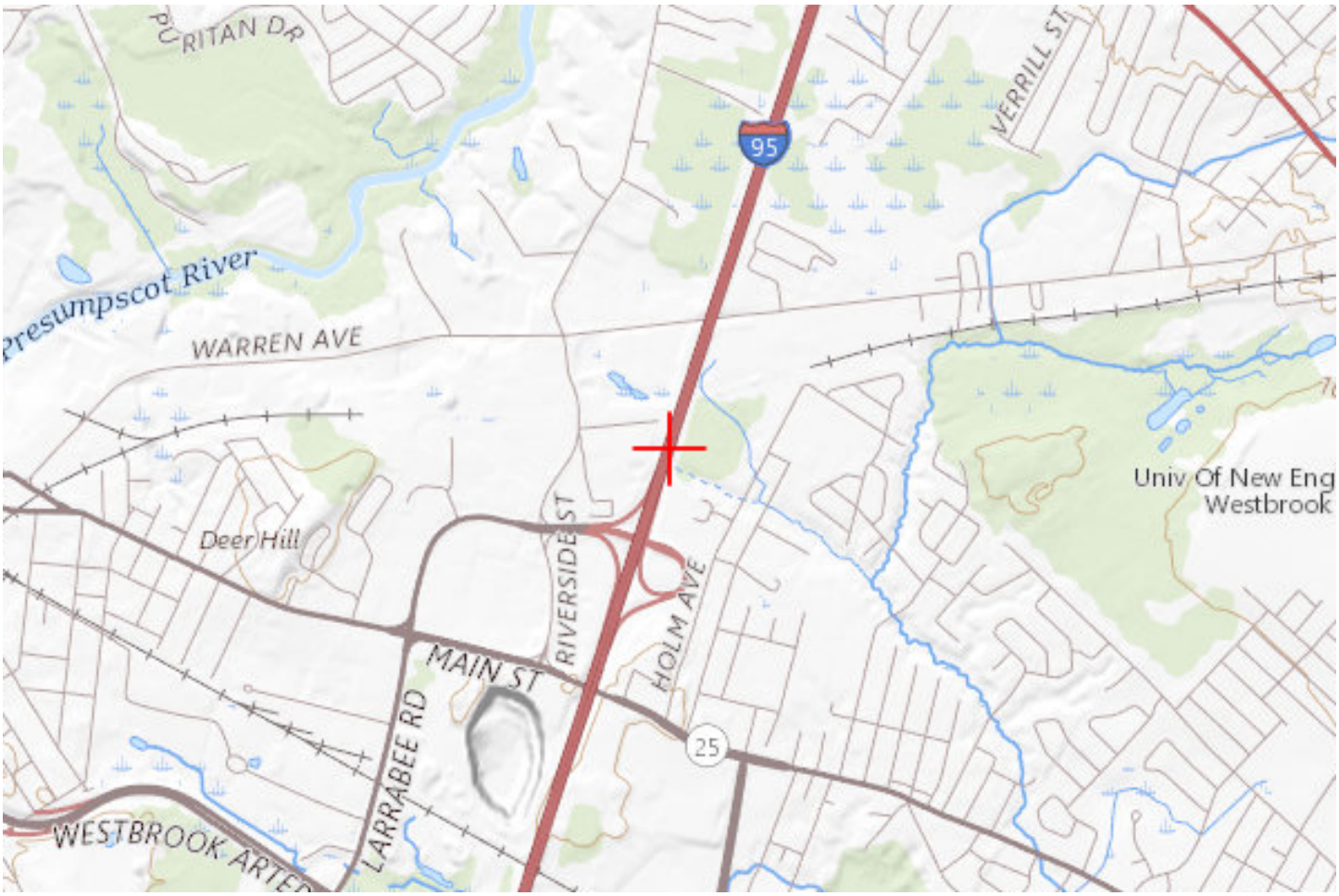
It is required that the manager of PORTLAND INTL JETPORT, (207) 756-8310 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site.

It is required that the manager of PORTLAND INTL JETPORT Air Traffic Control Tower @ (207) 552-1415 be notified at least 3 business days prior to the temporary structure being erected and again when the structure is removed from the site. Additionally, please provide contact information for the onsite operator in the event that Air Traffic Control requires the temporary structure to be lowered immediately.

This determination expires on 09/03/2022 unless extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

TOPO Map for ASN 2021-ANE-29-OE



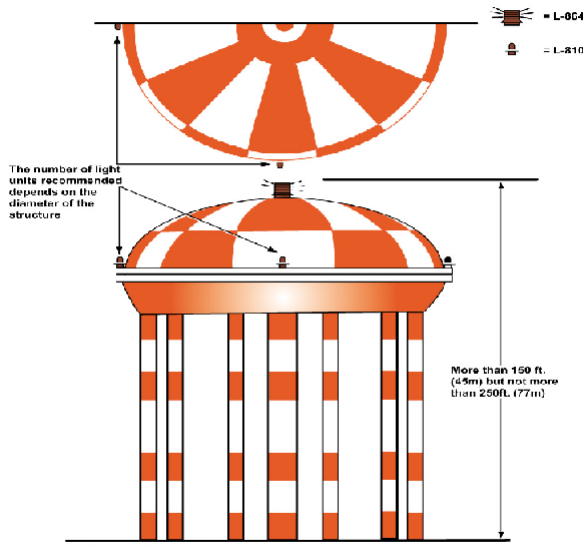
Sectional Map for ASN 2021-ANE-29-OE

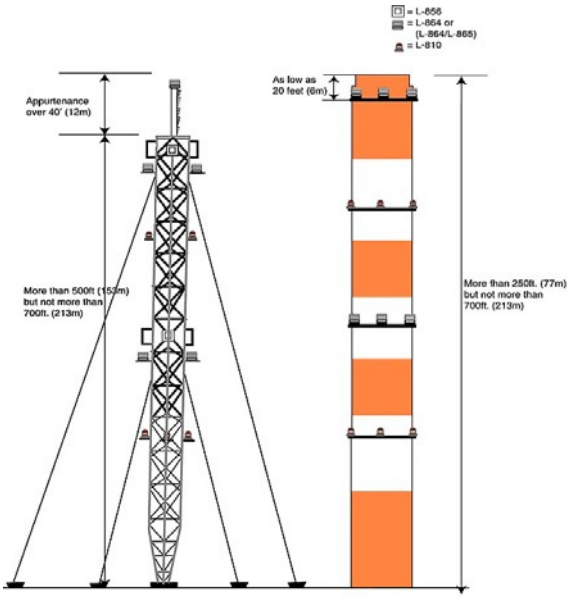
U.S. Department
of Transportation
**Federal Aviation
Administration**

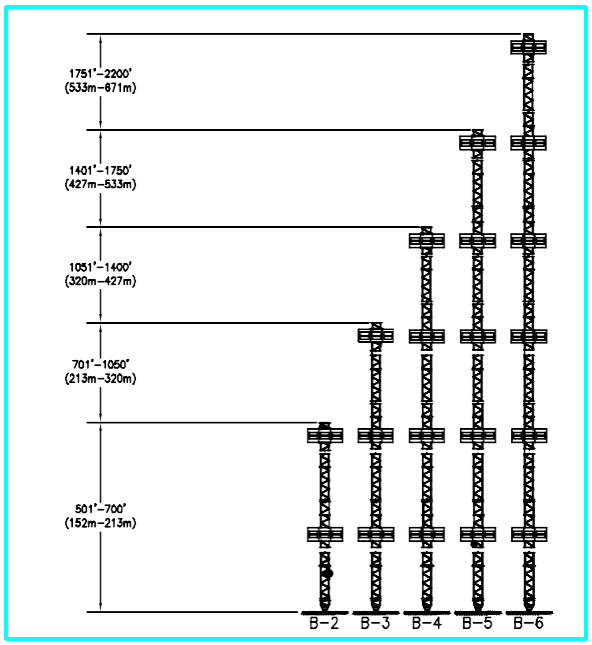
ADVISORY CIRCULAR

AC 70/7460-1M

Obstruction Marking and Lighting







Effective: 11/16/2020 **Initiated by: Policy Assurance**

U.S. Department of Transportation
Federal Aviation Administration

Advisory Circular

Subject: Obstruction Marking and Lighting

Date: 11/16/2020 **AC No.** 70/7460-1M
Initiated By: AJV-P13

Purpose.

This Advisory Circular (AC) describes the Federal Aviation Administration's standards for marking and lighting structures to promote aviation safety.

Cancellation. AC 70/7460-1L, change 2, Obstruction Marking and Lighting, dated August 2018 is cancelled by this version.

1. **Effective Date.** This AC is effective November 16, 2020.

2. **Related Documents.**

a. Title 14 of the Code of Federal Regulations Part 77 describes the standards used relative to objects in the navigable airspace and specifies the requirements for notice to the Administrator of certain proposed construction or alteration.

b. Federal Communications Commission (FCC) specifications are contained in Part 17 of the FCC Rules and Regulations

Principal Changes.

This circular contains numerous editorial changes. Major changes are listed below.

a. Page 2, Addition of Note. The FAA has changed specifications for light emitting diode (LED)-based red obstruction lights to make them visible to pilots using certain night vision goggle systems. Effective with the implementation of this change in FAA AC 150/5345-43, *Specification for Obstruction Lighting Equipment*, manufacturers will be required to meet the new specification for certified red LED-based obstruction lights.

b. Page 6, Removed paragraph 2.8, Obstruction Height Definition. Structures lower than 499 feet AGL can be considered obstructions. As written, the paragraph caused confusion and was deleted.

c. Informational paragraphs are added regarding the change to manufacturing standards for LED-based red obstruction lights compatibility with night vision goggle systems and maintaining conspicuity to avoid misinterpretation when replacing lights.

d. Reorganized information in Chapter 11, Marking and Lighting of Catenary and Catenary Support Structures and chapter 13, Marking and Lighting Wind Turbines.

e. Reorganized chapters by subject matter and figures in , Pages A-1 to A- 29, as well as minor grammatical changes

f. Added Chapter 14, Marking and Lighting Temporary Structures and associated figures in the Appendix, Figures A-31 through A-33.

g. Added Figure 22, Catenary Markers - Line Spacing (Adjacent Lines Within 200 feet (60.96 m) or Less

h. Added , Figure 30 Wind Turbine Lighting During Construction.

Comments or Suggestions.

Direct comments or suggestions regarding this AC to:

Federal Aviation Administration
Manager, Policy Assurance
Attention: AJV-P13
600 Independence Avenue, S.W.
Washington, DC 20591

KAREN L CHIODINI
Digitally signed by KAREN L CHIODINI
Date: 2020.11.14 12:21:32 -05'00'

Karen Chiodini, Director (A)
Policy, AJV-P
Mission Support Services
Federal Aviation Administration

CHAPTER 3. MARKING GUIDELINES

3.1 Purpose.

This chapter provides recommended guidelines to make certain structures conspicuous to pilots during daylight hours. One way to achieve this conspicuity is to paint and/or mark these structures. Recommendations on marking structures can vary, depending on terrain features, weather patterns, geographic location, and the number of structures.

3.2 Paint Colors.

Alternate sections of aviation orange and white paint should be used as the contrast in colors provides maximum visibility of an obstruction. Specific paint standards are contained in Chapter 15.

3.3 Paint Standards.

To be effective, the paint used should meet specific color requirements when freshly applied to a structure. Because all outdoor paints deteriorate with time, and it is not practical to give a maintenance schedule for all climates, surfaces should be repainted when the color changes noticeably or its effectiveness is reduced by scaling, oxidation, chipping, or layers of contamination. The subsequent standards should be followed.

3.3.1 Materials and Application.

The FAA recommends that quality paint and materials be selected to maximize years of service. The paint should be appropriate for the surfaces to be painted, including any previous coatings, and suitable for the environmental conditions. Surface preparation and paint application should follow the manufacturer's recommendations.

> **Note:** In-Service Aviation Orange Color Tolerance Charts are available from private suppliers for determining when repainting is required. The color should be sampled on the upper half of the structure, since weathering is greater there.

3.3.2 Surfaces not Requiring Paint.

Ladders, decks, and walkways of steel towers and similar structures do not need to be painted if a smooth surface presents a potential hazard to maintenance personnel. Painting may also be omitted from precision or critical surfaces if the paint would have an adverse effect on the transmission or radiation characteristics of a signal. However, the structure's overall marking effect should not be reduced.

3.3.3 Skeletal Structures.

Complete all marking/painting prior to or immediately upon completion of construction. This

applies to catenary support structures, radio and television towers, and similar skeletal structures. To be effective, paint should be applied to all inner and outer surfaces of the framework.

3.4 Paint Patterns.

Various types of paint patterns are used to mark structures. The pattern is determined by the size and shape of the structure. The following patterns are recommended:

3.4.1 Solid Pattern.

Obstacles should be painted aviation orange if the structure's horizontal and vertical dimensions do not exceed 10.5 feet (3.20 m).

3.4.2 Checkerboard Pattern.

Alternating rectangles of aviation orange and white are normally displayed on the following structures:

1. Water, gas, and grain storage tanks (see Figures A-3, A-4, and A-5).

2. Buildings, as required.

3. Large structures exceeding 10.5 feet (3.20 m) across, having a horizontal dimension that is equal to or greater than the vertical dimension.

3.4.3 Size of Patterns.

The sides of the checkerboard pattern should measure not less than five feet (1.52 m) or more than 20 feet (6.10 m) and should be as nearly square as possible. However, if it is impractical because of the size or shape of a structure, the sides of the patterns may be less than five feet (1.52 m). The pattern should be arranged so that each outer corner of the structure will be painted aviation orange.

3.4.4 Alternate Bands.
Alternate bands of aviation orange and white are normally displayed on the following structures:

1. Communication towers and catenary support structures.

2. Poles.

3. Smokestacks.

4. Skeletal framework of storage tanks and similar structures.

5. Structures that appear narrow from a side view that are 10.5 feet (3.20 m) or less across, and the horizontal dimension is less than the vertical dimension

6. Coaxial cable, conduits, and other cables attached to the face of a tower. 3.4.5.

3.4.5 Color Band Characteristics.

Bands for structures of any height (see Figure A-6) should be:

1. Equal in width, provided each band is not less than 1 1/2 feet (0.46 m) or more than 100 feet (30.48 m) wide.

2. Perpendicular to the vertical axis with the bands at the top and bottom painted orange.

3. An odd number of bands on the structure.

4. Equal and in proportion to the structure's AGL height.

5. Approximately one-seventh the height, if the structure is equal to or less than 700 feet (213.36 m) AGL. For each additional 200 feet (60.96 m) or fraction thereof, add one additional orange and one additional white band. Table 4-1 shows the required band widths based on the height of the structure.

Table 3-1. Structure Height to Bandwidth Ratio

If a structure is:		**Then Band Width:**
Greater Than	**Equal to or Less Than**	**Band Width**
10.5 feet (3.20 m)	700 feet (213.36 m)	1/7 of
700 feet (213.36 m)	900 feet (274.32 m)	1/9 of
900 feet (274.32 m)	1,100 feet (335.28 m)	1/11 of
1,100 feet (335.28 m)	1,300 feet (396.24 m)	1/13 of

3.4.6 Structures With a Cover or Roof.

If the structure has a cover or roof, the highest orange band should be continued to cover the entire top of the structure (see Figures A-3 and A-4).

3.4.7 Skeletal Structures Atop Buildings.

If a flagpole, skeletal structure, or similar object is erected on top of a building, the combined height of the object and building will determine whether marking is recommended. However, only the height of the object filed with the FAA determines the width of the color bands.

3.4.8 Partial Marking.

If marking is recommended for only a portion of a structure because the lower portion of the structure is shielded by other objects or terrain, the width of the bands on the exposed portion should still be determined by the overall height of the structure. Paragraph 3.4.5 provides details on calculating the width of the paint bands. A minimum of three bands should be displayed on the exposed portion of the structure. If the exposed portion of the structure is not large enough to have at least three bands, the width of the bands may be reduced equally so that three equally sized bands can be fit. This will ensure that the marking pattern provides sufficient contrast for a pilot to locate the structure.

3.4.9 Teardrop Pattern.

Spherical water storage tanks with a single, circular standpipe support may be marked in a teardrop-striped pattern. The tank should show alternate stripes of aviation orange and white. The stripes should extend from the top center of the tank to its supporting standpipe. The width of the stripes should be equal, and the width of each stripe at the greatest girth of the tank should not be less than five feet (1.52 m) nor more than 15 feet (4.57 m) (see Figure A-5).

3.4.10 Community Names.

If it is desirable to paint the name of the community on the side of a tank or other structure, the stripe pattern may be broken to serve this purpose. This open area should have a maximum height of three feet (0.91 m) (see Figure A-5).

3.4.11 Exceptions.

Structural designs not conducive to standard markings may be marked as follows:

1. If it is not practical to paint the roof of a structure in a checkerboard pattern, it may be painted solid orange.
2. If a spherical structure is not suitable for an exact checkerboard pattern, the shape of the rectangles may be modified to fit the shape of the surface.
3. Storage tanks not suitable for a checkerboard pattern may have alternating bands of aviation orange and white or a limited checkerboard pattern applied to the upper one- third of the structure.
4. The skeletal framework of certain water, gas, and grain storage tanks may be excluded from the checkerboard pattern.

3.5 Unlighted Markers.

Unlighted markers are used to identify structures and to make them more conspicuous when it is impractical to paint them. Unlighted markers may also be used with aviation orange and white paint when additional conspicuity is necessary for aviation safety. Unlighted markers should be displayed in conspicuous positions on or adjacent to the structures so as to retain the general definition of the structure. They should be recognizable in clear, daytime visibility from a distance of at least 4,000 feet (1,219.20 m) and in all directions from which aircraft are likely to approach. Unlighted markers should be distinctively shaped, i.e., spherical or cylindrical, so that they are not mistaken for items that are used to convey other information. They should be replaced when faded or otherwise deteriorated.

3.5.1 Spherical Markers.

Spherical markers are primarily used to identify overhead wires and catenary transmission lines that are less than 69 kilovolts (kV). Markers may be of another shape, i.e., cylindrical, provided the projected area of such markers is not less than that presented by a spherical marker.

1. Size and Color.

   The diameter of the markers used on extensive catenary wires (catenary wires that cross canyons, lakes, rivers, etc.) should not be less than 36 inches (91.44 centimeter (cm)). Smaller 20-inch (50.80-cm) spheres are permitted on less extensive catenary wires or on power lines below 50 feet (15.24 m) AGL and within 1,500 feet (457.20 m) of an airport runway end. Each marker should be a solid color, specifically aviation orange, white, or yellow.

2. Installation.

   a. Spacing. Unlighted markers should be spaced equally along the wire at approximately 200-foot (60.96 m) intervals, or fraction thereof. There should be less space between markers in critical areas near runway ends (i.e., 30 feet to 50 feet (9.14 m to 15.24 m)). They should be displayed on the highest wire or by another means at the same height as the highest wire. Where there is more than one wire at the highest point, the markers may be installed alternately along each wire if the distance between adjacent markers meets the spacing standard of 200 feet or less. This method distributes the weight and wind- loading factors (see Figures A-21 and A-22).

   b. Pattern. An alternating color scheme provides the most conspicuity against all backgrounds. Unlighted markers should be installed by alternating solid-colored markers of aviation orange, white, and yellow. Normally, an orange marker is placed at each end of

a line and the spacing is adjusted (not to exceed 200 feet (60.96 m)) to accommodate the rest of the markers. When less than four markers are used, they should all be aviation orange.

c. Wire Sag. Wire Sag, or droop, will occur due to temperature, wire weight, wind, etc. Twenty-five feet (7.62 m) is the maximum allowable distance between the highest wire installed with marker balls and the highest wire without marker balls, and must not violate the sag requirements of the transmission line design.

d. Adjacent Lines. Catenary crossings with multiple transmission lines require appropriate markers when the adjacent catenary structure's outside lines are greater than 200 feet (60.96 m) away from the center of the primary structure. If the outside lines of the adjacent catenary structure are within 200 feet (60.96 m) or less from the center of the primary structure, markers are not required on the adjacent lines.

