

MAINE TURNPIKE AUTHORITY

MAINE TURNPIKE

CONTRACT DOCUMENTS

CONTRACT 2021.07

EXIT 45
INTERCHANGE RECONFIGURATION
MILE 44.9

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 2021.07

EXIT 45 INTERCHANGE

RECONFIGURATION

MILE 44.9

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 February 16, 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 Bridge Construction Projects, with a highway subcontractor **prequalified** by the Maine Department of Transportation for Highway Construction Projects, a building subcontractor **prequalified** by the Maine Department of Transportation for Buildings and an electrical subcontractor **prequalified** by the Maine Department of Transportation for Traffic Signals and Lighting Projects. In addition to the Bridge Prequalification, the prime Contractor may hold any number of these additionally required prequalification's. All other bids may be rejected.

Contractors not currently prequalified by the Maine Department of Transportation can seek prequalification prior to the bid by following the prequalification procedure indicated in the AUTHORITY Supplemental Specifications and submitting the prequalification application directly to the Authority at the above address. This Project includes a wage determination developed by the State of Maine Department of Labor.

The work consists of highway, bridge, and toll system construction at the Exit 45 South Portland Interchange. The work includes a new bridge, new southbound and northbound ramps, a new southbound toll plaza on the west side of the Maine Turnpike with a signalized intersection and a new northbound toll plaza on the east side of the Maine Turnpike, Route 703 reconstruction, demolition of the existing toll plaza and bridge underpass, pavement, concrete, signing, overhead sign structure, concrete barrier, guardrail, bridge rails, electrical work, highway lighting, lightning suppression systems, and maintenance of traffic. The toll plaza work includes installation of tolling equipment, administration buildings, canopies, and toll booths 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 Two hundred Fifty (\$250.00) 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. These specific 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.

An on-line ZOOM pre-bid conference will be held on Tuesday January 26, 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 2021.07

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RECONFIGURATION
MILE 44.9

MAINE TURNPIKE AUTHORITY

PROPOSAL

CONTRACT 2021.07

EXIT 45 INTERCHANGE

RECONFIGURATION

MILE 44.9

TO MAINE TURNPIKE AUTHORITY:

The work consists of highway, bridge, and toll system construction at the Exit 45 South Portland Interchange. The work includes a new bridge, new southbound and northbound ramps, a new southbound toll plaza on the west side of the Maine Turnpike with a signalized intersection and a new northbound toll plaza on the east side of the Maine Turnpike, Route 703 reconstruction, demolition of the existing toll plaza and bridge underpass, pavement, concrete, signing, overhead sign structure, concrete barrier, guardrail, bridge rails, electrical work, highway lighting, lightning suppression systems, and maintenance of traffic. The toll plaza work includes installation of tolling equipment administration buildings, canopies, and toll booths and all other work incidental thereto in accordance with the Plans and Specifications.

This Work will be done under a Contract known as Contract 2021.07 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. 2021.07
EXIT 45
INTERCHANGE RECONFIGURATION
MM 44.9**