3.5.2 Flag Markers.

Flags are used to mark certain structures or objects when it is technically impractical to use spherical markers or paint. Flag markers must be mounted at the highest point of the structure to ensure visibility. Some common examples of structures that may utilize this type of markers include, temporary construction equipment and vehicles, oil and drilling rigs, cranes, and derricks.

1. Minimum Size. Each side of the flag marker should be at least two feet (0.61 m) in length.

2. Color Patterns. Flags should be colored as follows:

   a. Solid. Aviation orange.

   b. Orange and White. Arrange two triangular sections, one aviation orange, and the other white to form a rectangle.

   c. Checkerboard. Flags three feet (0.91 m) or larger should be a checkerboard pattern of aviation orange and white squares, each one foot (0.30 m) plus or minus 10 percent.

3. Shape. Flags should be rectangular in shape and have stiffeners to keep them from drooping in calm wind.

4. Display. Flag markers should be displayed around, on top, or along the highest edge of the obstruction. When flags are used to mark extensive or closely grouped obstructions, they should be displayed approximately 50 feet (15.24 m) apart. The flag stakes should be strong enough to support the flags and be higher than the surrounding ground, structures, and/or objects of natural growth.

3.6 Unusual Complexities.

The FAA may also recommend appropriate marking in an area in which grouped obstructions present a common obstruction to air navigation.

3.7 Omission or Alternatives to Marking.

The alternatives listed below require FAA review and concurrence prior to making changes. See subsequent chapters for specific guidance. High-Intensity Flashing White Lighting Systems are more effective than aviation orange and white paint and therefore can be recommended instead of paint marking. This is particularly true under certain ambient light conditions involving the position of the sun relative to the direction of flight. High-intensity lighting systems should not be used on structures 700 feet (213.36 m) AGL or less, however, when operated during daytime, twilight, or 24 hours a day, other methods of marking and lighting may be omitted.

3.7.1 Medium-Intensity Flashing White Lighting Systems are operated during daytime and twilight on structures 700 feet (213.36 m) AGL or less, but generally not on structures less than 200 feet (60.96 m) AGL. When used, other methods of marking may be omitted.

Note: Sponsors must ensure that alternatives to marking are coordinated with the FCC for structures under its jurisdiction prior to making the change.

CHAPTER 4. LIGHTING GUIDELINE

4.1 Purpose.

This chapter describes the various obstruction lighting systems used to identify structures that have been determined to require added conspicuity. The lighting standards in this AC are the minimum necessary for aviation safety. Recommendations for lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures.

4.2 Standards.

The standards outlined in this AC are based on using light units that meet specified intensities, beam patterns, color, and flash rates as stated in AC 150/5345-43, *Specification for Obstruction Lighting Equipment*. The AC may be obtained from: www.faa.gov/airports/resources/advisory_circulars/index.cfm/go/document.current/documentnumber/150_5345-43.

4.3 Lighting Systems.

Obstruction lighting may be displayed on structures as follows (refer to subsequent chapters for details):

1. Aviation Red Obstruction Lights. Use flashing lights and/or steady-burning lights during nighttime. Tower structures are typically marked with flashing red lights. Buildings and smaller obstructions located near airports should be marked with steady-burning red lights.

2. Medium-Intensity Flashing White Obstruction Lights. Medium-intensity flashing white obstruction lights may be used during daytime and twilight with automatic reduced intensity selected for nighttime operation. When this system is used on structures 700 feet (213.36 m) AGL or less, other methods of marking and lighting the structure may be omitted. Aviation orange and white paint is always required for daytime marking on structures exceeding 700 feet (213.36 m) AGL. This system is not normally recommended on structures 200 feet (60.96 m) AGL or less.

3. High-Intensity Flashing White Obstruction Lights. High-intensity flashing white obstruction lights may be used during daytime, with automatically selected reduced intensities for twilight and nighttime operations. When this system is used, other methods of marking and lighting the structure may be omitted. This system should not be used on structures 700 feet (213.36 m) AGL or less, unless an FAA aeronautical study shows otherwise.

   Note: All flashing lights on a structure should flash simultaneously except for catenary support structures, which have a distinct flashing sequence between the levels of lights (see paragraph 12.4).

4. Dual Lighting. This system consists of red lights for nighttime and high- or medium-intensity flashing white obstruction lights for daytime and twilight. When a dual lighting system incorporates medium-intensity flashing white lights on structures 700 feet (213.36 m) AGL or less or high-intensity flashing white lights on structures greater than 700 feet (213.36 m) AGL, other methods of marking the structure may be omitted.

5. Lighted Spherical Markers. Lighted markers are available for increased night conspicuity of high-voltage (69 kV or greater) transmission line catenary wires and should be manufacturer-certified as, visible and recognizable from a minimum distance of 4,000 feet (1,219.20 m) under nighttime conditions and under minimum VFR conditions, and have a minimum intensity of at least 32.5 candelas. Markers should be distinctively shaped, i.e., spherical or cylindrical, so that they are not mistaken for items used to convey other information

6. Aircraft Detection Lighting System. Lights are controlled by sensor based systems designed to detect aircraft approaching a single obstacle or group of obstacles and automatically activate the appropriate obstruction lights until the aircraft has departed the area and the lights are no longer needed. This technology reduces the impact of nighttime lighting on nearby communities and migratory birds, as well as, extends the life expectancy of obstruction lights.

7. Obstruction Lights During Construction. As the height of the structure exceeds each level at which permanent obstruction lights would be recommended, two or more lights of the type specified in the determination should be installed at that level. Temporary high- or medium-intensity flashing white lights, if recommended in the determination, should be operated 24 hours a day until all permanent lights are in operation. In either case, two or more lights should be installed on the uppermost part of the structure any time it exceeds the height of the temporary construction equipment. They may be turned off for periods when they could interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level when approaching from any direction.

8. Obstruction Lights in Urban Areas. When a structure is located in an urban area where there are numerous other white lights (e.g., streetlights), red obstruction lights with painting or a medium-intensity dual system is recommended. White lighting is not normally recommended on structures less than 200 feet (60.96 m) or within 3 NM of an airport.

4.4 Inspection, Repair, and Maintenance.

To ensure the proper candela output for fixtures with incandescent lamps, the voltage provided to the lamp filament should not vary more than plus or minus three percent of the lamp's rated voltage. The input voltage should be measured at the closest disconnecting means to the lamp fixture with the lamp operating during the hours of normal operation (for strobes, the input voltage of the power supplies should be within 10 percent of rated voltage).

Lamps should be replaced after being in operation for approximately 75 percent of their rated life or immediately upon failure.

Flashtubes in a light unit should be replaced immediately upon failure, when the peak effective intensity falls below specification limits, when the fixture begins skipping flashes, or at the manufacturer's recommended intervals.

Due to the effects of harsh environments, light fixture lenses should be visually inspected every 24 months or when the light fixture fails for ultraviolet (UV) damage, cracks, crazing, dirt buildup, etc., to ensure the certified light output has not deteriorated (see Chapter 2, paragraph 2.4 for reporting requirements in case of failure). Lenses that have cracks, UV damage, crazing, or excessive dirt buildup should be cleaned or replaced.

4.5 Nonstandard Lights.

Moored balloons, chimneys, church steeples, and similar obstructions may be floodlighted by fixed search light projectors installed at three or more equidistant points around the base of each obstruction. The searchlight projectors should provide an average illumination of at least 15 foot-candles (161.46 lux) over the top one-third of the obstruction.

4.6 Placement Factors.

The height above ground level (AGL) of the structure determines the number of light levels. The light levels may be adjusted slightly, but not to exceed 10 feet (3.05 m) when necessary to accommodate guy wires and personnel who replace or repair light fixtures. Except for catenary wire support structures, the following factors should be considered when determining the placement of obstruction lights on a structure:

1. Red Obstruction Lighting Systems. The structure's overall height, including all appurtenances, such as rods, antennas, and obstruction lights, determines the number of light levels.

2. Medium-Intensity Flashing White Obstruction Lighting Systems. The structure's overall height, including all appurtenances such as rods, antennas, and obstruction lights, determines the number of light levels.

3. High-Intensity Flashing White Obstruction Lighting Systems. The main structure's overall height, excluding all appurtenances, such as rods, antennas, and obstruction lights, determines the number of light levels.

4. Dual Obstruction Lighting Systems. The structure's overall height, including all appurtenances, such as rods, antennas, and obstruction lights, is used to determine the number of light levels for a medium-intensity white obstruction light/red obstruction dual lighting system. The structure's overall height, excluding all appurtenances, is used to

determine the number of light levels for a high-intensity white obstruction light/red obstruction dual lighting system.

5. Aircraft Lighting Detection System. The system should be designed with sufficient sensors and mounted with a clear view to provide complete detection coverage for aircraft that enter a three-dimensional volume of airspace, or coverage area, around an obstruction(s). The system should activate the obstruction lighting system in sufficient time to allow the lights to illuminate and synchronize to flash simultaneously prior to an aircraft penetrating the defined volume and remain on for a specified time expected for the aircraft to depart the coverage area.

6. Lighted Spherical Markers. The lighting unit should emit a steady-burning red light and be mounted on the highest energized line, visible to a pilot approaching from any direction. If the lighted markers are installed on a line other than the highest catenary wire, then unlighted markers should be used in addition to the lighted markers should be installed on the highest energized line. The maximum distance between the line energizing the lighted markers and the highest catenary above the lighted marker should be no more than 25 feet (7.62 m) and must not violate the sag requirements of the transmission line design.

7. Adjacent Structures. The elevation of the tops of adjacent buildings in congested areas may be used as the equivalent of ground level to determine the correct number of light levels required.

8. Shielded Lights. If an adjacent structure or object blocks the visibility of an obstruction light, the light's horizontal placement should be adjusted or additional lights should be mounted on that object to retain or contribute to the definition of the obstruction.

9. Nesting of Lights. Care should be taken to ensure that obstruction lights do not become blocked or "nested" as new antennas, hardware, or appurtenances are added to the top of a structure. If new equipment is added that blocks the obstruction light's visibility, the light fixtures must be relocated and/or raised so that it is not blocked by the new equipment. For example, when new larger cellular antenna panels are fitted to older towers, the obstruction light will need to be raised so that it is not blocked by the larger antenna panels. The widest structure, appurtenance, lightning rod, or antenna that can be placed in front of an obstruction light (excluding the L-810 light) without significantly blocking the obstruction light's visibility should be no wider than 7/8 of an inch. Due to their smaller size, L-810 lights should not be blocked by any structure.

4.7 Monitoring Obstruction Lights.

Obstruction lighting systems should be closely monitored by visual or automatic means. It is extremely important to visually inspect obstruction lighting in all operating intensities at least once every 24 hours on systems without automatic monitoring. In the event a structure is not readily accessible for visual observation, a properly maintained automatic monitor should be

used. This monitor should be designed to register the malfunction of any light on the obstruction regardless of its position or color. When using remote monitoring devices, the system's communication and operational status should be confirmed at least once every 24 hours. The monitor (aural or visual) should be located in an area generally occupied by the responsible personnel. In some cases, this may require a remote monitor in an attended location. For each structure, a log should be maintained in which the lighting system's daily operations status is recorded. Light fixture lenses should be replaced if serious cracks, hazing, dirt buildup, etc., has occurred.

4.8 Ice Shields.

Where icing is likely to occur, metal grates or similar protective ice shields should be installed directly over each light unit to prevent falling ice or accumulation from damaging the light units. The light should be mounted in a manner to ensure an unobstructed view of at least one light by a pilot approaching from any direction.

4.9 Light Shields.

In general, light shields are not permitted because of the adverse effects they have on the obstruction light fixture's photometrics. In addition, these shields can promote undesired snow accumulation, bird nesting, and wind loading.

4.10 Distractions.

When obstruction lights are in proximity to a navigable waterway, they may distract vessel operators. To avoid interference with marine navigation, coordinate with the Office of Navigation Systems, United States (U.S.) Coast Guard before installing the lighting system. The contact information for the U.S. Coast Guard is:

Commandant (CG-NAV-1)
U.S. Coast Guard
2703 Martin Luther King Jr. Avenue, Southeast STOP 7418
Washington, DC 20593-0001
Telephone: 202-372-1546

CHAPTER 8. DUAL LIGHTING WITH RED/MEDIUM-INTENSITY FLASHING WHITE LIGHT SYSTEMS

8.1 Purpose.

This dual lighting system includes red lights (L-864) for nighttime and medium-intensity and flashing white lights (L-865) for daytime and twilight use. This lighting system may be used in lieu of operating a medium-intensity flashing white lighting system at night. There may be some populated areas where nighttime use of medium- intensity light systems may cause significant environmental concerns. Using the dual lighting system should reduce/mitigate those concerns and complaints. Recommendations for lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures.

8.2 Installation.

The light units should be installed as specified in Chapters 4, 5, and 6. The number of light levels needed is dependent on the height of the obstruction, as shown in Figure, A-16.

8.3 Operation.

Light systems should be operated as specified in Chapter 4, 5, and 6. These systems should not be operated simultaneously; however, there should be no more than a 2-second delay when changing from one system to the other. Outage of the uppermost red light must cause the white obstruction light system to activate and operate in its specified “night” step intensity.

8.4 Control Device.

The light system is controlled by a device (photocell) that changes the intensity of the lights when the ambient light changes. The illuminance sensing device should, if practical, face the northern sky in the Northern Hemisphere and the system should automatically change intensity steps when the illuminance reaching a north-facing vertical surface is as follows:

1. Twilight-to-Night. This should not occur before the illumination drops below 5 foot-candles (53.82 lux) but should occur before it drops below 2 foot-candles (21.53 lux).

2. Night-to-Day. The intensity changes listed in subparagraph 8.4.1 above should be reversed when changing from the night-to-day mode.

8.5 Antenna or Similar Appurtenance Light.

1. When a structure equipped with a dual lighting system is topped with an antenna or similar appurtenance exceeding 40 feet (12.19 m) in height, a medium-intensity flashing white (L-865) and a flashing red light (L-864) should be placed within 40 feet (12.19 m) from the tip of the appurtenance. The white light should operate during daytime and twilight and the red

light during nighttime. These lights should flash simultaneously with the rest of the lighting system.

2. When a structure equipped with a dual lighting system is topped with an antenna or similar appurtenance less than 40 feet (12.19 m) in height and exceeds 7/8 of an inch, a minimum of two medium-intensity flashing white (L-865), flashing red lights (L-864) should be placed immediately below, within 40 feet (12.19 m) from the tip of the appurtenance (see Figure A-17). The white light should operate during daytime and twilight and the red light between the hours of sunset and sunrise. These lights should flash simultaneously with the rest of the lighting system.

8.6 Omission of Marking.

When medium-intensity white obstruction lights are operated on structures 700 feet (213.36 m) AGL or less during daytime and twilight, other methods of marking may be omitted.

CHAPTER 15. MARKING AND LIGHTING EQUIPMENT AND INFORMATION

15.1 Purpose.

This chapter lists documents relating to obstruction marking and lighting systems and where they may be obtained.

15.2 Paint Standard.

15.2.1 Paint and aviation colors/gloss, referred to in this AC, with the exception of wind turbines, should conform to Aerospace Material Specification Standard, SAE-AMS- STD-595, *Colors Used in Government Procurement*, previously known as FED-STD- 595 (cancelled February 14, 2017). Wind turbines must meet the standards in Chapter 13, paragraph 13.4, of this AC.

15.2.2 Approved colors must be formulated without using lead, zinc chromate, or other heavy metals to match international aviation orange, white, and yellow, as listed in Table 3-1. All coatings must be manufactured and labeled to meet Federal Environmental Protection Act Volatile Organic Compound(s) guidelines, including the National Volatile Organic Compound Emission Standards for architectural coatings.

1. Exterior Acrylic Waterborne Paint. Coatings should be ready-mixed, 100 percent acrylic, exterior latex formulated for application directly to galvanized surfaces. Ferrous iron and steel or non-galvanized surfaces must be primed with a manufacturer-recommended primer compatible with the finish coat.

2. Exterior Solvent-Borne Alkyd-Based Paint. Coatings should be ready-mixed, alkyd-based, exterior enamel for application directly to non-galvanized surfaces, such as ferrous iron and steel. Galvanized surfaces must be primed with a manufacturer-recommended primer compatible with the finish coat.

Table 15-1. Aerospace Material Specification Standard, SAE-AMS-STD-595

Color	Number
Orange	EA 12197
White	EA 17875
Yellow	EA 13538

15.3 Availability of Specifications and Advisory Circulars.

1. Federal and military specifications describing the technical characteristics of various paints and their application techniques are available through the ASSIST Database at https://assist.dla.mil/online/start/. ASSIST is a robust, comprehensive website used by standardization management activities to develop, coordinate, distribute, and manage defense and federal specifications and standards, military handbooks, commercial item descriptions, data item descriptions, and related technical documents prepared in accordance with the policies and procedures of the Defense Standardization Program (DSP).
2. For Federal Product Description line items only (for download, refer to ASSIST), use the following Uniform Resource Locator (URL):

   https://www.gsa.gov/buying-selling/purchasing-programs/requisition- programs/gsa-global-supply/supply-standards/index-of-federal- specifications-standards-and-commercial-item-descriptions.

3. Copies of FAA Advisory Circulars may be obtained online at:

   https://www.faa.gov/regulations_policies/advisory_circulars/

15.4 Lights and Associated Equipment Standards.

The lighting equipment referred to in this AC should conform to the latest edition of one of the following specifications, as applicable:

1. Obstruction Lighting Equipment.
   a. AC 150/5345-43, *FAA Specification for Obstruction Lighting Equipment*.
   b. Military Specifications MIL-L-6273, *Light, Navigational, Beacon, Obstacle, or Code, Type G-1*.
   c. Military Specifications MIL-L-7830, *Light Assembly, Marker, Aircraft Obstruction*.
2. Certified Equipment.
   a. AC 150/5345-53, *Airport Lighting Certification Program*, lists the manufacturers that have demonstrated compliance with the specification requirements of AC 150/5345-43, *FAA Specification for Obstruction Lighting Equipment*.
   b. Other manufacturers' equipment may be used provided the equipment meets the specification requirements of AC 150/5345-43, *FAA Specification for Obstruction Lighting Equipment*.
3. Airport Lighting Installation and Maintenance.

   AC 150/5340-30, *Design and Installation Details for Airport Visual Aids*.

4. Vehicles and Structures.

   a. AC 150/5210-5, *Painting, Marking, and Lighting of Vehicles Used on an Airport*, contains provisions for marking vehicles principally used on airports.

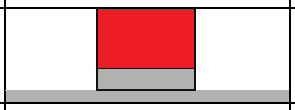
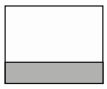
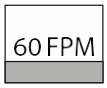
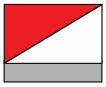
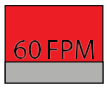
   b. FAA Standard FAA-STD-003, *Paint Systems for Structures.* Obstruction marking for FAA facilities must conform to FAA Drawing Number D-5480 (page 39 of 42).