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
201.11	CLEARING	Acre	2				
202.071	REMOVING ASBESTOS CONTAINING MATERIALS	Lump Sum	1				
202.081	REMOVING BUILDINGS	Lump Sum	1				
202.15	REMOVING EXISTING MANHOLE OR CATCH BASIN	Each	16				
202.17	REMOVING EXISTING STRUCTURAL CONCRETE (320 CY)	Lump Sum	1				
202.19	REMOVE EXISTING BRIDGE (500,000 LB STEEL, 750 CY CONCRETE)	Lump Sum	1				
202.202	REMOVING PAVEMENT SURFACE	Square Yard	16,900				
203.20	COMMON EXCAVATION	Cubic Yard	98,375				
203.25	GRANULAR BORROW	Cubic Yard	7,380				
203.43	GEOFOAM LIGHTWEIGHT FILL	Cubic Yard	7,000				
203.45	LEVELING SAND	Cubic Yard	1,650				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
203.52	LOW PERMEABILITY FILL	Cubic Yard	15				
206.082	STRUCTURAL EARTH EXCAVATION - MAJOR STRUCTURES, PLAN QUANTITY	Cubic Yard	1,240				
206.10	STRUCTURAL EARTH EXCAVATION - PIERS	Cubic Yard	270				
304.10	AGGREGATE SUBBASE COURSE - GRAVEL	Cubic Yard	13,400				
304.14	AGGREGATE BASE COURSE - TYPE A	Cubic Yard	10,020				
403.207	HOT MIX ASPHALT, 19.0 mm NOMINAL MAXIMUM SIZE	Ton	7,500				
403.2072	19.0 mm ASPHALT RICH BASE HMA	Ton	4,200				
403.208	HOT MIX ASPHALT, 12.5 mm NOMINAL MAXIMUM SIZE	Ton	910				
403.2081	HOT MIX ASPHALT, 12.5 mm (POLYMER MODIFIED) - RAP	Ton	5,382				
403.209	HOT MIX ASPHALT, 9.5 mm (SIDEWALKS, DRIVES, ISLANDS & INCIDENTALS)	Ton	59				
403.212	HOT MIX ASPHALT, 4.75 mm NOMINAL MAXIMUM SIZE (SHIM)	Ton	400				
403.213	HOT MIX ASPHALT, 12.5 mm NOMINAL MAXIMUM SIZE (BASE AND INTERMEDIATE BASE COURSE)	Ton	5,682				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
409.15	BITUMINOUS TACK COAT RS1 OR RS1H - APPLIED	Gallon	6,523				
419.30	SAWING BITUMINOUS PAVEMENT	Linear Foot	9,400				
470.08	BERM DROPOFF CORRECTION - GRINDINGS	Ton	50				
501.231	DYNAMIC LOADING TEST	Each	8				
501.50	STEEL H-BEAM PILES 89 LB/FT, DELIVERED	Linear Foot	4,300				
501.501	STEEL H-BEAM PILES 89 LB/FT, IN PLACE	Linear Foot	4,300				
501.52	STEEL H-BEAM PILES 102 LB/FT, DELIVERED	Linear Foot	6,250				
501.521	STEEL H-BEAM PILES 102 LB/FT, IN PLACE	Linear Foot	6,250				
501.90	PILE TIPS	Each	124				
501.91	PILE SPLICES	Each	265				
501.92	PILE DRIVING EQUIPMENT MOBILIZATION	Lump Sum	1				
502.219	STRUCTURAL CONCRETE, ABUTMENTS AND RETAINING WALLS (155 CY)	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:							
502.239	STRUCTURAL CONCRETE, PIERS (243 CY)	Lump Sum	1				
502.26	STRUCTURAL CONCRETE ROADWAY AND SIDEWALK SLAB ON STEEL BRIDGES (533 CY)	Lump Sum	1				
502.261	STRUCTURAL CONCRETE, PILE CAPS (300 CY)	Lump Sum	1				
502.262	STRUCTURAL CONCRETE, PAVEMENT SLABS (890 CY)	Lump Sum	1				
502.263	STRUCTURAL CONCRETE - PLAZA ISLANDS, BUMPERS AND CURTAIN WALLS (120 CY)	Lump Sum	1				
502.264	STRUCTURAL CONCRETE, PARAPET (59 CY)	Lump Sum	1				
502.265	STRUCTURAL CONCRETE - UTILITY PITS (66 CY)	Lump Sum	1				
502.266	STRUCTURAL CONCRETE - PEDESTALS & FOOTINGS (13 CY)	Lump Sum	1				
502.31	STRUCTURAL CONCRETE APPROACH SLAB (160 CY)	Lump Sum	1				
502.452	STRUCTURAL CONCRETE DISTRIBUTION SLAB (140 CY)	Lump Sum	1				
503.14	EPOXY-COATED REINFORCING STEEL, FABRICATED AND DELIVERED	Pound	514,000				
503.15	EPOXY-COATED REINFORCING STEEL, PLACING	Pound	514,000				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
503.18	GLASS FIBER REINFORCED POLYMER (GFRP) REINFORCING BARS, FABRICATED AND DELIVERED	Linear Foot	80,600				
503.19	GLASS FIBER REINFORCED POLYMER (GFRP) REINFORCING BARS, PLACING	Linear Foot	80,600				
503.90	SYNTHETIC FIBER REINFORCEMENT	Pound	2,700				
504.50	TOLL PLAZA CANOPY - SOUTHBOUND	Lump Sum	1				
504.51	TOLL PLAZA CANOPY - NORTHBOUND	Lump Sum	1				
504.61	TOLL DUAL PURPOSE MAST ARM – SOUTHBOUND	Lump Sum	1				
504.62	TOLL DUAL PURPOSE MAST ARM – NORTHBOUND	Lump Sum	1				
504.702	STRUCTURAL STEEL FABRICATED AND DELIVERED, WELDED (581,000 LB)	Lump Sum	1				
504.71	STRUCTURAL STEEL ERECTION (581,000 LB)	Lump Sum	1				
505.08	SHEAR CONNECTORS (5,285 EA)	Lump Sum	1				
506.9104	THERMAL SPRAY COATING (SHOP APPLIED) (581,000 LB)	Lump Sum	1				
507.091	ALUMINUM BRIDGE RAILING, 1 BAR (548 LF)	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:							
508.14	HIGH PERFORMANCE WATERPROOFING MEMBRANE (2800 SY)	Lump Sum	1				
511.091	TEMPORARY EARTH SUPPORT SYSTEMS	Lump Sum	1				
513.09	SLOPE PROTECTION - PORTLAND CEMENT CONCRETE	Square Yard	1,020				
514.06	CURING BOX FOR CONCRETE CYLINDERS	Each	1				
515.202	CLEAR PROTECTIVE COATING FOR CONCRETE SURFACES	Square Yard	1,595				
515.203	BROADCAST SEALANT FOR CONCRETE SURFACES	Square Yard	1,300				
515.23	EPOXY OVERLAY	Square Yard	86				
520.23	ASPHALTIC PLUG JOINT	Linear Foot	485				
523.52	BEARING INSTALLATION	Each	7				
523.5401	LAMINATED ELASTOMERIC BEARINGS, FIXED	Each	7				
524.30	TEMPORARY STRUCTURAL SUPPORT	Lump Sum	1				
524.40	PROTECTIVE SHIELDING - STEEL GIRDERS	Square Yard	4,200				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
526.306	TEMPORARY CONCRETE BARRIER, TYPE 1 - SUPPLIED BY AUTHORITY (7900 LF)	Lump Sum	1				
526.307	CONCRETE BARRIER TYPE 1 - STORMWATER FILTER	Linear Foot	30				
526.351	CONCRETE BARRIER - TYPE A (2021 LF)	Lump Sum	1				
526.352	CONCRETE BARRIER - TYPE B (453 LF)	Lump Sum	1				
526.353	CONCRETE BARRIER - TYPE C (370 LF)	Lump Sum	1				
526.354	CONCRETE BARRIER - TYPE D (151 LF)	Lump Sum	1				
526.362	CONCRETE BARRIER - TYPE C TRANSITION BARRIER	Each	2				
526.366	CONCRETE BARRIER - MEDIAN GUARDRAIL TRANSITION BARRIER	Each	2				
526.367	CONCRETE BARRIER - TYPE B GUARDRAIL TRANSITION BARRIER	Each	2				
526.368	CONCRETE BARRIER - TYPE C GUARDRAIL TRANSITION BARRIER	Each	1				
526.369	CONCRETE BARRIER - TYPE D GUARDRAIL TRANSITION BARRIER	Each	1				
527.307	CENTER BARRIER CRASH ATTENUATOR (SMART CUSHION)	Each	2				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
527.341	WORK ZONE CRASH CUSHION - TL-3	Unit	6				