15.5 Availability of Military Specifications.

The military standards and specifications listed above may be obtained from:

DAP/DODSSP
Building 4, Section D
700 Robbins Avenue
Philadelphia, PA 19111-5904
Telephone: (215) 737-8000
FAX: (215) 737-7155

URL: https://quicksearch.dla.mil/ (ASSIST Database)

Type	Symbol	Description
L-810 **L-810 F**		Steady-Burning or Flashing (30 FPM) - RED Single Obstruction Light
L-810 **L-810 F**		Steady-Burning or Flashing (30 FPM) – RED Double Obstruction Light
L-856		High-Intensity Flashing – WHITE Obstruction Light (40 FPM)
L-857		High-Intensity Flashing – WHITE Catenary Light (60 FPM)
L-864		Medium-Intensity Flashing – RED Obstruction Light (20-40 FPM)(30 FPM when used with L-810 F)
L-865		Medium-Intensity Flashing – WHITE Obstruction Light (40-FPM)
L-866		Medium-Intensity Flashing - WHITE Catenary Light (60-FPM)
L-864/L-865		Medium-Intensity Flashing Dual – RED / WHITE Obstruction Light (20-40 FPM) Obstruction Light (40 FPM)
L-885		Flashing Obstruction Light - RED Obstruction Light (60 FPM)

FPM = Flashes Per Minute

Table A-1. FAA-Approved Obstruction Lighting Fixtures

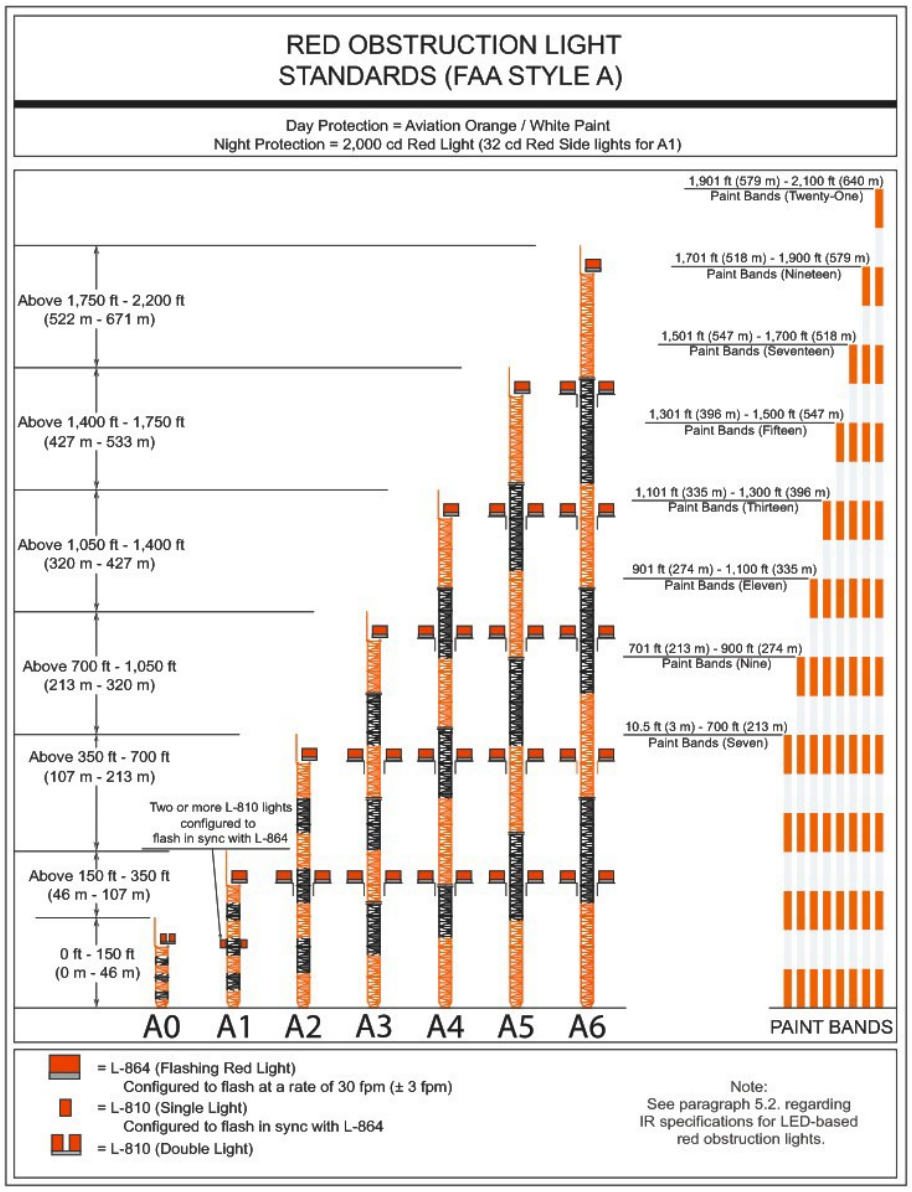


Figure A-6. Red Obstruction Light Standards (FAA Style A)

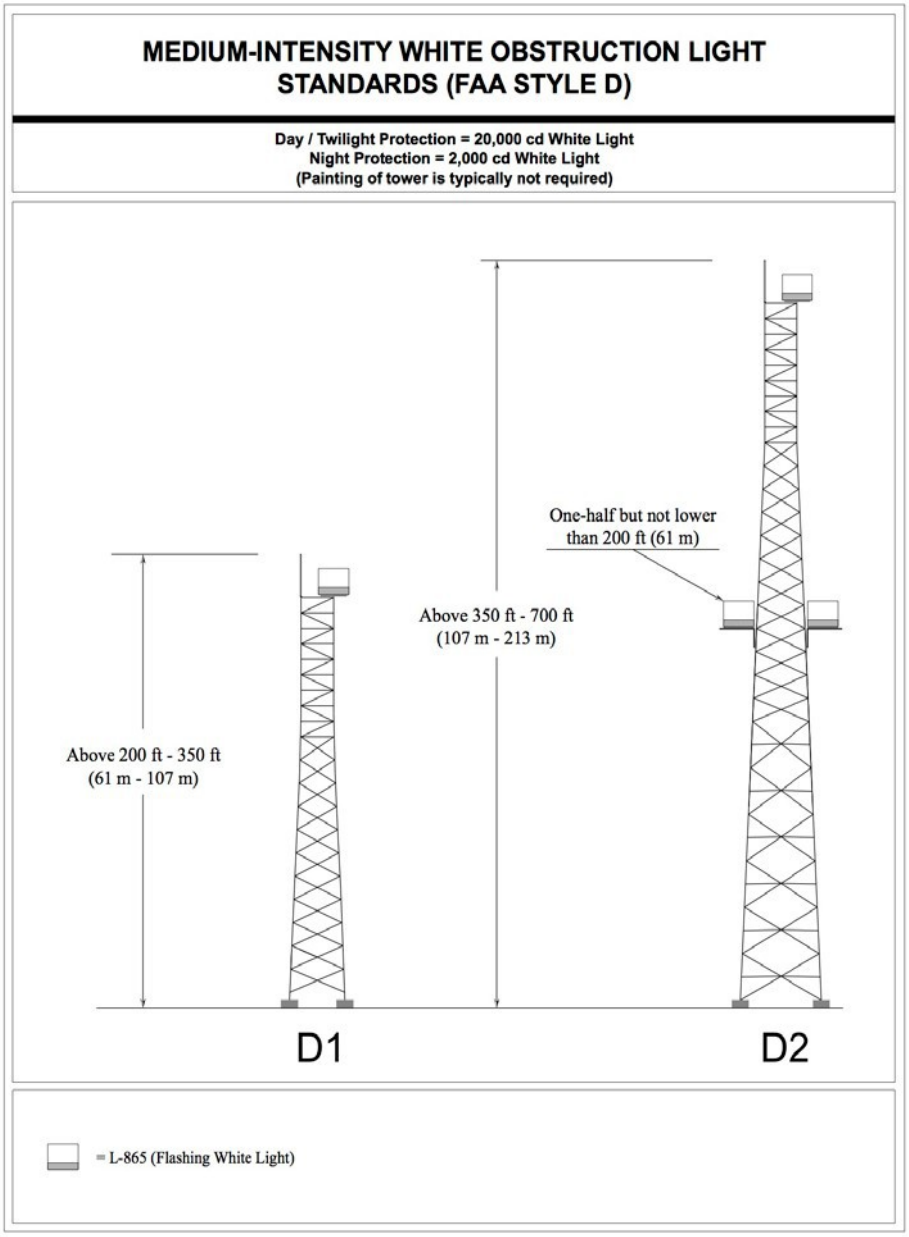


Figure A-9. Medium-Intensity White Obstruction Light Standards (FAA Style D)

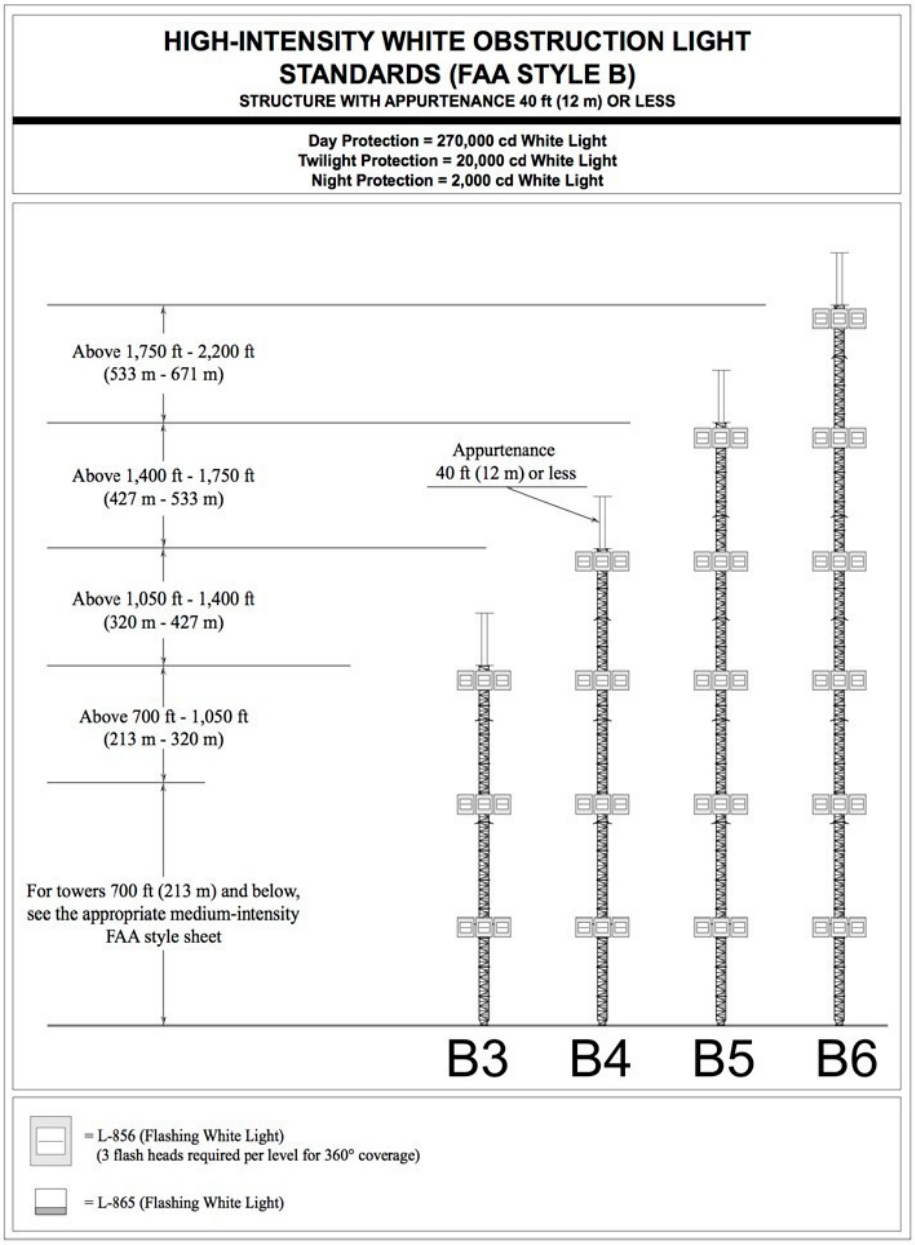


Figure A-13. High-Intensity White Obstruction Light Standards (FAA Style B)—With Appurtenance 40 Feet or Less

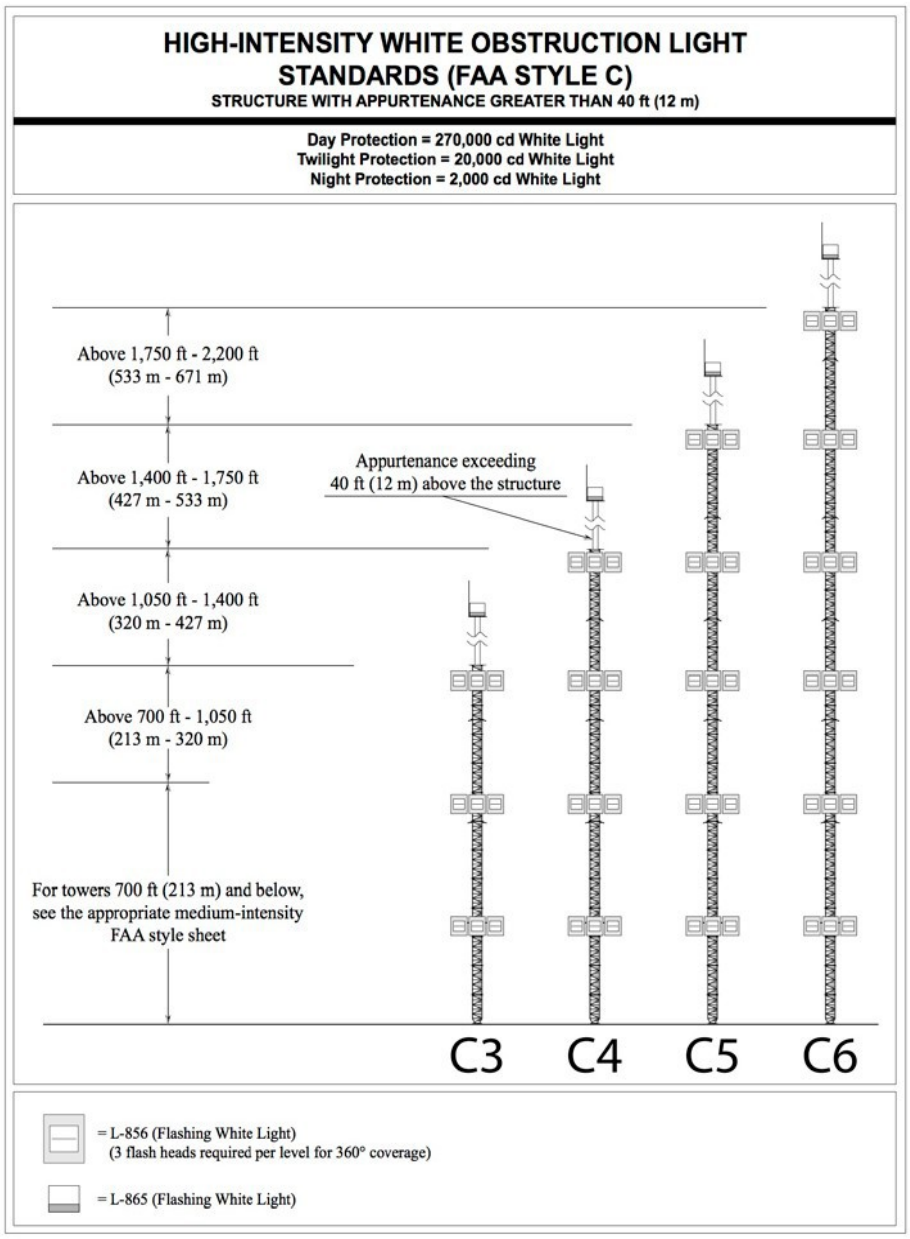


Figure A-14. High-Intensity White Obstruction Light Standards (FAA Style C)—With Appurtenance Over 40 Feet High

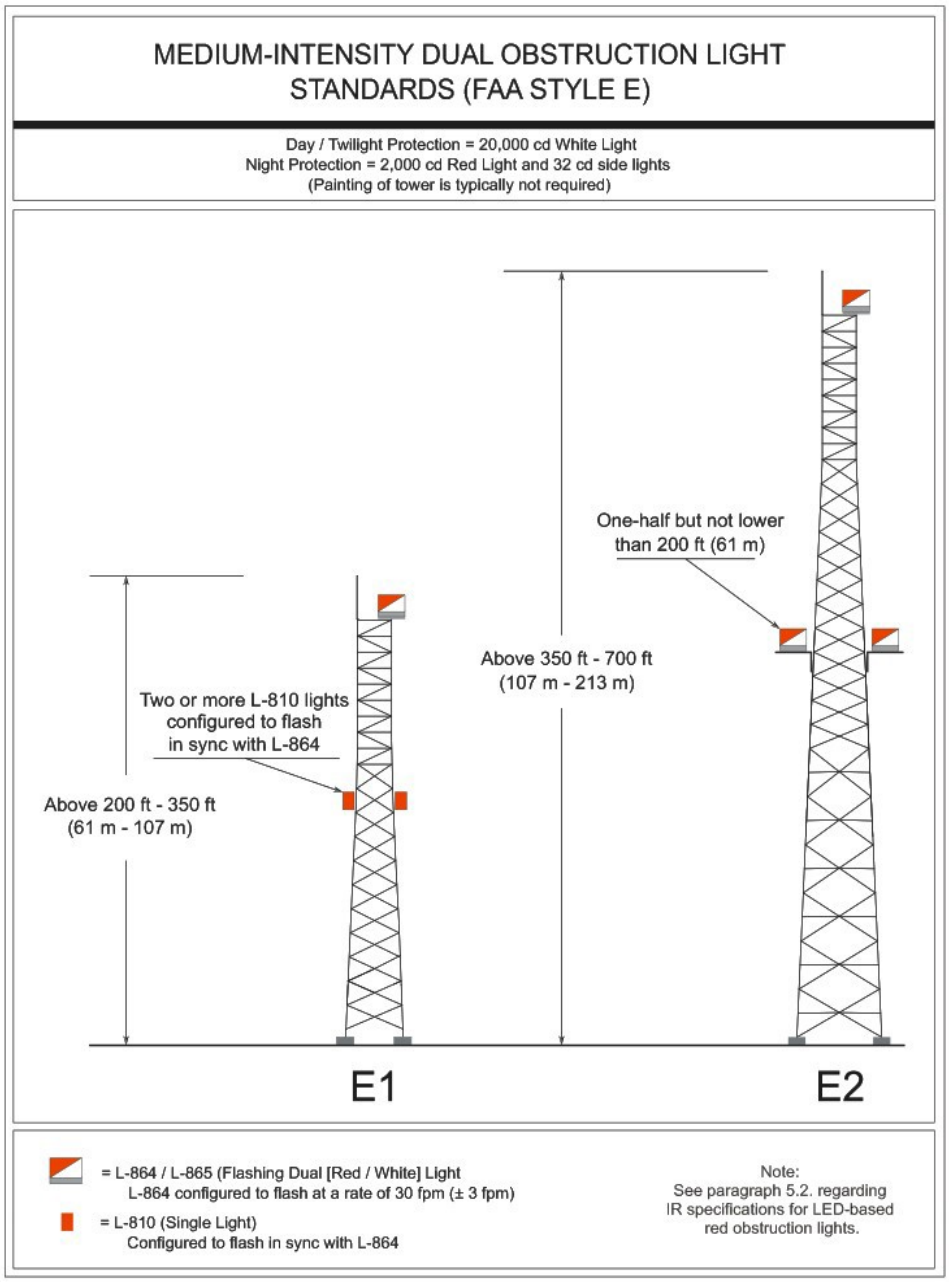


Figure A-16. Medium-Intensity Dual Obstruction Light Standards (FAA Style E)