527.342	WORK ZONE CRASH CUSHION - TL-2	Unit	4				
527.343	RESETTING EXISTING WORK ZONE CRASH CUSHION	Unit	1				
602.40	PUMPED GROUT FILL	Cubic Yard	91				
603.101	TEMPORARY CULVERT	Linear Foot	150				
603.102	TEMPORARY CULVERT - 15" RCP CLASS V	Linear Foot	32				
603.155	12" REINFORCED CONCRETE PIPE - CLASS III	Linear Foot	510				
603.159	12" CULVERT PIPE OPTION III	Linear Foot	440				
603.175	18" REINFORCED CONCRETE PIPE - CLASS III	Linear Foot	330				
603.195	24" REINFORCED CONCRETE PIPE - CLASS III	Linear Foot	330				
603.28	CONCRETE COLLAR	Each	1				
604.09	CATCH BASIN TYPE B1	Each	4				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
604.182	CLEANING EXISTING CATCH BASIN AND MANHOLE	Each	1				
604.244	CATCH BASIN TYPE F4	Each	1				
604.246	CATCH BASIN TYPE F5	Each	9				
604.248	CATCH BASIN TYPE F6	Each	6				
604.26	CATCH BASIN TYPE B5	Each	6				
604.40	SECURE CATCH BASIN GRATE	Each	5				
605.016	6" PVC UNDERDRAIN	Linear Foot	550				
605.018	8" PVC UNDERDRAIN	Linear Foot	210				
605.09	6 INCH UNDERDRAIN TYPE B	Linear Foot	1,050				
605.10	6 INCH UNDERDRAIN OUTLET	Linear Foot	40				
605.11	12 INCH UNDERDRAIN TYPE C	Linear Foot	420				
605.12	15 INCH UNDERDRAIN TYPE C	Linear Foot	300				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
605.13	18 INCH UNDERDRAIN TYPE C	Linear Foot	620				
606.1301	31" W-BEAM GUARDRAIL - MID-WAY SPLICE (7' STEEL POST, 8" OFFSET BLOCKS, SINGLE FACED)	Linear Foot	1,350				
606.1304	31" W-BEAM GUARDRAIL - MID-WAY SPLICE (7' STEEL POST, 8" OFFSET BLOCKS, OVER 15' RADIUS)	Linear Foot	50				
606.1307	31" W-BEAM GUARDRAIL - MID-WAY SPLICE FLARED TERMINAL	Each	9				
606.132	31" W-BEAM GUARDRAIL - MID-WAY SPLICE (7' STEEL POST, 8" OFFSET BLOCKS, DOUBLE FACED)	Linear Foot	180				
606.1351	31" W-BEAM GUARDRAIL - MID-WAY SPLICE TERMINAL END - ANCHORED END	Each	8				
606.1723	BRIDGE TRANSITION - TYPE III	Each	8				
606.1724	BRIDGE TRANSITION - TYPE III, MODIFIED	Each	1				
606.265	TERMINAL END - SINGLE RAIL - GALVANIZED STEEL	Each	4				
606.352	REFLECTORIZED BEAM GUARDRAIL DELINEATOR	Each	38				
606.353	REFLECTORIZED FLEXIBLE GUARDRAIL MARKER	Each	34				
606.356	UNDERDRAIN DELINEATOR POST	Each	380				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
606.3561	DELINEATOR POST - REMOVE AND RESET	Each	60				
606.3562	DELINEATOR POST - REMOVE AND STACK	Each	70				
607.25	REMOVE AND RESET CHAIN LINK FENCE	Linear Foot	11				
607.494	GATE SUPPLIED BY THE AUTHORITY	Each	1				
608.08	REINFORCED CONCRETE SIDEWALK	Square Yard	190				
609.11	VERTICAL CURB TYPE 1	Linear Foot	280				
609.12	VERTICAL CURB TYPE 1 - CIRCULAR	Linear Foot	58				
609.13	VERTICAL BRIDGE CURB TYPE 1	Linear Foot	490				
609.14	VERTICAL BRIDGE CURB TYPE 1 - CIRCULAR	Linear Foot	180				
609.15	SLOPED CURB TYPE 1	Linear Foot	570				
609.234	TERMINAL CURB TYPE 1 - 4 FOOT	Each	8				
609.238	TERMINAL CURB TYPE 1 - 8 FOOT	Each	2				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