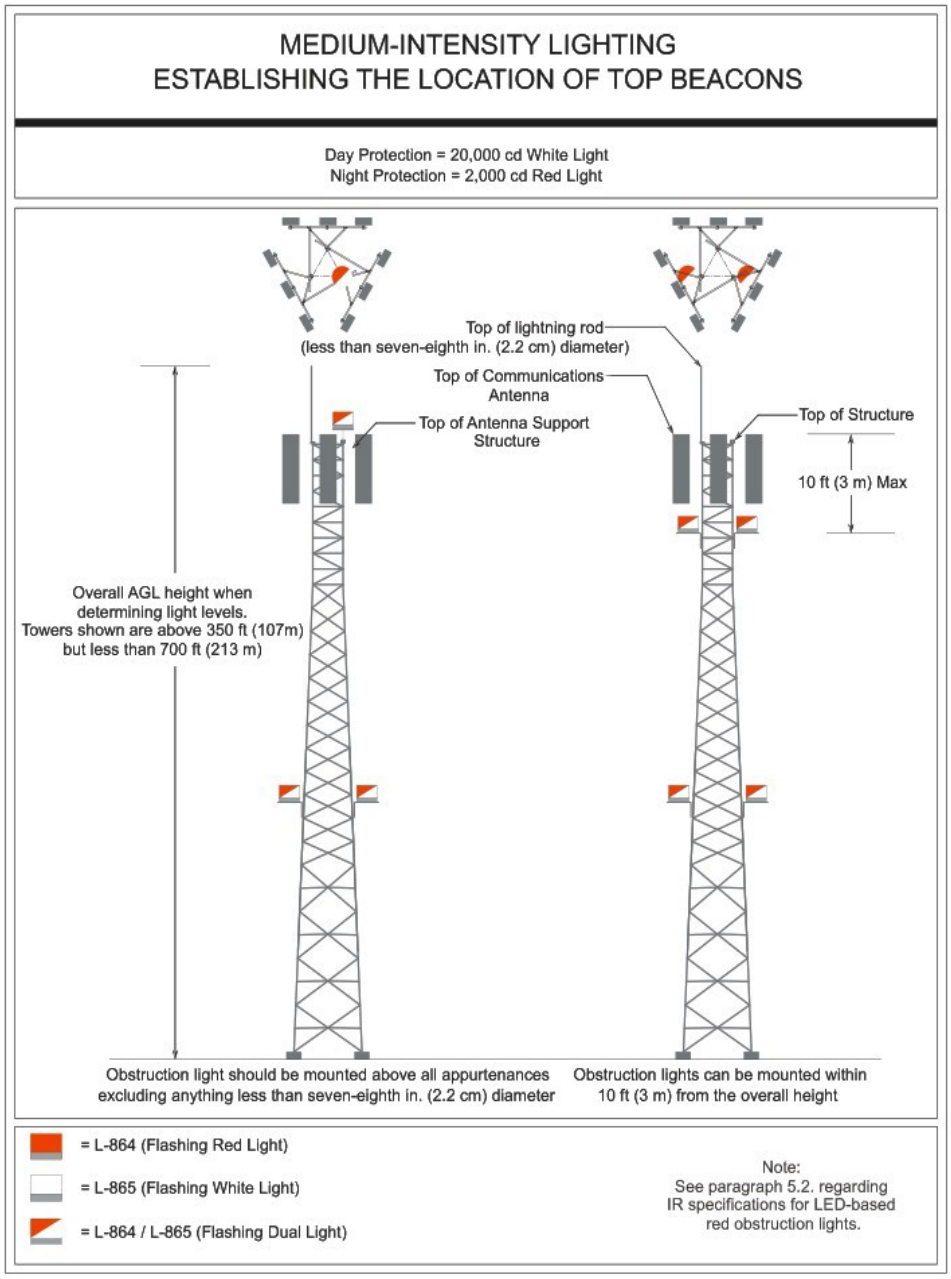


Figure A-17. Medium-Intensity Lighting—Establishing the Location of Top Beacons

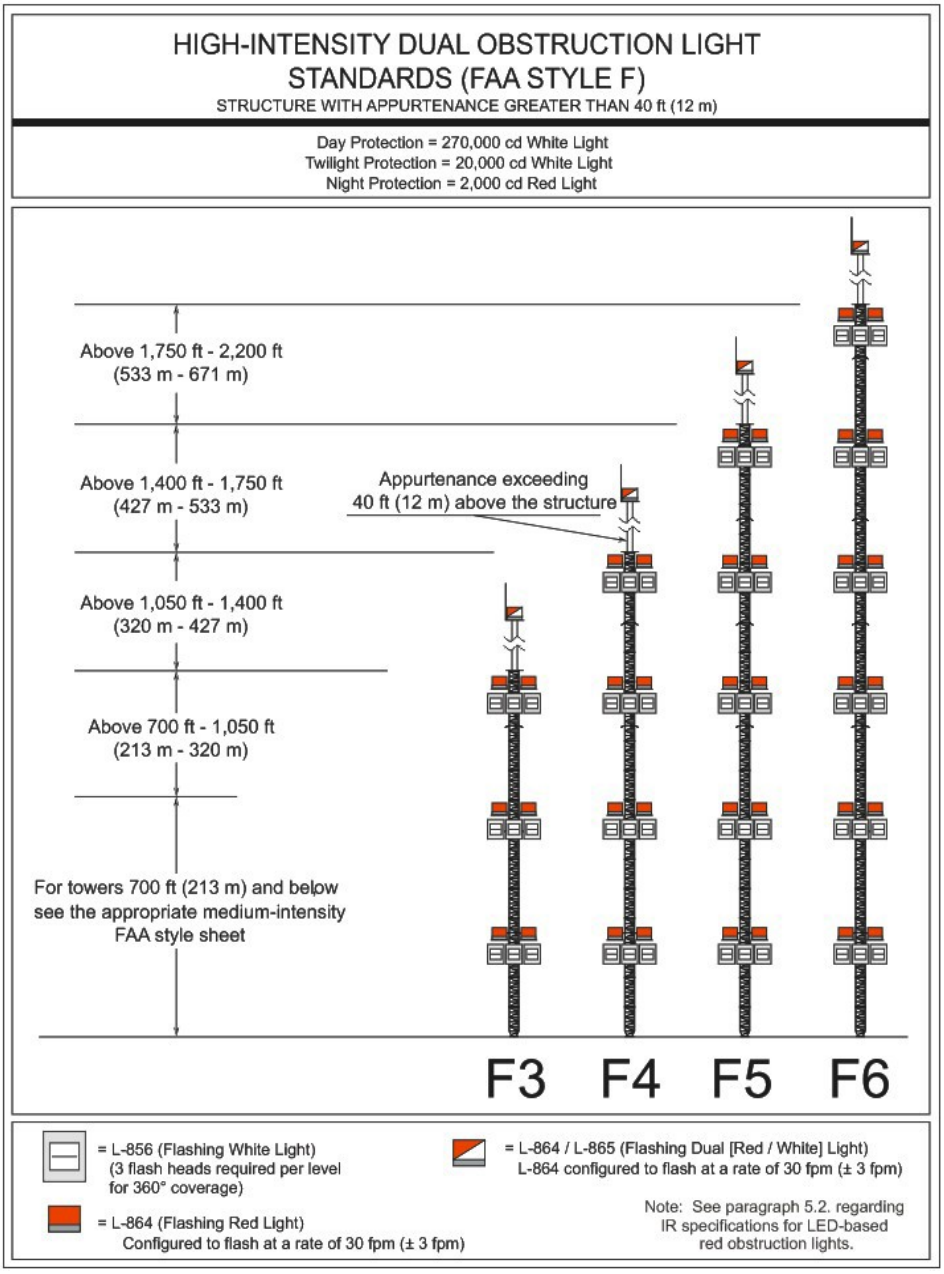


Figure A-18. High-Intensity Dual Obstruction Light Standards (FAA Style F)—With Appurtenance Over 40 Feet High

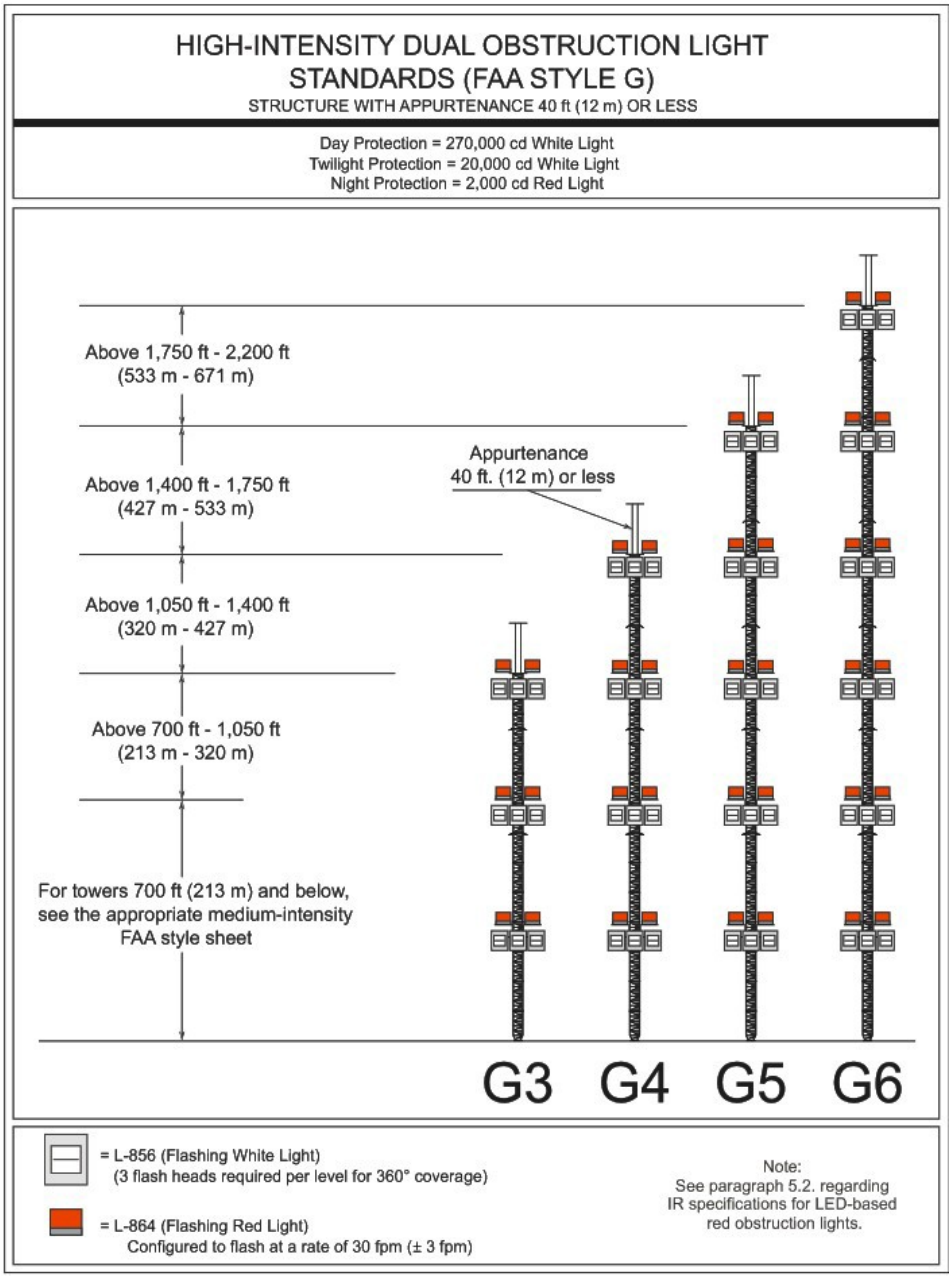


Figure A-19. High-Intensity Dual Obstruction Light Standards (FAA Style G)—With Appurtenance 40 Feet or Less

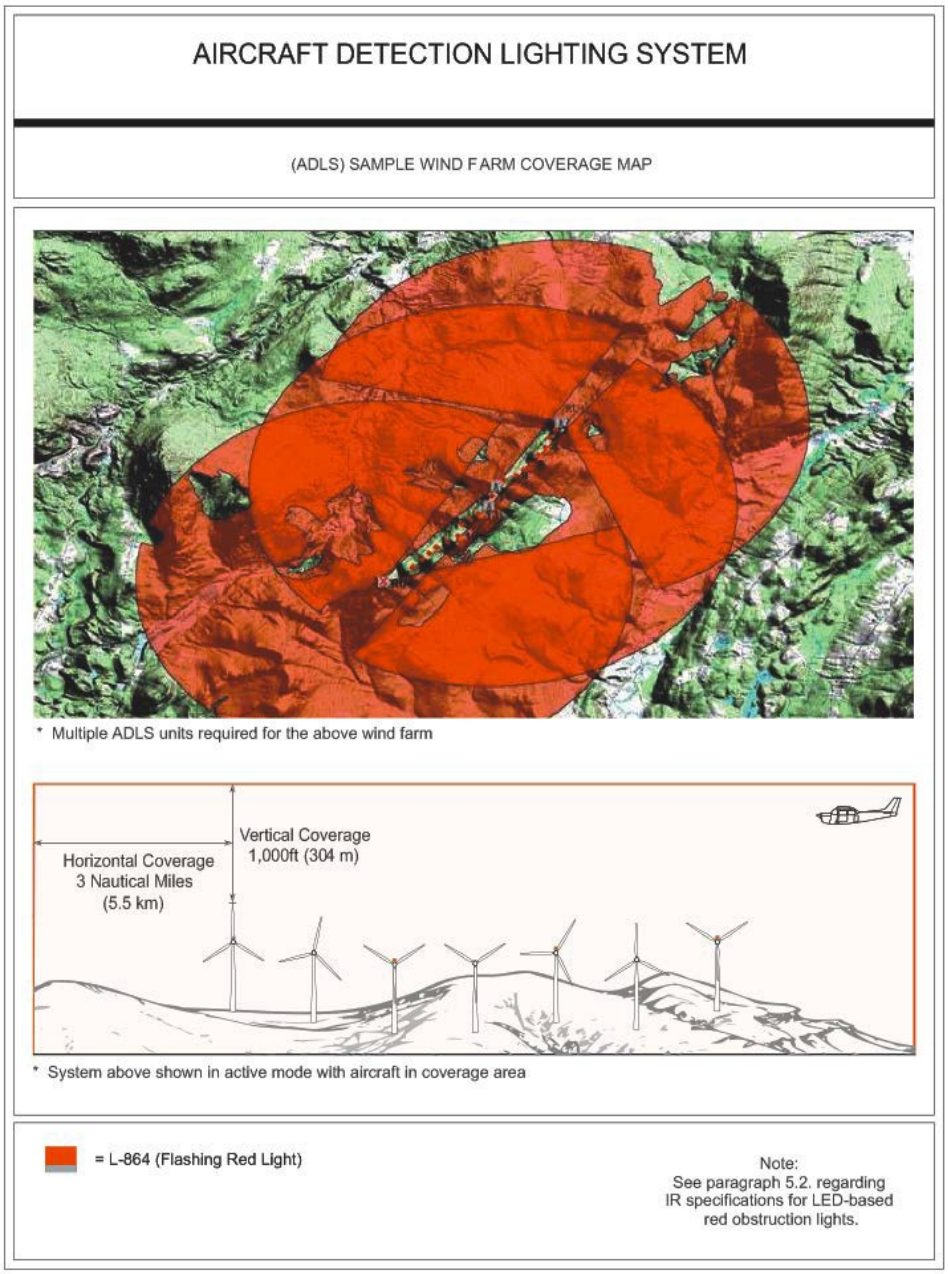


Figure A-20. Aircraft Detection Lighting System (sample coverage map)

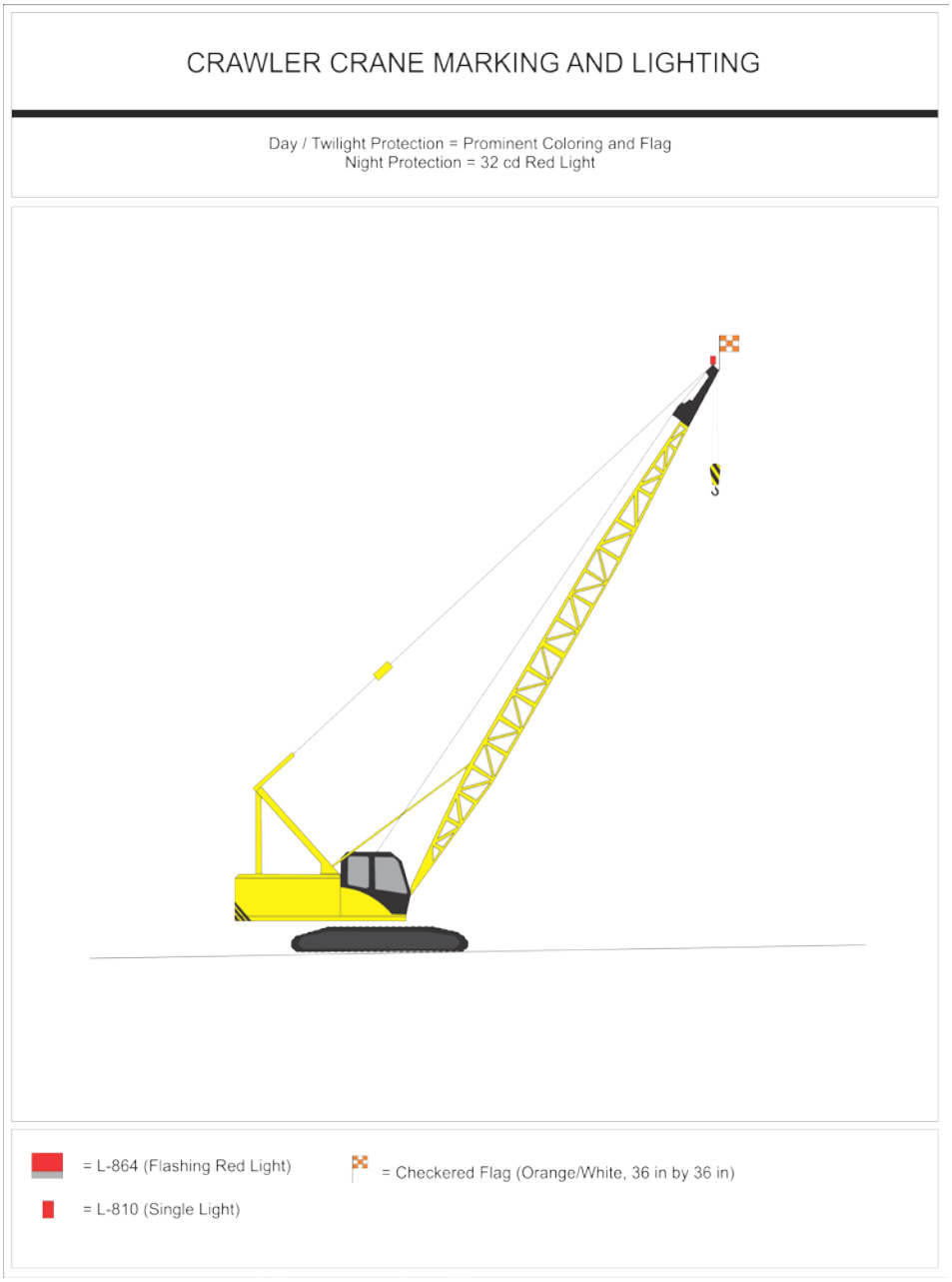


Figure A-31. Crawler Crane Marking and Lighting

APPENDIX B: MISCELLANEOUS

B-1. **Rationale for Obstruction Light Intensities.**

Sections 91.117, 91.119 and 91.155 of 14 CFR Part 91, *General Operating and Flight Rules*, prescribe aircraft speed restrictions, minimum safe altitudes, and basic visual flight rules (VFR) weather minimums for governing the operation of aircraft, including helicopters, within the United States.

B-2. **Distance Versus Intensities.**

Table B-1 indicates at what distance the various candela intensities are visible under one and three statute mile meteorological visibilities:

Table B-1. Distance and Intensity

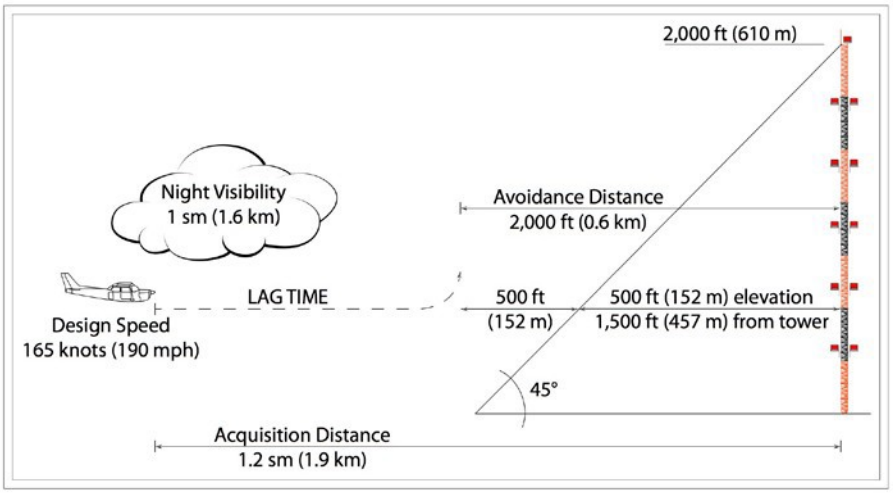
Time Period	Meteorological Visibility Statute Miles	Distance Statute Miles	Intensity Candelas
Night		2.9 (4.67 km)	1,500 (±25%)
	3 (4.83 km)	3.1 (4.99 km)	2,000 (±25%)
		1.4 (2.25 km)	32
Day		1.5 (2.41 km)	200,000
	1 (1.61 km)	1.4 (2.25 km)	100,000
		1.0 (1.61 km)	20,000 (±25%)
Day		3.0 (4.83 km)	200,000
	3 (4.83 km)	2.7 (4.35 km)	100,000
		1.8 (2.90 km)	20,000 (±25%)
Twilight	1 (1.61 km)	1.0 (1.61 km) to 1.5 (2.41 km)	20,000 (±25%)
Twilight	3 (4.83 km)	1.8 (2.90 km) to 4.2 (6.76 km)	20,000 (±25%)

Note: Distance calculated for north sky illuminance

B-3. **Conclusion.**

Aircraft pilots travelling at 165 knots (189.88 miles per hour (mph)/305.58 kilometers per hour (kph)) or less should be able to see obstruction lights in sufficient time to avoid the structure by at least 2,000 feet (609.60 m) horizontally under all conditions of operation, provided the pilot is operating in accordance with 14 CFR Part 91. Pilots operating 250 knots (287.70 mph/463.00 kph) aircraft should be able to see the obstruction lights unless the weather deteriorates to 1 SM (1.61 km) visibility at night, during which time period 2,000 candelas enables the light to be seen at 1.2 SM (1.93 km). To provide an acquisition distance of 1.5 SM (2.41 km), a higher intensity of 20,000 candelas would be required. This light, with 3 SM visibility at night, could generate a residential annoyance factor. In addition, aircraft at these speeds can normally be expected to operate under instrument flight rules (IFR) at night when the visibility is 1 SM (1.61 km).

Figure B-1. Illustration of Acquisition Distance Calculation



Note: The 2,000-foot avoidance distance comes from the guy wires of a 2,000-foot structure. The guy wires at a 45-degree angle would be at a distance of 1,500 feet from the structure at a 500-foot elevation. Since the aircraft is to be 500 feet clear of obstacles (the guy wire), the distance of avoidance from the structure is 1,500 + 500 = 2,000 feet (see Figure B-1).

B-4. **Definitions**.

B-4.1 Flight Visibility.

The average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night.

Reference: *Airman's Information Manual Pilot/Controller Glossary*.

B-4.2 Meteorological Visibility.

A term that denotes the greatest distance, expressed in statute miles, that selected objects (visibility markers) or lights of moderate intensity (25 candelas) can be seen and identified under specified conditions of observation.

B-4.2 Lighting System Configuration.

1. Configuration A. Red Obstruction Lighting System.
2. Configuration B. High-Intensity White Obstruction Lights for structures with appurtenance 40 feet or less.
3. Configuration C. High-Intensity White Obstruction Lights for structures with appurtenance greater than 40 feet.
4. Configuration D. Medium-Intensity White Obstruction Lights.
5. Configuration E. Medium-Intensity Dual White and Red Obstruction Lights.
6. Configuration F. High-Intensity Dual Obstruction Lights for structures with appurtenance greater than 40 feet.
7. Configuration G. High-Intensity Dual Obstruction Lights for structures with appurtenance 40 feet or less.

Example: "Configuration B 3" denotes a high-intensity lighting system with three levels of light.

APPENDIX C: ACRONYMS

Abbreviation	Meaning
AC	Advisory Circular
ADLS	Aircraft Detection Lighting System
AGL	Above Ground Level
AMSL	Above Mean Sean Level
CFR	Code of Federal Regulations
CM	Centimeter
DSP	Defense Standardization Program
F	Flashing Lights
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FPM	Flashes Per Minute
IFR	Instrument Flight Rules
IR	IFR Military Training Route
KHZ	Kilohertz
KM	Kilometers
KPH	Kilometre Per Hour
KV	Kilovolts
LED	Light Emitting Diode
LUX	Lumen Per Square Meter
M	Meter
MET	Meteorological Evaluation Tower
MHZ	Megahertz
MPH	Miles Per Hour
NAS	National Airspace System
NAVAIDS	Navigational Aids
NM	Nautical Mile
NOTAM	Notice to Airmen
NVG	Night Vision Goggles
OEG	Obstruction Evaluation Group
SM	Statue Mile
URL	Uniform Resource Locator
UV	Ultra Violet
US	United States
VFR	Visual Flight Rules

Appendix D
Portland Water District
Construction Specifications for
Water Main Replacement at Exit 48

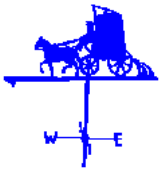
CONTRACT DOCUMENTS

FOR

MAINE TURNPIKE EXIT 48
PORTLAND AREA WIDENING
WATER MAIN REPLACEMENT

Portland

December 2020
P O R T L A N D W A T E R D I S T R I C T
225 Douglass Street
Portland, Maine 04104-3553



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DIVISION 1: GENERAL REQUIREMENTS

SECTION 01010 – SUMMARY OF WORK

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall furnish and install water main and appurtenances in an easement crossing the Maine Turnpike at Exit 48 in Portland as shown on the Drawings and specified herein.

B. The Owner is the Portland Water District. The contract agent is the Maine Turnpike Authority.

1.02 DUTIES OF THE OWNER

A. The Owner will locate the terminal points of the work and will also locate any of its facilities lying in close proximity which would in any way be a hazard to the Contractor's operations.

B. The Owner will operate any valves or hydrants which may be found desirable or necessary to be used for any purpose.

C. The Owner will notify customers of all work involving temporary shutdown of service.

1.03 DUTIES OF THE CONTRACTOR

A. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto.

B. Provide water mains to supply the Owner with a satisfactory, watertight pipeline, laid to proper line and grade in accordance with these contract documents, to the satisfaction of the Owner. The Contractor shall leave the site in a condition, which is suitable to the Owner, abutting landowners and any municipal or state authorities having jurisdiction over the areas involved.

C. The Contractor shall furnish plant and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the time stipulated in the Contract.

D. The Contractor must give the District adequate notice of all planned activities such as shutdowns to allow time for customer notification.

E. The Contractor will furnish all fuel, gasoline, oil, etc. for the operation of his equipment, all tools and equipment, and all labor and supervision necessary for the handling of material, for excavation, installation, backfilling and cleaning the site as required. He will dispose of excess spoil and restore the land surface to the original contour over the entire length of the project. Restoration shall be made to the satisfaction of the MTA resident.

F. The Contractor will perform the pressure and leakage test and disinfection of the main as described herein in the presence of the MTA resident or Owner.

SECTION 01150 – SITE CONDITIONS

PART 1 - GENERAL

1.01 PLANT AND EQUIPMENT

A. The Contractor shall furnish plant and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will insure the completion of the work within the time stipulated in the Contract.

1.02 PIPE LOCATIONS

A. Pipelines shall be located substantially as indicated on the Drawings, but the Owner reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

1.03 CARE AND PROTECTION OF PROPERTY

A. The Contractor shall familiarize himself with all obstructions which he can foresee, such as existing pipes, services, conduits, ducts, sewers or any other such obstructions which might interfere with the Work, and shall make arrangements with the owners of such facilities so as to save the Owner harmless from any damages thereto caused by his operations and to make whatever arrangements might be necessary to move and restore or remove and replace these facilities. Costs associated with this Work shall be incidental to the Contract.

B. The Contractor shall be responsible for the preservation of all public and private property, and shall use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work on the part of the Contractor, such property shall be restored by the Contractor, at no additional cost to the Owner, to a condition similar or equal to that existing before the damage was done, or he shall make good the damage in other manner acceptable to the Owner.

C. The Contractor shall assume full responsibility for the protection of all trees, buildings, structures, and utilities, public or private, including poles, signs, services to buildings, buried utilities, gas pipes, water pipes, hydrants, sewers, drains, and electric and telephone cables, whether or not they are shown on the Drawings. The Contractor shall carefully support and protect all such structures and utilities from injury of any kind. Costs associated with this Work shall be incidental to the Contract. Any damage resulting from the Contractor's operations shall be repaired at no additional expense to the Owner.

D. Any damage to or displacement of street or highway surfaces due to blasting or otherwise shall be either replaced satisfactorily by the Contractor or shall be paid for by him to the authority responsible for the street or highway at no additional cost to the Owner.

-- END OF SECTION --

SECTION 01250 - MEASUREMENT AND PAYMENT

PART 1: GENERAL

1.01 METHOD OF MEASUREMENT AND BASIS OF PAYMENT:

A. All measurements for payments will be based on completed work performed in strict accordance with the drawings and specifications, and on the contract bidding and payment item schedules. All work completed under the contract will be measured by the PORTLAND WATER DISTRICT ("DISTRICT") according to the methods outlined below. In cases where the payment clause in the specifications relating to any unit or lump sum price stated in the contract requires that the said unit or lump sum price cover and be considered compensation for certain work or material essential to the item, this same item will not be measured or paid for under any other pay item which may appear elsewhere in the specifications.

1.02 INCIDENTAL WORK

A. Incidental work items for which separate payment is not made, but is incidental to the water main items, include (but are not limited to) the following items:
   1. Pre-construction photographs
   2. Traffic control plan (per Section 652 of Special Provisions of Project Specifications)
   3. Clearing, grubbing and stripping
   4. Dewatering
   5. Clean-up
   6. Loaming and seeding
   7. Restoration of property
   8. Crossing other utilities, unless otherwise paid for
   9. Bonds, insurance, shop drawings, warranties and other submittals required by the contract documents
   10. Repair and replacement of utilities damaged by construction activities or for Contractor convenience and corresponding proper disposal of removed materials
   11. Weather protection
   12. Trench boxes, steel and/or wood sheeting, as required
   13. Dust control
   14. Permits not otherwise paid for or provided by the Owner
   15. Facilities for storage of materials to be incorporated into the Work
   16. Test pits to determine existing utility locations, soil conditions, and as required to complete the project
   17. Pavement markings
   18. Saw cutting, removal and disposal of existing pavement
   19. Resetting or replacement of existing street signs

1.03 PAYMENT FOR INCREASED OR DECREASED QUANTITIES

When alterations in the quantities or work not requiring supplemental agreements are ordered and performed, the Contractor shall accept payment in full at the contract price for the actual quantities or work done. No allowance will be made for anticipated profits.

1.04 OMITTED ITEMS

Should any item contained in the bid form be found unnecessary for the proper completion of the work contracted, the Owner may eliminate such items from the Contract, and such action shall in no way invalidate the Contract, and no allowance will be made for items so eliminated in making final payment to the Contractor.

1.05 ITEMS NOT INCLUDED IN THIS SECTION

All items not included in this section shall be paid in accordance to the project Special Provisions, MTA Supplemental Specifications, or MaineDOT Standard Specifications.

PART 2: PAYMENT ITEMS:

2.01 ITEM NO. 603.195 24 inch Class III Reinforced Concrete Pipe

A. Method of Measurement: Linear feet as measured along the centerline of the pipe for the actual number of linear feet of pipe installed.

B. Basis of Payment: Payment of the unit price established in the Bid shall be full compensation for excavation, bedding, backfill, fittings, piping, laying and jointing, restoration of property and associated work as specified and shown on the Drawings.

2.02 ITEM NO. 603.281 Concrete Collar for Reinforcing Concrete Pipe

A. Method of Measurement: Actual number installed

B. Basis of Payment: Payment of the unit price established in the Bid shall be full compensation for installation, forming, concrete, bedding, and associated work as specified and shown on Drawings.

2.03 ITEM NO. 845.11 & 845.12 Stone Pipe Support In Casing

A. Method of Measurement: Lump Sum

B. Basis of Payment: Payment of the unit price established in the Bid shall be full compensation for installation, equipment, stone and associated work as specified and shown on Drawings.

2.04 ITEM NO. 822.3405 & 822.3605 Cl 52 DI Pipe

A. Method of Measurement: Linear feet as measured along the centerline of the pipe for the actual number of linear feet of pipe and fittings installed.

B. Basis of Payment: Payment of the unit price established in the Bid shall be full compensation for equipment, excavating, shoring and bracing, dewatering, pipe & gaskets, laying and jointing, connections to existing piping, removal and disposal of existing piping, capping pipes that are not removed, thrust restraint, select backfill, insulation, backfilling, testing, restoration, and associated work as specified and shown on the Drawings.

2.05 ITEM NO. 825.60 – High Density Polyethelene Water Main

A. Method of Measurement: Linear feet as measured along the centerline of the pipe for the actual number of linear feet of pipe and fittings installed.

B. Basis of Payment: Payment of the unit price established in the Bid shall be full compensation for excavating, shoring and bracing, dewatering, pipe, fittings, brick and mortar casing end seals, fusing, locator wire, thrust restraint, select backfill, removal and disposal of existing piping, testing, restoration and associated work as specified and shown on the Drawings.

2.06 ITEM NO. 823.333 – Air Release Valve

A. Method of Measurement: Actual number installed

B. Basis of Payment: Payment of the unit price established in the Bid shall be full compensation for excavation, shoring and bracing, dewatering, corporation, angle valve, fittings, operating rod, service box, valve box, installation, backfill, testing, testing and associated work as specified and shown on the Drawings.

2.07 ITEM NO. 823.311 Gate Valve

A. Method of Measurement: Actual number installed

B. Basis of Payment: Payment of the unit price established in the Bid shall be full compensation for excavation, shoring and bracing, dewatering, valve, valve box, backfill, testing and associated work as specified and shown on Drawings.

2.08 ITEM NO. 827.303 – Unsuitable Material Excavated Below Trench Grade

A. Method of Measurement: Cubic yard as measured in place prior to removal for the actual number of cubic yards excavated.

B. Basis of Payment: Payment of the unit price established in the Bid shall be full compensation for removing unsuitable excavated material below trench grade and replacing with granular bedding material as directed by the MTA resident.

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 GENERAL REQUIREMENTS

A. For all products to be incorporated into the Work submit to the M.T.A. resident who will distribute to Owner (Portland Water District) for approval sufficient information in the form of shop drawings, product data and/or samples such that the Owner can determine that the product is in compliance with the Technical Specifications and Drawings.

B. Submit two (2) copies of each submittal. One (1) copy will be returned to the Contractor. Each copy shall include a cover sheet which clearly identifies the product and corresponding specification section. Each cover sheet shall bear the Contractor's stamp and signature certifying that the submittal is in full compliance with the Contract Documents or that any deviations from the Contract Documents are clearly identified on a separate sheet(s) labeled "Deviations From Contract Documents" and attached to the cover sheet.

C. The Owner (P.W.D.) shall review the submittals and indicate their status as:

1. “A” - Approved Subject to the Requirements of the Contract

2. “B” - Approved as Noted, Subject to the Requirements of the Contract

3. “C” – Revise as Noted, Resubmittal Required

4. “D” – Not Approved

D. Owner's review is only for general conformance with the design concept and general conformance with the information given in the Contract Documents. Corrections or comments made during the review do not relieve the Contractor from compliance with the requirements of the Contract Documents.

E. Re-submittals: Make re-submittals under procedures specified for submittals; identify changes made since previous submittal.

F. Contractor shall be responsible for the delays and or additional expenses that result from the Contractor's failure to submit a complete submittal and/or to identify portions of the submittal that does not conform to the specifications.

-- END OF SECTION --

SECTION 01710 – SITE CLEANUP

PART 1 - GENERAL

1.01 APPLICABILITY

A. This section applies to project cleanup activities to be conducted throughout the entire duration of the Work.

PART 2 – PRODUCTS

(NOT USED)

PART 3 - EXECUTION

3.01 CLEANUP DURING WORK PROGRESS

A. Proceed with construction cleanup as the Work progresses

1. Remove mud, oil, grease, soil, gravel, trash, scrap, debris, and excess materials that are unsightly or may cause accidents to persons or properties.

2. Properly store tools and materials when not in use away from trafficked areas.

B. During the progress of the work, the construction areas shall be kept clean and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damages repaired so that the public and property owners will be inconvenienced as little as possible. Cleanup shall follow directly behind the progress of the Work.

C. Contractor shall fill in all depressions and water pockets on public and private property caused by his operations; clean all drains, ditches and culverts which have been obstructed by his work; and, shall leave the site in a neat condition wherever his operations have disturbed existing conditions.

3.02 FINAL CLEANUP

A. Final cleanup (including any property restoration, replacement or restitution per the Contract) shall be completed to the satisfaction of the right-of-way grantor, or any

abutters, as well as to the satisfaction of any municipal or state authority which may be involved if in public right-of-way.

-- END OF SECTION --

DIVISION 2: SITE WORK

SECTION 02230 – CLEARING, GRUBBING AND RESTORATION

PART 1 - GENERAL

1.01 SCOPE

A. The Contractor shall do all clearing, grubbing, topsoil stripping, and restoration necessary for the construction of this project.

PART 2 - PRODUCTS

1. MATERIALS

A. Materials shall be at Contractor's option, except that stripped topsoil shall be stockpiled and replaced in approximately its original location and to its original depth.

PART 3 - EXECUTION

3.01 CLEARING AND GRUBBING

A. Before any excavation shall begin, the Contractor shall remove all underbrush, trees, stumps, or other obstructions within the work area, but shall not work on any private property without permission. The Contractor and MTA resident shall agree upon the extent of clearing within the work area prior to the start of work. The Contractor shall not deviate from the agreed upon limits without the permission of the MTA resident.

B. All limbs, stumps, etc., shall be disposed of offsite by the Contractor and at his expense unless otherwise specified.

C. After the trees have been cut and stumps removed from wooded areas and in all field areas, existing topsoil and humus material shall be excavated and stockpiled by the Contractor.

D. If the Contractor fails to salvage and reuse existing topsoil and humus material, he shall furnish sufficient loam from off the project site to restore the disturbed areas to match the existing topsoil depth, at no additional expense to the Owner.

E. No excavations for pipe laying shall begin until the existing topsoil and humus material has been stockpiled.

3.02 CARE AND RESTORATION OF EXISTING PROPERTY

A. Excavating machinery shall be of suitable type and be operated with care to prevent injury to trees not to be cut, and particularly to overhanging branches or limbs.

B. Branches, limbs and roots shall not be cut except by permission of the MTA resident. All cutting shall be smooth and neatly done without splitting or crushing. In case of cutting or unavoidable injury to branches, limbs, or trunks of trees, the cut or injured portion shall be neatly trimmed and covered with an application of grafting wax or tree-healing paint as directed.

C. Cultivated hedges, shrubs, and plants which might be injured by the Contractor's operations shall be protected by suitable means or shall be dug up and temporarily replanted and maintained. After the construction operations have been substantially completed, they shall be replanted in their original position and cared for until growth is re-established. If cultivated hedges, shrubs and plants are injured to such a degree as to affect their growth or diminish their beauty or usefulness, they shall be replaced by items of kind and quality at least equal to the kind and quality existing at the start of the work.

D. All surfaces which have been damaged by the Contractor's operations shall be restored to a condition at least equal to that in which they were found immediately before work was started.

E. The Contractor shall be fully responsible for all damages to public and private property and will be expected to carefully protect from injury all walls, fences, buildings, and underground facilities. If removal and replacement is required, it shall be done so that the replacement is equivalent to that which existed prior to construction and shall be paid for by the Contractor.

-- END OF SECTION --

PART 1 - GENERAL

1.01 SCOPE

A. Furnish all labor, materials, equipment and incidentals necessary to perform all installation, maintenance, removal and area cleanup related to sediment and erosion control work as shown on the Drawings and as specified herein. The work shall include, but not necessarily be limited to installation of silt fences, sediment traps, sediment removal and disposal, device maintenance, removal of temporary devices, temporary mulching, erosion control blanket, and final cleanup.

1.02 SUBMITTALS

A. Within 10 days after award of Contract, submit to the MTA resident for approval technical product literature for all commercial products to be used for sedimentation and erosion control.

1.03 REFERENCE MANUAL

A. Except as otherwise specified herein, the material and construction shall be in accordance with the Department of Transportation "Standard Specifications for Highways and Bridges of the State of Maine" and the "Maine Erosion and Sedimentation Control Handbook for Construction, Best Management Practices" (BMP Handbook).

1.04 PERFORMANCE REQUIREMENTS

A. The CONTRACTOR shall be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to offsite areas or into streams and wetland areas via surface runoff or underground drainage systems. Measures in addition to those shown on the drawings necessary to prevent the movement of sediment off site, control erosion or stabilize disturbed areas shall be installed, maintained, removed and cleaned up at no additional cost to the OWNER.