609.34	CURB TYPE 5	Linear Foot	170				
609.35	CURB TYPE 5 - CIRCULAR	Linear Foot	20				
610.08	PLAIN RIPRAP	Cubic Yard	340				
610.18	STONE DITCH PROTECTION	Cubic Yard	750				
610.181	TEMPORARY STONE CHECK DAM	Cubic Yard	81				
613.319	EROSION CONTROL BLANKET	Square Yard	8,650				
615.07	LOAM	Cubic Yard	7,050				
615.073	LOAM - SUPPLIED BY AUTHORITY	Cubic Yard	2,700				
618.14	SEEDING METHOD NUMBER 2	Unit	810				
618.143	SPECIAL SEEDING	Unit	14				
619.1201	MULCH - PLAN QUANTITY	Unit	810				
619.1202	TEMPORARY MULCH	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:							
620.56	DRAINAGE GEOTEXTILE	Square Yard	800				
620.58	EROSION CONTROL GEOTEXTILE	Square Yard	3,350				
620.60	SEPARATION GEOTEXTILE	Square Yard	390				
620.70	HDPE GEOMEMBRANE	Square Yard	4,300				
621.408	EVERGREENS (2.5' - 3') GROUP B	Each	6				
621.513	HYBRID RHODODENDRON 'PJM' (2.5' - 3')	Each	6				
621.553	DECIDUOUS SHRUBS (3'-4') GROUP B	Each	4				
625.106	WATER SERVICE SUPPLY LINE (<3")	Linear Foot	1,550				
625.107	WATER METER PIT	Each	1				
626.121	QUAZITE JUNCTION BOX (36x24)	Each	23				
626.122	QUAZITE JUNCTION BOX (18x11)	Each	68				
626.123	QUAZITE JUNCTION BOX (48x36)	Each	4				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
626.131	ADJUST EXISTING JUNCTION BOX TO GRADE	Each	6				
626.22	NON-METALLIC CONDUIT	Linear Foot	10,000				
626.223	HORIZONTAL DIRECTIONAL DRILLED CONDUIT	Linear Foot	6,650				
626.31	18 INCH DIAMETER FOUNDATION	Each	2				
626.32	24 INCH DIAMETER FOUNDATION	Each	70				
626.332	30-INCH DIAMETER, GREATER THAN 8-FEET LONG, ALL 36 INCH AND 42 INCH DIAMETER FOUNDATIONS	Cubic Yard	9				
626.38	GROUND MOUNTED CABINET FOUNDATION	Each	3				
626.701	OVERHEAD GUIDE SIGN FOUNDATION STA 1062+50	Lump Sum	1				
627.18	12" SOLID WHITE PAVEMENT MARKING LINE	Linear Foot	6,100				
627.712	WHITE OR YELLOW PAVEMENT MARKING LINE	Linear Foot	49,000				
627.73	TEMPORARY 6 INCH PAVEMENT MARKING TAPE	Linear Foot	20,000				
627.731	TEMPORARY 6 INCH BLACK PAVEMENT MARKING TAPE	Linear Foot	250				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
627.75	WHITE OR YELLOW PAVEMENT & CURB MARKING	Square Foot	32				
627.77	REMOVING EXISTING PAVEMENT MARKING	Square Foot	45,200				
627.78	TEMPORARY PAVEMENT MARKING LINE, WHITE OR YELLOW	Linear Foot	197,000				
627.812	TEMPORARY RAISED PAVEMENT MARKERS	Each	1,650				
627.941	PAVEMENT MARKING TAPE - DOTTED WHITE LANE LINE, 6-INCH WIDTH	Linear Foot	350				
627.942	PAVEMENT MARKING TAPE - DOTTED WHITE LANE LINE, 12-INCH WIDTH	Linear Foot	420				
627.944	PAVEMENT MARKINGS - RECESSED TAPE - WORDS, ARROWS, STOP BARS	Square Foot	320				
629.05	HAND LABOR, STRAIGHT TIME	Hour	200				
631.10	AIR COMPRESSOR (INCLUDING OPERATOR)	Hour	40				
631.11	AIR TOOL (INCLUDING OPERATOR)	Hour	40				
631.12	ALL PURPOSE EXCAVATOR (INCLUDING OPERATOR)	Hour	160				
631.13	BULLDOZER (INCLUDING OPERATOR)	Hour	160				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