B. Sedimentation and erosion control measures shall conform to the requirements of the BMP Handbook.

C. Where CONTRACTOR's effort to control erosion has been demonstrated to be ineffective or potentially ineffective in the opinion of the MTA resident, the MTA resident may order that the erosion control plan be amended and that additional erosion control measures be constructed at no additional cost to the OWNER.

1.05 SEQUENCE OF CONSTRUCTION

A. All hay bale check dams and silt fencing shall be in place below or adjacent to construction areas before actual construction begins. These devices shall remain in place until a healthy grass cover is obtained and the site is stabilized. These temporary structures shall be inspected weekly throughout the construction phase. They shall be repaired or replaced when necessary. These devices shall be removed when the area they serve is completely stabilized.

B. Permanent re-vegetation or seeding of all disturbed areas shall occur immediately upon completion of work or, if temporary stabilization measures were used, within 7 days from the time the area was last actively worked. Temporary stabilization measures are required within two days from the time the area was last actively worked or prior to storm events.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Silt Fence

1. Steel or wood posts shall be a minimum of 5 feet in length.

2. Silt fence fabric shall be a woven, polypropylene, ultraviolet resistant material such as Mirafi 100X as manufactured by Mirafi, Inc., Charlotte, N.C. or equal.

B. Mulch material for all slopes equal to or greater than 20% shall be an erosion control blanket (ECB). The ECB shall consist of 70% long fiber hay or straw and 30% coconut fiber. The fibrous material shall be held in place by top and bottom netting sewn together. The fibrous material shall be reasonably free from noxious weeds or other undesirable material. The ECB shall be Type SC150 as manufactured by North American Green, or approved equal.

C. For slopes less than 20% and level areas, mulch material shall consist of long fiber hay or straw reasonably free from noxious weeds or other undesirable material. No material shall be used which is so wet, decayed, or compacted as to inhibit even and uniform spreading. No chopped hay, grass clippings or other short fiber material shall be used unless directed. The hay or straw shall be treated with a mulch tackifier.

D. Latex acrylic copolymer such as Soil Sealant with coalescing agent as manufactured by Soil Stabilization Co., Merced, California, or approved equivalent, shall be used as hay or straw mulch tackifier. Asphalt tackifiers are not allowed.

PART 3 - EXECUTION

3.01 MINIMIZATION OF EXPOSED SOILS

A. Minimizing the exposed soil areas on the construction site is one of the most important and reliable methods of erosion control. The CONTRACTOR must phase the work so that areas of bare soil will be minimized. Exposed areas must be treated as described herein and in the BMP Handbook.

3.02 TEMPORARY EROSION AND SEDIMENTATION CONTROL MEASURES

A. Temporary erosion and sedimentation control measures will include silt fences, hay bale barriers, temporary seeding, temporary mulching and topsoil stockpiling.

B. Silt fence will be placed down slope of all construction areas which drain toward a stream, wetland or improved area.

C. Hay bale barriers will be used as necessary until final restoration is complete. They may also be used as check dams in drainage areas. Hay bales will be staked end to end in an excavated trench four inches deep across the area of runoff.

D. Temporary mulching will be placed on all disturbed areas within two days or prior to any storm event. Mulch anchoring will be used on areas where the slope is greater than 5% or when placed after September 15. Straw mulch shall be applied at a rate of 90 lbs. per 1000 sq. ft. All mulched areas will be inspected before and after storms. If less than 90% of the surface is covered by mulch, additional mulch shall be applied immediately. Mulching shall be installed and maintained as recommended in the BMP Handbook.

E. Topsoil shall be stockpiled on site with silt fence installed down slope of the piles. These stockpiles shall be mulched in accordance with the temporary mulching requirements.

3.03 INSTALLATION

A. Silt Fence Installation

1. Position silt fences as shown on the Drawings and as necessary to prevent off site movement of sediment produced by construction activities as directed by the MTA resident.

2. Dig trench approximately 4 inches wide and 4 inches deep along proposed fence lines.

3. Drive stakes 8 feet on center (maximum) at back edge of trenches. Drive stakes 2 feet (minimum) into ground.

4. Attach filter fabric on stakes to bottom of trench with about 4 inches of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and secure.

5. Backfill trench with excavated material and tamp.

6. Install pre-fabricated silt fence according to manufacturer's instructions.

3.04 MAINTENANCE AND INSPECTIONS

A. Inspections

1. CONTRACTOR shall make a visual inspection of all sediment control devices daily and immediately before and after every rainstorm.

2. If such inspection reveals that additional measures are needed to prevent movement of sediment to offsite areas or into streams or wetland areas, CONTRACTOR shall promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.

B. Device Maintenance

1. Silt fences

a. Remove accumulated sediment once it builds up to one-half of the height of the fabric.

b. Replace damaged fabric or patch with a two foot minimum overlap.

c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.

3.05 EROSION CONTROL BLANKET

A. Install erosion control blankets in accordance with manufacturer's instructions. Properly prepare, fertilize and seed the area to be covered with permanent vegetation before the blanket is applied. Apply the blankets in the direction of water flow and staple together in accordance with manufacturer's instructions. Side overlaps shall be 2-inch minimum. The staples shall be made of wire .091-inch in diameter or greater, "U" shaped with legs 10 inches in length and a 1- inch crown. The staples shall be driven vertically into the ground at a rate of one staple per square yard according to manufacturer's staple pattern guide.

B. Bury upper and lower ends of the matting to a depth of 4 inches in a trench. Where the matting must be cut or more than one roll is required, turn down upper end of downstream roll into a slit trench to a depth of 4 inches. Overlap lower end of upstream roll 4 inches past edge of downstream roll and staple.

C. To ensure full contact with soil surface, roll matting with a roller weighing 100 pounds per foot of width perpendicular to flow direction after seeding, placing matting, and stapling. Thoroughly inspect after completion. Correct any areas where matting does not present a smooth surface in full contact with the soil below.

3.06 REMOVAL AND FINAL CLEANUP

A. Once the site has been fully stabilized against erosion, remove sediment control devices and all accumulated silt. Dispose of silt and waste materials in proper manner. Re-grade all areas disturbed during this process and stabilize.

-- END OF SECTION --

PART 1 - GENERAL

1.01 DESCRIPTION

A. This section includes all excavation for water mains, hydrants and appurtenances, including drainage, sheeting and bracing, backfilling, disposal of surplus material, and miscellaneous grading. All work shall be done as indicated on the drawings and as herein specified.

B. Excavation for water mains shall be the width and depth as indicated on the standard details. Excavation for hydrants and appurtenances shall provide suitable room for their construction.

C. The Contractor shall furnish and place all sheeting, bracing and supports, and necessary dewatering, and shall carry out the excavation in such a manner as to eliminate all possibilities of undermining or disturbing existing pipelines, utilities, roadways, shoulders and/or structures.

D. The Contractor shall furnish, place and compact various types of bedding material and trench sand as called for in the specifications or as directed. The types and quality of bedding and backfill material are specified in this section, but its use for pipe bedding, backfill, replacement of unsuitable material excavated below trench grade, and other uses are as specified elsewhere.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Bedding Material

1. Screened or crushed gravel bedding material shall be hard durable particles free from organic matter, lumps of clay and other deleterious substances. The gradation shall meet the requirements of the following table and MDOT specifications Section 703.06 Type B aggregate.

Sieve Size Designation	% By Weight
½ inch	35 - 75
¼ inch	25 – 60
No. 40	0 – 25
No. 200	0 – 5.0

2. Select backfill as specified below may be used for bedding material.

3. Bedding material shall not contain particles of rock which have any dimensions greater than 4”.

B. Select Backfill

1. Sand backfill shall be hard, durable particles of granular material with 100% passing the 1/2" sieve and between 0-15 % passing the #200 mesh. All percentages are by weight. Sand shall be graded so as to secure the required compaction.

C. Backfill

1. Suitable native material that does not contain stone or rock particles with any dimensions greater than 8".

2. Granular borrow (MaineDOT 703.19)

D. Pea Stone

1. Pea stone for pipe support in casing shall be clean stone with 100% passing the 3/8" sieve and 0-4% passing the #200 mesh.

PART 3 - EXECUTION

3.01 EXCAVATION

A. When any pavement, regardless of type, must be cut, it shall be done in a neat and symmetrical manner by use of a saw, chisel, or other suitable method. In no case shall pavement be torn up with a backhoe bucket except between and inside of cuts previously made as above. Should any further pavement be broken, outside of the cuts, as by blasting, such damaged pavement shall be cut out in a neat and orderly fashion.

B. The Contractor shall perform all excavation of every description and of whatever substances encountered to the depths shown on the drawings or directed by the MTA resident.

C. No extras will be allowed for quicksand excavation, muck excavation, or any other type unless specifically provided for in the bidding schedule.

D. Surplus excavated material may be used at other parts of the construction project as required for fill, etc. Excess material shall be disposed of by the Contractor.

E. The sidewalls of all trench excavation shall be kept as nearly vertical as possible in all roadways, lawns, near homes, etc. by sheeting, bracing, or other means. The width of the trench at a point six (6) inches above the top of the water pipe shall not be greater than the width detailed. If the type of excavated material will not allow the width detailed, then the trench shall be properly sheeted and braced. The cost of sheeting, bracing, or other means is included in the cost of the pipelines and no extras will be allowed.

F. The excavation shall be made to secure a flat bottom trench (undisturbed earth bottom) for the full length of the pipe so as to give a uniform support to the pipe and shall be in accordance with ANSI A21.50 (AWWA C150), Type 2 Laying Condition.

G. The bottom of the trench shall be accurately graded to provide support to the full length of the pipe barrel. Excavate at each bell to prevent bell from bearing on trench bottom.

3.02 EXCAVATION BELOW TRENCH GRADE

A. By mistake of Contractor: Where the bottom of the trench shall, by mistake of the Contractor, have been taken out to a greater depth than required, it shall be refilled to the proper grade with bedding material, and all to be placed and compacted as specified at no additional cost to the Owner.

B. By instruction from MTA resident: If, in the opinion of the MTA resident, existing material below trench grade is unsuitable for properly laying the pipe, the Contractor will excavate and remove the unsuitable material and replace the same with bedding material as authorized by the MTA resident and properly compacted to his satisfaction. The Contractor will be paid under the item titled "Unsuitable Material Excavated Below Trench Grade."

3.03 EXCAVATION NEAR EXISTING UTILITIES, ETC

A. It will be necessary to excavate near existing pipes, drains and other utilities in certain locations. Some of these have been indicated on the drawings, but no attempt has been made to show all of the services and the completeness and accuracy of the information given is not guaranteed. The Contractor shall call "Dig-Safe" at least three business days in advance of any excavation to allow utilities to locate underground facilities.

B. As the excavation approaches pipes, conduits, or other underground structures and utilities, digging by machinery shall be discontinued and the excavation shall be done by means of hand tools.

C. If the utility is of the opinion that at any point sufficient or proper support has not been provided, they may order additional supports placed at the expense of the Contractor. Compliance with such order shall not relieve the Contractor from his responsibility for the sufficiency of such supports. It shall be the responsibility of the Contractor to prevent damage to or displacement of utilities and to consult with and request the concurrence of the utility company's representative in this matter at all locations. The cost of protecting such utilities shall be considered incidental to the cost of laying the pipe.

3.04 TRENCH SURCHARGES

A. The excavated material shall be placed adjacent to the excavation in a manner to cause no excessive surcharge on the trench bank nor to obstruct free access to hydrants and valves. Should traffic or other conditions make it impractical or unsafe to stack material adjacent to trench, it shall be hauled and stored at a location provided by the

Contractor and at the expense of the Contractor. When required, it shall be re-handled and used in backfilling the trench by the Contractor and at his expense.

3.05 SHEETING AND BRACING

A. The Contractor shall be responsible for the design, construction, maintenance and safety of all sheeting and bracing required to support the sides of the excavation and to prevent the movement of earth which could in any way damage or endanger adjacent structures, utilities, roadways, increase the width of the excavation to more than that specified, or delay the work.

B. All sheeting, bracing and shoring is to be included in prices bid for several items of work in bidding schedule and will not be paid for as separate items.

C. No shoring shall be left in place unless so directed by the MTA resident.

3.06 DRAINAGE AND DEWATERING OF EXCAVATIONS

A. The Contractor shall conduct his operations so as to prevent at all times the accumulation of water, ice and snow in excavations or in the vicinity of excavated areas so as to prevent water from interfering with the progress or quality of the work. Under no conditions shall water be allowed to rise in unbackfilled trenches after pipe has been placed.

B. Accumulated water, ice and snow shall be promptly removed and disposed of by dewatering. Disposal shall be carried out in a manner which will not create a hazard to public health; nor cause injury to public or private property, work completed or in progress, or public streets; nor cause any interference in the use of streets and roads by the public. Pipes under construction shall not be used for drainage of excavations.

C. During construction, when an unstable condition in the pipe sub-grade has been created due to the Contractor's excavation, the sub-grade shall be stabilized by dewatering or other means accepted by the MTA resident.

3.07 BACKFILLING – GENERAL

A. In general and unless other material is indicated on the drawings or is specified, material used for backfilling trenches and excavations around structures shall be suitable material which was removed in the course of making the construction excavations or as specified.

B. Frozen materials shall not be placed in the backfill, nor shall material be placed upon frozen material. Previous frozen material shall be removed or shall be otherwise treated as required before new backfill is placed.

C. Backfilling shall be done as soon as practical after the pipe has been laid and jointed.

3.08 SUITABLE BACKFILL MATERIAL

A. Suitable backfill material shall be the following or a combination of the following:

1. Excavated material that will compact to the compaction requirements.

2. Material that does not contain rocks larger than 8" in any dimension.

3. Dry clay backfill free from lumps.

4. Wet clay that alone would pump but when mixed with sand and/or gravel will be stable and will compact.

3.09 BACKFILLING PIPE TRENCHES

A. As soon as practicable after the pipes have been laid and jointed, backfilling shall begin and shall proceed until it is completed or has sufficient backfill to allow pipe testing.

1. The first layer of suitable backfill material shall be brought half-way up the pipe and compacted to 80% maximum density and then the normal backfilling shall begin and shall be compacted as specified.

2. All backfill shall be thoroughly compacted by hand tamping as placed, by use of mechanical or vibratory compactors, or by other acceptable methods.

3. Remainder of the trench shall be backfilled as follows:

a. In paved areas, road shoulders and seeded areas, the entire depth of trenches above the center line of the pipe shall be backfilled in eight (8) inch layers with suitable backfill material and each layer thoroughly and carefully compacted as specified. Bring backfill up to bottom of gravel base and/or loam.

b. In other areas, the trench above the center- line of the pipe shall have suitable backfill material placed and compacted in eighteen (18) inch maximum layers as specified.

B. The nature of the excavated materials will govern both their acceptability for backfill and the method best suited for their placement and compaction in the backfill.

1. Both the materials and the methods shall be subject to the acceptance of the MTA resident.

2. No stones or rock larger than 8" in the greatest dimension shall be placed in the backfill.

C. Backfilling in public right-of-way, along the streets or highways in or along shoulder, berm or backslope shall be done in accordance with the specifications and requirements of the state or municipality, whichever is responsible for the street or highway involved. Responsibility for the fulfillment of permit conditions or any other applicable requirements of the street or highway authority shall be the obligation of the Contractor. Surface restoration shall be carried out to the satisfaction of the street or highway authority or as shown on the plans.

D. Backfilling shall follow pipe laying as closely as reasonable, so that a minimum of trench shall be open at any time. The regulations of the highway authorities shall be observed as regards the amount of trench to be open at any one time. Overnight, and especially over weekends and holidays, the amount of open trench shall be kept at an absolute minimum. Any caved-in trench, especially after heavy rain and flooding, shall be cleaned out and the bottom consolidated before any additional pipe shall be laid.

3.010 TOP OF BACKFILL

A. In paved and shoulder areas, backfill shall be carried up to pavement or shoulder sub-grade ready to receive the gravel base. In other areas, backfill shall be brought up to adjacent finished grade minus the depth of any required topsoil and so as to provide a finished surface slightly mounded over the trench. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required for proper compaction, and shall then be refilled and compacted with the surface restored to required grade and degree of compaction, mounded over, and smoothed off, at no additional expense.

B. In unpaved areas, the gravel topping shall be left in a smooth and even condition, with no large stone on or in the surface. In cases where a paved surface has been broken, a temporary bituminous patch and/or a permanent paving restoration shall be made as required by the appropriate local or state road authority.

3.011 COMPACTION

A. Compaction densities specified herein shall be the percentage of the maximum density obtainable at optimum moisture content as determined and controlled in accordance with AASHTO Standard T-180, Method A or D depending on the material size. Field density tests shall be made in accordance with AASHTO Standard T-147.

B. Each layer of backfill shall be moistened or dried as required and shall be compacted to the following densities, unless otherwise specified in the project specifications.

1. Bedding material: 80%

2. Suitable backfill material under paved or shoulder areas: 90%

3. Gravel base

    a. Under paved areas: 95%

    b. In shoulder areas: 90%

    c. As replacement for unsuitable material excavated below grade: 90%

4. Loam areas: 90%

5. All other areas: 85%

C. Methods and equipment proposed for compaction shall be subject to prior acceptance by the MTA resident. Compaction generally shall be done with vibrating equipment. Displacement of, or injury to, the pipe and structure shall be avoided. Movement of in-place pipe or structures shall be at the Contractor's risk. Any pipe or structure damaged thereby shall be replaced or repaired as directed by the MTA resident and at the expense of the Contractor.

D. Testing:

1. Field density tests may be ordered by the MTA resident for each foot of depth of backfill at an average interval of 200 feet along the trench.

2. The Contractor shall furnish all necessary samples for laboratory tests and shall provide assistance and cooperation during field tests. The Contractor shall plan his operations to allow adequate time for laboratory tests and to permit taking of field density tests during compaction.

3. Any costs of retesting required as a result of failure to meet compaction requirements shall be borne by the Contractor.

3.012 FILL AND GRADING

A. Excavated material not required for backfilling around pipes or structures may be used for fill in areas which require material for re-grading.

B. The re-grading shall be carried out as directed by the MTA resident, so that all surface water will drain towards brooks or drainage pipes.

C. All material shall be of such nature that after it has been placed and properly compacted, it will make a dense and stable fill.

3.013 PROTECTION OF EXISTING STRUCTURES

A. All existing pipes, wires, poles, fences, property line markers and other items, which must be preserved in place without being temporarily or permanently relocated, shall be carefully supported and protected from injury by the Contractor, at no additional cost to the Owner. Should such items be injured, they shall be restored by the Contractor, without compensation therefore, to at least as good condition as that in which they were found immediately before the work was begun.

3.014 ACCOMMODATION OF TRAFFIC

A. The Contractor shall construct and maintain, without extra compensation, such adequate and proper bridges over excavations as may be necessary or as directed for the safe accommodation of pedestrians and vehicles. The Contractor shall furnish and erect, without cost to the Owner, substantial barricades at crossing of trenches, or along the trench, to protect the traveling public.

B. The Contractor shall not obstruct fire hydrants.

3.015 PLACEMENT OF STONE IN ANNULAR SPACE OF CASING

A. The Contractor shall place clean 3/8" stone in the casing annular space. Specialty contractors that blow soil and mulch through delivery piping have the necessary equipment : Bark Brothers of Lewiston or equal.

SECTION 02537 – WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE

A. This section includes the furnishing and installing of ductile iron water pipe and ductile iron or cast iron fittings as specified.

1.02 SUBMITTALS

A. Submit shop drawings for all material in accordance with the provisions of Section 01300.

PART 2 - PRODUCTS

2.01 GENERAL

A. Upon approval of the proposed Manufacturer and Product Series, the Contractor shall utilize that source for said material for the entirety of the Work unless otherwise approved by the MTA Re to maintain consistency throughout the project.

B. Pipe delivered for construction shall be strung and protected so as to prevent entrance of any foreign material.

C. Any defective or imperfect materials furnished by the Contractor shall be marked as such and removed immediately from the site. Satisfactory materials shall be substituted for that rejected at no additional cost to the Owner.

D. All materials, products and coating that contact drinking water shall be certified to meet NSF/ANSI Standard 61 – latest revision, Drinking Water System Components – Health Effects.

2.02 ATTACHMENT HARDWARE

A. Stainless Steel: Type 304 – contains the addition of Molybdenum to the nickel-chromium steels.

B. High Strength/Low Alloy Steel: Trade name for cold formed T-head bolts containing alloying elements such as copper, nickel, and chrome (Cor-Blu).

2.03 CAST IRON OR DUCTILE IRON SPLIT REPAIR SLEEVE

A. Split repair sleeve shall be mechanical joint.

B. The side rubber gaskets shall be rectangular to cross-section and shall fit into grooved channels in the casting. These gaskets shall extend the entire length of the sleeve.

C. Split repair sleeve shall be AB-CD pattern to permit use of plain rubber and duck-tipped gaskets for various O.D. piping sizes.

D. Mechanical joint with accessories furnished; glands, gaskets and Cor-Ten T-bolts and nuts or equal.

E. All side bolts shall be Stainless Steel (Type 304) or silicone bronze.

F. Interior and exterior to be bituminous coated with a minimum of 4 mils D.F.T.

G. The sleeve shall be provided with a 2" F.I.P.T. test port with brass plug.

2.04 CORPORATION STOP

A. Conforming to AWWA C-800.

B. ¾" to 2" curb stops shall be ball valve design with brass ball that is Teflon coated or brass ball with Teflon seats.

C. The ball shall be supported by seats which are water tight in either direction.

D. The valve shall have a full port opening.

E. The body of the corporation stop shall be of heavy duty design.

F. The valve working pressure shall be 300 psi.

G. Approved Manufacturers:

1. A.Y. McDonald
2. Cambridge Brass
3. Ford Meter Box Co.
4. Mueller Co.

2.05 CURB STOP

A. Conforming to AWWA C-800.

B. ¾” to 2” curb stops shall be ball valve design with brass ball that is Teflon coated or brass ball with Teflon seats.

C. The ball shall be supported by seats which are water tight in either direction.

D. The valve shall have a full-port opening.

E. The valve shall open with ¼ turn (90°) with a check or stop.

F. The valve shall not have a drain.

G. The valve stem shall have 2 “O” rings and a bronze ring lock which holds the stem solidly in the valve body.

H. The valve body shall be of heavy duty design.

I. The valve working pressure shall be 300 psi.

J. Approved Manufacturers:

1. A.Y. McDonald
2. Cambridge Brass
3. Ford Meter Box Co.
4. Mueller Co.

2.06 CUT-IN SLEEVE

A. The sleeve shall be mechanical joint to plain-end type.

B. The sleeve shall fit over either AB or CD pattern pipe.

C. Interior coating– Seal-coated – AWWA C104-74, min. 4 mils D.F.T.

D. Exterior coating – Bituminous coated, min. 4 mils D.F.T.

E. Mechanical joint connections

1. Glands: Duck-tipped for AB pipe, Plain Gaskets for CD pipe
2. Cor-Ten tee bolts and nuts

F. Cut-in sleeves shall have at least one stop-screw in sizes up through 10” and at least 2 stop-screws in 12” size.

G. The stop-screw “O” ring shall be recessed into the body of the sleeve between stop-screw and body.

H. Approved Manufacturers

1. Mueller Co.

2.07 DUCTILE IRON FITTINGS

A. Fittings include but are not limited to bends, reducers, off-sets, tees and sleeves.

B. Material shall be ASTM A536 latest, grade 70-50-05, in accordance with AWWA C110 (latest revision) for fittings larger than 24" and C153 (latest revision) for fittings 3" thru 24".

C. Fittings shall be cement lined AWWA C104 (latest revision) or fusion bonded epoxy coated with a 5 mil nominal thickness per AWWA C550 and C116.

D. Interior seal coated AWWA C104 with minimum of 4 mils dry film thickness.

E. Exterior bituminous coated, 4 mils minimum dry film thickness or fusion bonded epoxy coated with a 5 mil nominal thickness per AWWA C550 and C116.

F. Sleeves shall not be cement lined, but shall be bituminous coated inside to 4 mils dry film thickness. All sleeves shall be long body type.

G. Mechanical joint with accessories furnished: D.I. glands, gaskets, Cor-Ten T-bolts and nuts

H. Class 350 pressure rating in accordance with AWWA C153 - 3"-24" sizes.

I. Class 250 pressure rating in accordance with AWWA C110 - 30"-48" sizes.

J. The "compact design" fittings must provide adequate space for the MJ joint and accessories to be installed without special tools (i.e. Lowell wrench can be used).

2.08 DUCTILE IRON PIPE

A. Ductile iron pipe shall meet requirements of AWWA Standard C-151 (latest revision) and be cement lined and seal coated to meet AWWA Standard C-104 (latest revision).

B. Joints shall meet requirements of AWWA C-111 (latest revision).

C. Interior seal coated, bituminous paint oil cut, emulsion not acceptable, thickness minimum of 2 mils dry film thickness.

D. Exterior bituminous coated with minimum of 2 mils dry film thickness.

E. Class 52 wall thickness, 4-inch diameter through 12-inch diameter inclusive.

F. Ductile Iron Pipe with diameters 16-inches and larger shall be approved by PWD.

G. State nominal laying length and mark shorter lengths near bell.

H. Mechanical joint pipe to be furnished with gland, gaskets and Cor-Ten bolts and nuts.

I. Approved Manufacturers

1. American Cast Iron Pipe

2. U.S. Pipe

2.09 HIGH DENSITY POLYETHELENE PIPE

A. HDPE pipe shall be manufactured in accordance with AWWA C906. This material shall have a long term Hydrostatic Strength of 1600 psi when tested in accordance with ASTM D2837. HDPE shall be manufactured from PE 4710 polyethylene compounds that meet or exceed ASTM D3350 cell classification 445574. The manufacturer shall comply with NSF Standard 61 and/or Standard 14 and must be certified by the NSF International for potable water. Joints shall meet requirements of AWWA C-111 (latest revision).

B. The pipe and fittings shall have a Standard Dimension Ratio (SDR) of 11 and be rated for a working pressure of 200 psi at a temperature of 75 degrees Fahrenheit with a service life of 50 years. All pipe and fittings shall be ductile iron pipe size.

C. 2” and smaller diameter service connections shall be made using an electro fusion transition corporation saddle. Outlet material shall be brass alloy and the compression ring shall be 304 stainless. Larger diameter services connections shall be made using electro fusion branch saddles compatible with the pipe.

D. A 10 gauge insulated (for direct buried use) solid copper wire shall be fastened to the buried pipe to facilitate electronic pipe locating. The wire shall be fastened at two locations per length. Wire share be polyethelene coated per ASTM D-1248. Insulation thickness shall be a minimum of .030”.

E. Approved Manufacturers

1. Performance Pipe

2. JM Eagle

3. Isco Industries

4. Or Equal

2.10 FIRE HYDRANT

A. The hydrant shall open right.

B. Operating nut shall be DI or bronze, pentagon in shape with dimensions:

1. Top 1-13/16” tapering to 1-7/8” on bottom

C. Nozzles:

1. Two (2) each: 2-1/2” National Standard Thread

2. One (1) each: 4-1/2” National Standard Thread

D. Port covers shall be supplied without chains and shall have the same size pentagon operator as specified in 3.0(b) above.

E. Traffic model hydrant with breakaway feature.

F. Barrel Length

1. 6 ft. cover, 6-1/2 ft. bury; or

2. 5-1/2 ft. cover, 6 ft. bury; or

3. 5 ft. cover, 5'-6" bury

G. Hydrant shoe or base shall have 6" MJ inlet and 5-1/4" valve opening with non-draining bronze seat that is permanently plugged. Valve seat and sub-seat arrangement shall be bronze to bronze. Horizontal and vertical blocking planes manufactured into hydrant base.

H. Bolts

1. All buried mechanical joint bolts and nuts (T-head, etc.) shall be Cor-Blu or equal

2. All buried flange joint bolts shall be stainless steel (Type 304) or silicone bronze

I. Protective Coatings

1. All paintings and coatings shall be a minimum of 3 mils total dry film thickness, unless noted

2. The internal area of the hydrant base, which is normally exposed to water and which includes the internal body of hydrant shoes, including lower valve plate, shall be epoxy coated

3. All internal and external cast iron or ductile iron components shall be coated with an approved bituminous coating, 3 mils minimum.

4. Coatings for upper barrel - exterior:

a. Surface preparation blast clean SSPC-SP-6

b. Primer Sherwin Williams Red Oxide E61RC21, 1.5 mils, dry

c. Finish coat Sherwin Williams – Regal Yellow, F78Y30, 1.5 mils, dry or sufficient paint to hide the second coat

d. Total dry film thickness - 3 mils minimum

5. Coatings for bonnet, operating nut, port cap:

a. Surface preparation: Blast clean, SSPC-SP-6

b. Exterior primer

c. Exterior aluminum

d. Total dry film thickness: 3 mils minimum.

J. PWD personnel shall install flow indicator collars on all new hydrants.

K. Approved Hydrants:

1. Clow Eddy – with lower stern machined from bar stock

2. American Darling Models: B62B-1, B62B-5

2.11 PIPE JOINT RESTRAINT

A. Use in conjunction with mechanical joint fittings.

B. The joint restraint ring and its wedging components shall be made of ductile iron conforming to ASTM A536-80.

C. Dimensions of the restrainer must allow use with standard M.J. bell conforming to AWWA C111 and AWWA C153.

D. Restrainer must restrain up to 350 psi of working pressure in 3” to 16“ size and 250 psi of working pressure in 18” to 48” size with a 2:1 safety factor.

E. Torque limiting twist off nuts shall be used to ensure proper actuation of the restraining wedges where applicable.

F. Approved Manufactures

1. Sigma Super Lug

2. Ford Uni-Flange Series 1400

3. Ebba Mega Lug

4. Romac Grip Ring

5. Star Grip Series 300

6. Romac Romagrip

7. MJ FIELD LOK Gasket

2.12 POLYETHYLENE ENCASEMENT

A. Tube type polyethylene encasement shall be installed on all ductile iron pipe and fittings in accordance with AWWA Standard C105 - latest revision, Method A.

B. Polyethylene encasement shall be either linear low-density polyethylene (LLDPE) film with a minimum thickness of 8-mil or high-density, cross-laminated polyethylene (HDCLPE) film with a minimum thickness of 4-mil.

C. Circumferential wraps of tape or plastic tie straps shall be placed at 2-ft. intervals along the barrel of the pipe.

D. The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material but is not intended to be a completely airtight or watertight enclosure. All lumps of clay, mud, cinders, and so forth, on the pipe surface shall be removed prior to installation of the polyethylene encasement. During installation, care shall be exercised to prevent soil or embankment material from becoming trapped between the pipe and the polyethylene.

E. The polyethylene film shall be fitted to the contour of the pipe to effect a snug, but not tight, encasement with minimum space between the polyethylene and the pipe. Sufficient slack shall be provided in contouring to prevent stretching the polyethylene where it bridges irregular surfaces, such as bell-spigot interfaces, bolted joints, or fittings, and to prevent damage to the polyethylene due to backfilling operations. Overlaps and ends shall be secured with adhesive tape, string, plastic tie straps, or any other material capable of holding the polyethylene encasement in place until backfilling operations are complete.

F. Three layers of polyethylene adhesive tape shall be wrapped around any polywrapped pipe where a tapping machine will be placed. All copper services connected to a pipe wrapped in polyethylene encasement shall be wrapped within three feet of the pipe.

2.13 PVC PIPE

A. For all water main installations that are less than 4” I.D. (4” and larger use ductile iron), the District will require use of 2” I.D. PVC plastic water pipe meeting the following: Under special site conditions the District does require the use of C-900 PVC in sizes larger than 4”.

B. Two inch diameter (2”)

1. The I.D. shall be a minimum of 2”

2. The O.D. shall be a maximum of 2.38”

3. The minimum wall thickness shall be 0.113”

4. The minimum working pressure rating shall be 200 PSI (SDR-21).

5. The pipe shall conform to standard ASTM 2241.

6. The pipe shall be provided in 20’ lengths. If approved by the MTA Resident, field cutting per Manufacturer’s recommended practices.

7. The gasket or O-Ring material shall be rubber meeting ASTM F 477 and of the “permanent use” type.

8. Fittings: Standard AWWA C900 fittings are not available in the 2” I.D. and therefore “steel pipe” class fittings, or Certa-Lok Yelomine couplings and fittings meeting ASTM D 3139 shall be used. The normal nomenclature for “steel fittings” is

Schedule 40 or Schedule 80, with the respective pressure ratings of 280 PSI and 400 PSI. Both of these fitting classes are acceptable for use.

9. Service Connections: All service connections shall be made with tapping saddles* per Portland Water District specifications or by use of tees meeting the above noted fitting specifications.

10. An eight gauge bare copper wire shall be fastened to the buried PVC pipe to facilitate electronic pipe locating. The wire shall be fastened at two locations per length and not at any joint.

C. The District requires 200 PSI (SDR-14) PVC pipe for other sizes such as 4", 6", 8", and 12". Pipe shall conform to AWWA C-900. PVC pipe for these sizes only as approved by PWD.

D. Approved Manufacturers:

1. J-M Manufacturing - Blue Brute

2. Certainteed – Yelomine

3. Victaulic – Aquamine

4. IPEX – Blue Brute

2.14 RESILIENT SEATED GATE VALVE

A. Valve shall meet the latest revision of the AWWA C-509 Standard.

B. Valve shall have a smooth unobstructed water way which shall be a minimum diameter of the valve.

C. Valve ends to be specified and shall be furnished with Cor-ten (or equal) bolts and nuts.

D. Valve shall be rated for zero leak rate at 200 psi differential working pressure and have a 400 psi hydrostatic test for structural integrity.

E. Sealing - Valve shall have a minimum of 2 "O" rings situated such that the "O" rings above the thrust collar can be replaced with the valve under pressure and in the open position.

F. Valve stem shall:

1. open right with a stem nut made of grade D,E manganese bronze

2. non-rising

3. include a thrust collar integrally cast to the stem

4. include with two (2) thrust washers, placed one above and one below the stem thrust collar

5. constructed of grade D,E manganese bronze

6. such that the thrust washers are made of a synthetic polymer with physical properties required

G. The body, including the stuffing box and the bonnet, shall be constructed of cast iron or ductile iron, meeting the latest revision of AWWA C-153

H. Wedge shall be constructed of ductile iron (less guiding mechanism), fully encapsulated and permanently bonded with a resilient elastomer, constructed such to allow the flushing of any interior exposed surface during operations.

I. Coatings

1. internal and external valve body, including the stuffing box, bonnet, and interior of the wedge shall be fusion bonded epoxy coated with 8 mils D.F.T.

2. interior shall meet latest version of AWWA C-550

3. shall be holiday free, interior and exterior, per testing method described in AWWA C-550, Sec. 5.1

J. Operating nut shall be two inch (2") square ductile iron with a countersunk hold down nut (made of 316 stainless steel or silicone bronze), for tapered stems. Or, a stainless steel pin inserted through the stem for full diameter stems.

K. Bolts – The seal plate and bonnet bolts shall be stainless steel (Type 316 or Type 304)

L. Valves 12" nominal diameter and smaller shall be directly operated by the nut on the valve stem and mounted vertically. Number of turns to open or close shall closely match the formula: (3 x D) + 2. For example, a 12" valve should open or close with approximately (3 x 12) + 2 = 38 turns of the operating nut.

M. Valves larger than 12" nominal diameter shall be designed to be installed horizontally and shall have bevel gear operators driven by the operating nut. Valves 14" – 24" nominal diameter shall have 4:1 bevel gear operators. Valves with 30" – 36" nominal diameters shall have 6:1 bevel gear operators and valves with 42" – 48" nominal diameters shall have 8:1 bevel gear operators. Number of turns to open or close shall closely match the formula: ((3 x D) + 2) times the bevel gear ratio. For example, a 24" valve should open or close with approximately ((3 x 24) + 2) x 4 = 296 turns of the operating nut.

N. Contractor may be required to supply a valve for inspection and determination of coating process.

O. Approved Manufacturers

1. U.S.P.

2. AFC Series 2500

3. Mueller A-2360/61/62

4. Clow Series F6100

2.15 BUTTERFLY VALVE

A. Butterfly valves and their operators shall conform generally, to AWWA standard C504, short body pattern Class 150B.

B. The valve shafts shall be in two parts, inserted from each side of the valve. The disc pins or bolts shall be fastened to prevent loss, loosening in service, and shall be sealed as necessary to prevent leakage through the disc. Valve shafts shall be stainless steel. Carbon steel shafts with stainless steel journals are not permitted. Shaft seals shall be the "O" ring type or self adjusted packing.

C. The valve disc shall be cast of either ductile iron or alloy iron and epoxy coated. The disc periphery shall be accurately machined or faced to form a 360 degree seating surface uninterrupted by shaft holes. The disc and shaft geometry shall be such that the seat rubber is not compressed when the valve is fully open.

D. The natural rubber, insert type valve seat shall be mechanically retained in place, independent of cementing or bonding agents. The mating seat material shall be stainless steel.

E. The stub shaft of all valves 16" and larger shall have a two way thrust bearing adequate to hold the disc centered in the valve seat.

F. The valve operators shall be manual, totally enclosed, grease packed, and of traveling nut and lever design. The gear housing shall be suitable for buried and submerged service; special provisions shall be made to seal the gear housing from water infiltration from the ground or along the valve shaft into the housing. The space between the valve body and the gear box shall be one iron casting designed so as to provide access sufficient to inspect and replace the "O" ring seals. Operating stems shall be fitted with standard AWWA 2" square operating nuts. All valves shall turn to the <u>RIGHT</u> to open.

G. The internal and external valve body shall be epoxy coated to C-550 with a minimum of 5 mils dry film thickness.

H. Seal plate and end cover bolts shall be 304 stainless steel, and valve ends as specified will be furnished with Cor-Ten, or equal, bolts and nuts.

I. Approved Manufacturers

a) Henry Pratt "Groundhog" Class 150 B
b) Mueller: "Lineseal III" Class 150 B
c) Clow / M&H / Kennedy Class 150 B

2.16 RESTRAINED JOINT GASKETS

A. Restrained joint gaskets in the Portland Water District distribution system shall be rated in accordance with the performance requirements of ANSI/AWWA C111/A21.11.

B. Required applications:

1. Any hydrant branch or service with a distance greater than 18’ shall have an approved restrained joint gasket in the bell ends.

2. Where a casing is required, all joints within the casing shall have an approved restrained joint gasket unless restrained joint pipe is used.

3. At any time as required by the Owner or MTA Resident.

4. Any live service tap where there is a joint between the connection and the end of the service

C. Approved Manufacturers

1. American Fast-Grip Gasket – American Pipe

2. Field Lok 350 Gasket – US Pipe

2.17 SERVICE BOX AND ROD

A. Service box

1. Shall be 1.0” Schedule 40 steel pipe with top having 1.0” N.P.T. pipe threads for screw-on cover or coupling.

2. Shall be Erie style with 6’ slide-type riser.

3. Any extension of a service box requires a threaded merchant coupling with no set screw.

B. Cover

1. Shall be Quincy type (heavy duty) cover that screws on Service Box (1.1 above)

2. Shall be tapped with a 1” rope thread with a solid brass plug with pentagon operating he

C. Service box foot piece

1. The standard foot piece shall be heavy duty (Ford style or equal) cast iron design.

2. The large, heavy-duty foot piece shall have an arch that will fit over 2” ball-valve curb stop

D. Service Rod

1. Shall have a self-aligning design
2. 36” length for all services
3. 24” length for air valves
4. Shall be round and constructed of stainless steel (304) with an epoxy coating (minimum 4 mil D.F.T.)
5. Shall have a yoke design that is an integral part of the rod
6. The curb-stop attachment pin shall be a brass cotter pin
7. The rod “wrench-flat” shall have a minimum thickness of ¼” tapered to 1/16” and width of 5/8” or ½”.
8. Diameter:
    a. ½” for ½”, ¾”, and 1” services
    b. 5/8” diameter for 1 ½” and 2” service

2.18 SERVICE SADDLE

A. The service saddle shall have the “larger sized” body, the same as associated with the “service repair” saddle, which shall have a minimum diameter of 6 in. and multiple “O” ring type sealing.

B. The saddle body shall be constructed of epoxy coated ductile iron.

C. The sealing gasket(s) shall be either Buna-N rubber or SBR rubber (ASTM D2000).

D. Service saddles shall be installed with all 1 1/2” and 2” corporation stops (cc only).

E. Approved Manufacturers:

Size	Tap	Saddle
2” – 2-1/4”	¾”, 1” cc	Smith-Blair 315, Ford FC 202
4” - 12” D.I.	¾”- 11/2” cc	Smith Blair 331
4” - 12” D.I.	2” cc	Smith-Blair 313
16”	¾”-2” cc	Smith-Blair 313
20” – 36”	¾”-2”cc	Smith-Blair 366

F. PVC Pipe: Stainless steel straps will be used on saddles on C-900 PVC Pipe

1. Approved Manufacturers:

Size	Tap	Saddle
2” – 2-1/4”	¾”, 1” cc	Smith-Blair 315, Ford FC 202
4”-12”		Smith-Blair 265

2.19 STAINLESS STEEL REPAIR CLAMP

A. The sleeve shall be of full circle design, either one piece or two piece, for pipe sizes 2" thru 12"

B. Body: Shall be 18-8 stainless steel shell.

C. Gasket: Shall be full length and diameter of the body size. This gasket shall form a multiple O-ring, or grid, sealing barrier for the entire length and circumference. Shall be virgin SBR rubber (ASTM D2000 AA 415)

D. Lugs, sidebar, and lifting bar shall be heavy gauge 18-8 stainless steel with TIG/MIG welding and chemical passivation of all welds.

E. Bolts and Nuts shall be Teflon coated 18-8 heavy gauge stainless steel.

F. Armor: The armor, or bridging plate between the side bars shall be heavy gauge 18-8 stainless steel bonded to the gasket to bridge the lug area.

2.20 TAPPING SLEEVE

A. For sizes 12" and smaller tapping sleeve shall be ductile iron or approved fabricated steel.

1. Tapping sleeve shall be mechanical joint with recessed outlet flange for tapping valve.

2. Tapping sleeve shall conform to AWWA C-207, Class D, with rated maximum working pressure of 200 psi.

3. The side rubber gaskets shall be rectangular in cross-section and fit into grooved channels in the casting. These gaskets shall extend the entire length of the sleeve and shall not require cutting or trimming to match MJ end gaskets.

4. Tapping sleeve shall be AB-CD pattern to permit use of plain rubber and duck-tipped gaskets for various O.D. piping sizes.

5. Mechanical joint with accessories furnished; glands, gaskets, and Cor-Ten T-bolts and nuts or equal.

6. All flange outlet bolts shall be stainless steel (Type 304).

7. Interior and exterior to be bituminous coated with a minimum of 4 mils dry film thickness or fusion bonded epoxy coated.

8. The sleeve shall be provided with a ¾" F.I.P.T. test port and brass lug.

9. Approved Manufacturers

a. AFC

b. Mueller Co.

c. US Pipe

d. Tyler / Union

e. Powerseal Model 3490 and 3490 MJ (Fabricated Steel)

B. For sizes 16” and larger tapping sleeve shall be fabricated steel:

1. Body and Flange - A-36

2. Coating - Fusion-bonded epoxy coating with minimum D.F.T. of 5 mils, inside and out

3. Bolts, Nuts - Stainless Steel (Type 304)

4. Gaskets – SBR

5. Flange - AWWA Class D plate flange with ANSI 150# drilling, proper recessing for tapping valves

6. Sleeves shall be provided with 3/4" F.I.P.T. test port and plug

7. Approved Manufacturers

a. Romac FTS 420

b. Fort FTSC

c. Smith Blair 622

d. JCM 412

e. Powerseal Model 3490 and 3490 MJ (up to 24”)

f. JCM 415 or approved equal (for RCCP pipe only)

2.21 VALVE BOX

A. Material shall be cast iron or ductile iron free from defects.

B. Interior and exterior of all components shall be bituminous coated with a minimum of 4 mils dry film thickness.

C. The valve box bottom section shall be slide-type with bell-type base with bottom lip

D. The valve box top section shall be slide-type, 36 inches long (minimum). No top flange and no “bead” or bottom flange

E. The valve box cover shall be a 2” drop-type cover to fit the 7-1/4” opening of the top sectio

F. The valve box intermediate (mid) section shall be slide-type with a minimum 3” belled bottom. Base section No. 645 may be used as an alternate.

2.22 Rigid Insulation

A. Where indicated on the drawings install 2” thick rigid insulation. Several layers may be specified depending on depth of cover. Insulation shall be polystyrene and specified for buried use.

PART 3 - EXECUTION

3.01 PIPE LAYING CONDITIONS

A. Pipe shall not be laid in water, or when trench conditions or weather conditions are unsuitable for such work.

B. The interior of each pipe shall be inspected while being joined to see that the alignment is preserved and to assure that no dirt or debris has entered the pipe after laying and partial backfilling.

C. Pipe fittings and accessories shall be carefully lowered into the trench, piece by piece, by means of derrick, crane, slings and other suitable tools and equipment, in a manner such as to prevent damage to the material or to its protective coating and linings. No chain or slings shall be passed through the inside bore of any pipe or valve or fitting. Under no circumstances shall piping materials be dropped or dumped into the trench.

3.02 LAYING DUCTILE IRON PIPE

A. As soon as the excavation is completed and the existing trench bottom has been brought to the proper grade, the pipe shall be laid.

B. All pipe, before being lowered into the trench, shall be inspected inside and out. Both ends shall be cleaned and any visible dirt or debris removed from inside the pipe and the interior of all affected pipe and fittings shall be swabbed with a 5% hypochlorite solution immediately before they are installed. Care shall be taken to lay the pipe to true lines and grades as shown on the drawings.

C. Coupling holes shall be excavated so that the barrel of the pipe shall bear upon the trench bottom.

D. Blocking under the pipe will not be permitted.

E. Each section shall rest upon the pipe bed for the full length of its barrel.

F. The circular rubber gasket shall be inserted in the gasket seat provided. A thin film of gasket lubricant shall be applied to the inside surface of the gasket. Gasket lubricant shall be a solution of vegetable soap or other solution supplied by the pipe manufacturer.

G. The spigot end of the pipe shall be cleaned with an approved soap solution and entered into the rubber gasket in the bell, using care to keep the joint from contacting the ground. The joint shall then be completed by forcing the plain end to the seat of the bell. Pipe which is not furnished with a depth mark shall be marked before assembly to assure that the spigot end is inserted to the full depth of the joint.

H. Pipe shall be aligned with the preceding unit and laid so as to form a close joint with the adjoining pipe and bring the inverts continuously to the required line and grade.

I. No length of pipe shall be laid until the previous length has had sufficient material tamped about it to firmly secure it in place so as to prevent any movement or disturbance.

J. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work, except by permission of the MTA resident.

K. The pipe shall be laid with the bell ends facing the direction of the laying, unless otherwise permitted by the MTA resident.

L. Joints, when made, shall be done in the manner prescribed by the manufacturer of the pipe. In the case of rubber gasket joints, these joints shall be made up in accordance with the American National Standards for the jointing of cast iron pressure pipe and fittings. (ANSI/AWWA C111/A21.11).

M. Joints of all pipes in the trench shall be completed before work is stopped; and all openings in the pipeline shall be closed with watertight plugs when pipe laying is stopped at the close of the day's work or for other reasons.

N. Thrust blocks shall be used behind tees, bends, or other fittings where shown. Size shall be appropriate for soil conditions and thrust forces acting on the specific fitting.

3.03 TRENCH BOTTOM

A. Should the trench bottom contain unsuitable material, as indicated in Section 02217, Article 3.2-b, the Contractor shall over-excavate and replace with bedding material as required and authorized by the MTA resident. The quantity of unsuitable material will be measured from the bottom outside of the pipe.

B. Should ledge be encountered, it shall be removed to a depth of 6" below the bottom of the pipe, and replaced with bedding material.

3.04 CUTTING PIPE

A. All ductile iron pipe shall be cut using abrasive wheel cutter, rotary wheel hand cutter (with carbide cutter) or a guillotine pipe saw. All cuts shall be square and even with no ragged rough ends.

B. Field cut pipe lengths shall be beveled and filed to avoid damage to the gasket and facilitate making the joint.

C. When the cut end of pipe is to be used as a joint, the outside of the cut end shall be tapered back about 1/8-inch at an angle of about 30 degrees with the center line of the pipe. This shall be done with a coarse file or a portable grinder.

3.05 TEMPORARY PLUGS

A. When pipe laying is not actually in progress, the openings of pipes shall be closed by temporary watertight plugs or other accepted means.

3.06 RETAINER GLANDS

A. Install retainer glands on all mechanical joints of fittings, valves and hydrants.

3.07 POLYETHYLENE ENCASEMENT

A. Tube type polyethylene encasement shall be installed on all ductile iron pipe and fittings in accordance with AWWA Standard C105 - latest revision, Method A. Circumferential wraps of tape or plastic tie straps shall be placed at 2-ft. intervals along the barrel of the pipe.

B. The polyethylene encasement shall prevent contact between the pipe and the surrounding backfill and bedding material but is not intended to be a completely airtight or watertight enclosure. All lumps of clay, mud, cinders, and so forth, on the pipe surface shall be removed prior to installation of the polyethylene encasement. During installation, care shall be exercised to prevent soil or embankment material from becoming trapped between the pipe and the polyethylene.

C. The polyethylene film shall be fitted to the contour of the pipe to effect a snug, but not tight, encasement with minimum space between the polyethylene and the pipe. Sufficient slack shall be provided in contouring to prevent stretching the polyethylene where it bridges irregular surfaces, such as bell-spigot interfaces, bolted joints, or fittings, and to prevent damage to the polyethylene due to backfilling operations. Overlaps and ends shall be secured with adhesive tape, string, plastic tie straps, or any other material capable of holding the polyethylene encasement in place until backfilling operations are complete.

3.08 FIELD TEST OF INSTALLED HYDRANT

A. Hydrant flow shall completely stop with no more than 200 ft. lb. of torque applied to the operating nut.

B. Failure to shut completely at no more than 200 ft. lb. of torque will be cause for rejection of that hydrant.

3.09 HIGH DENSITY POLYETHYLENE PIPE JOINTS

A. The HDPE pipe sections shall be joined on the job site using heat fusion methods. Transitions to other pipe materials shall be via heat fused polyethylene stub ends connected to an H.D.P.E. mechanical joint adaptor.

B. All heat fused joints shall be made by qualified personnel of the pipe supplier. The Contractor shall be responsible for scheduling, coordination and all costs associated with the pipe jointing.

C. Joining pipe lengths shall be performed using equipment specifically designed for heat fusion of polyethylene pipe of the sizes specified. The equipment shall have a trimming mechanism to produce a clean, flush surface perpendicular to the pipe wall at all joints and a Teflon coated heating plate to prevent adhesion of the pipe to the plate. Pipe ends shall be clean and free of polyethylene trimmings, dirt or other deleterious material prior to fusing.

D. The heat fusion process shall be performed in full accordance with the pipe manufacturer's recommendations. Pipe joining equipment shall monitor pressure and heating plate temperature to insure proper jointing.

-- END OF SECTION --

SECTION 02593 – PRESSURE AND LEAK TESTING OF HDPE WATER MAINS

PART 1 - GENERAL

1.01 SCOPE

A. Furnish all labor, materials, equipment gages and related items necessary to complete all pressure and leakage tests of all water mains.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PRESSURE AND LEAKAGE TEST

A. After the pipe has been laid and backfilled, it shall be pressure tested and tested for leakage in the presence of the MTA resident and/or the Owner. Following acceptance of the pressure and leakage tests, the new mains shall be thoroughly cleaned by flushing and shall be disinfected by chlorination per Section 2595.

B. All tests shall be conducted at a time and in a manner to minimize as much as possible any interference with the operation of the existing water system. The Owner will supply all water necessary for testing and placing the lines in service. The Contractor shall supply all labor, materials and equipment necessary to make any necessary connections to the water system and to carry out the tests.

C. The Contractor shall provide a corporation tap (or use blow off assembly) for pressure and leak testing and chlorination as directed by the MTA resident. The Contractor is responsible for all work associated with the excavation, including proper trench protection, barricades, traffic control and proper backfilling and compaction upon successful completion of the test.

D. Each section of pipe shall be slowly filled with water and all air expelled from the pipe. If permanent air vents are not located at all high points, Contractor shall install corporation stops at such high points to bleed off air as the line is filled with water.

E. A pressure test pump will be connected to the new main at the testing point. The pressure will be slowly increased to 150 psi. The 150 psi test pressure shall be maintained for four hours by adding water as necessary. The pump will then be shut off and the test pressure reduced to 140 psi. If the pressure remains steady (about 5%) for one hour, no leakage is indicated.

F. If any test discloses leakage greater than that specified above, the Contractor shall, at his own expense, locate and make repairs as necessary until the leakage is within the specified allowance.

B. Final acceptance of the lines will not occur until satisfactory tests have been passed.

-- END OF SECTION --

SECTION 02594 – PRESSURE AND LEAK TESTING OF DI WATER MAINS

PART 1 - GENERAL

1.01 SCOPE

A. Furnish all labor, materials, equipment, gages and related items necessary to complete all pressure and leakage tests of all ductile iron (DI) water mains.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PRESSURE AND LEAKAGE TESS

A. After the pipe has been laid and backfilled, it shall be pressure tested and tested for leakage in the presence of the MTA resident and/or the Owner.

B. All tests shall be conducted at a time and in a manner to minimize as much as possible any interference with the operation of the existing water system. The Owner will supply all water necessary for testing and placing the lines in service. The Contractor shall supply all labor, materials and equipment necessary to make any necessary connections to the water system and to carry out the tests.

C. The Contractor shall excavate and provide a corporation tap for pressure and leak testing as directed by the MTA resident. The Contractor is responsible for all work associated with the excavation, including proper trench protection, barricades, traffic control and proper backfilling and compaction upon successful completion of the test.

D. The pipe shall be slowly filled with water and all air expelled from the pipe. If permanent air vents are not located at all high points, Contractor shall install corporation stops at such high points to bleed off air as the line is filled with water.

E. A pressure test pump will be connected to the new main at the testing point. The pressure will be slowly increased to 150 psi and allowed to stabilize (+/-2.5 psi) for a minimum of 15 minutes.

F. A reservoir of potable water shall be connected to the test pump and the initial level of water recorded.

G. The pump pressure shall be maintained at 150 psi for one hour with all make up water withdrawn from the reservoir.

H. After one hour, the water level in the reservoir will be measured and the volume of water drawn from the reservoir calculated and compared with the following allowable leakage:

$$\text{Allowable Leakage (gph)} = \frac{\text{Pipe Length (feet)} \times \text{Nominal Diameter (inches)}}{10{,}876^*}$$

*Correct only for 150 psi test pressure

I. If any test discloses leakage greater than that specified above, the Contractor shall, at his own expense, locate and make repairs as necessary until the leakage is within the specified allowance:

J. Final acceptance of the lines will not occur until satisfactory tests have been passed.

-- END OF SECTION --

SECTION 02595 – DISINFECTION OF WATER MAINS

PART 1 - GENERAL

1.01 SCOPE

A. Furnish all labor, materials, equipment, and incidentals necessary to disinfect the distribution system.

B. Do not disinfect water mains until pressure and leakage testing is completed, see Section 02594.

PART 2 - PRODUCTS

2.01 MATERIALS

L. The Contractor shall chlorinate the new main in accordance with the continuous feed method specified in Section 5.2 of AWWA Standard C651-latest revision, using 5% to 15% sodium hypochlorite solution.

M. The Contractor may use calcium hypochlorite granules or tablets placed in the new mains during installation in accordance with Section 5.1 of AWWA Standard C651-latest revision, as a supplement to the continuous feed method.

PART 3 - EXECUTION

3.01 DISINFECTION

A. Upon satisfactory completion of the pressure and leak test, all new water mains shall be disinfected before they are placed into service in accordance with Section 5.2 of AWWA Standard C651-latest revision and the procedures specified herein.

3.02 FLUSHING

A. Section of pipe to be disinfected shall first be flushed to remove any solids or contaminated material that may have become lodged in the pipe. If no hydrant is installed at the end of the main, then a suitably sized tap should be provided.

B. All taps required by the Contractor for chlorination or flushing purposes, or for temporary release of air, shall be provided by him as part of the construction of the water main.

C. Flushing shall proceed for 4 hours at a flow velocity of 2.5 feet per second.

3.03 REQUIREMENTS OF CHLORINE

A. Before being placed into service, the main shall be chlorinated so that a chlorine residual of not less than 10 parts per million remains in the water after standing 24 hours in the pipe. Chlorine residual at start of test shall be at least 25 parts per million.

3.04 POINT OF APPLICATION

A. The preferred point of application of the chlorinating agent is at the beginning of the pipeline or any valved section of it and through a corporation stop inserted in the pipe.

The water injector for delivering the chlorine solution water into the pipe should be supplied from a tap made on the pressure side of the gate valve controlling the flow into the pipeline extension. Alternate points of application may be used when accepted or directed by the MTA resident.

3.05 RATE OF APPLICATION

A. Water from the distribution system, or other source of supply as accepted by the MTA resident, shall be controlled to flow very slowly into the newly laid pipeline during application of the chlorine. The rate of chlorine mixture flow shall be in such proportion to the rate of water entering the newly laid pipe that the dosage applied to the water will be sufficient at achieve at least 25 parts per million unless otherwise directed by the MTA resident.

3.06 PREVENTING REVERSE FLOW

A. Valves shall be operated by the Owner so that the strong chlorine solution in the line being treated will not flow back into the line supplying the water. Check valves may be used, if desired.

3.07 RETENTION PERIOD

A. Treated water shall be retained in the pipe at least 24 hours. After this period, the chlorine residual at pipe extremities and at other representative points shall be at least 10 parts per million.

3.08 CHLORINATING VALVES AND HYDRANTS

A. In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent and under normal operating pressure.

3.09 FINAL FLUSHING AND TESTING

A. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipe at its extremity until the replacement water throughout its length shows, upon tests, that the residual chlorine is not in excess of that to be carried in the system.

B. After flushing, water samples collected from the treated piping system as directed by the MTA resident, shall show satisfactory bacteriological results. Bacteriological analyses shall be performed by the Owner.

C. Chlorine residual of water being flushed from the newly laid pipe following chlorination must be neutralized by treating with one of the chemicals listed in the table below.

D. Amounts of chemicals required to neutralize various residual chlorine concentrations in 100,000 gallons of water*

Residual Chlorine Concentration	Sulphur Dioxide	Sodium Bisulfate	Sodium Sulfite	Sodium Thiosulfate

(mg/L)				
1	0.8	1.2	1.4	1.2
2	1.7	2.5	2.9	2.4
10	8.3	12.5	14.6	12.0
25	20.9	31.3	36.5	30.3

*Except for residual chlorine concentration, all amounts are in pounds.

3.010 REPETITION OF FLUSHING AND RESULTS

A. Should the initial disinfection process result in an unsatisfactory bacterial test, the original chlorination procedure shall be repeated by the Contractor.

B. If after the third re-chlorination attempt satisfactory results are not obtained, the Contractor shall submit for review and approval a foam pigging plan. The submittal shall include but is not limited to details and sketches showing point of entry, retrieval, pigging sub-contractor, and pigging subcontractor qualifications and experience. Work on pigging shall not commence until the submitted plan and proposed subcontractor are approved in accordance with Section 01300 Submittals. Pigging shall be provided at no additional expense to the Owner.

1. Polyurethane pigs shall be new and will be not be reused. The pig shall be immersed in a 25 mg/l solution of sodium hypochlorite prior to launching. The pig shall be pushed through the main with water pressure.

2. A minimum of three new pigs and three pig launching/flushing shall be completed by the Contractor.

3. The third pig shall be inspected by the Owner and examined for any residue. At the sole discretion of the Owner, additional new pig launching and flushing shall be provided by the Contractor until a residue-free pig is produced.

4. Following approval to conclude the pig launching and flushing process a final bacterial test shall be provided. If satisfactory results are not obtained, the pig launching and flushing process shall be repeated until a satisfactory result is obtained at no additional expense to the Owner.

-- END OF SECTION --

APPENDIX

Typical Casing End

View From Casing End

Typical Mechanical Joint

(Wood Skids Attached Under Each Joint)