631.14	GRADER (INCLUDING OPERATOR)	Hour	160				
631.171	TRUCK - SMALL (INCLUDING OPERATOR)	Hour	40				
631.172	TRUCK - LARGE (INCLUDING OPERATOR)	Hour	160				
631.22	FRONT END LOADER (INCLUDING OPERATOR)	Hour	80				
631.32	CULVERT CLEANER (INCLUDING OPERATORS)	Hour	20				
631.36	FOREMAN	Hour	160				
631.50	JACKHAMMER (AIR TOOL INCLUDING OPERATOR)	Hour	60				
631.51	BUCKET TRUCK	Hour	60				
631.52	SCISSOR LIFT	Hour	60				
631.53	ELECTRICIAN	Hour	100				
631.54	ELECTRICIAN'S APPRENTICE	Hour	100				
631.55	PLUMBER	Hour	60				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
633.031	PROPANE SERVICE - SOUTHBOUND	Lump Sum	1				
633.032	PROPANE SERVICE - NORTHBOUND	Lump Sum	1				
633.21	PROPANE TANK SUPPORTS	Each	8				
633.31	PROPANE TANK PAD	Square Yard	55				
634.175	REPLACEMENT LED FIXTURE	Each	6				
634.208	REMOVE AND RESET LIGHT STANDARD	Each	11				
634.2083	REMOVE AND STACK LIGHT STANDARD	Each	8				
634.231	CONVENTIONAL LIGHT STANDARD WITH LED FIXTURE	Each	41				
639.181	FIELD OFFICE, TYPE A (PROVIDED BY MTA)	Each	1				
639.261	GEOTECHNICAL INSTRUMENTATION PROTECTION AND REMOVAL	Lump Sum	1				
643.712	LANE USE SIGNAL INSTALLATION	Each	6				
643.80	TRAFFIC SIGNAL AT: EXIT 45 I-95 SB ON/OFF RAMPS	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:							
643.931	WOOD POLES WITH GUYS AND SPAN WIRE	Each	6				
645.107	REMOVE AND STACK CANOPY MOUNTED SIGN	Each	4				
645.109	REMOVE AND RESET SIGN	Each	1				
645.1092	CANOPY MOUNTED DYNAMIC MESSAGE SIGN	Each	2				
645.1099	REMOVE AND DISPOSE SIGN	Each	70				
645.123	OVERHEAD GUIDE SIGN: (STA. 1062+50)	Lump Sum	1				
645.124	OVERHEAD GUIDE SIGN ON EXISTING STRUCTURE	Lump Sum	1				
645.14	CANOPY MOUNTED SIGN	Each	2				
645.141	CANOPY MOUNTED SIGN - SUPPLIED BY AUTHORITY	Each	2				
645.161	BREAKAWAY DEVICE SINGLE POLE	Each	14				
645.162	BREAKAWAY DEVICE MULTI POLE	Each	9				
645.251	ROADSIDE GUIDE SIGN, TYPE I	Square Foot	610				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
645.271	REGULATORY, WARNING, CONFIRMATION AND ROUTE ASSEMBLY SIGN, TYPE I	Square Foot	760				
645.289	STEEL H-BEAM POLES	Pound	6,500				
645.501	REMOVE AND RESET MAINLINE SIGN NO. 1	Lump Sum	1				
645.5011	TEMPORARY REMOVE AND RESET MAINLINE SIGN	Lump Sum	1				
645.502	REMOVE AND RESET MAINLINE SIGN NO. 2	Lump Sum	1				
645.503	REMOVE AND RESET MAINLINE SIGN NO. 3	Lump Sum	1				
645.504	REMOVE AND RESET MAINLINE SIGN NO. 4	Lump Sum	1				
645.505	REMOVE AND RESET MAINLINE SIGN NO. 5	Lump Sum	1				
648.00	FLAGPOLE AND SPOTLIGHT	Each	2				
652.30	FLASHING ARROW	Each	6				
652.312	TYPE III BARRICADES	Each	9				
652.33	DRUM	Each	710				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
652.34	CONE	Each	50				
652.35	CONSTRUCTION SIGNS	Square Foot	3,750				
652.361	MAINTENANCE OF TRAFFIC CONTROL DEVICES	Lump Sum	1				
652.38	FLAGGERS	Hour	240				
652.41	PORTABLE-CHANGEABLE MESSAGE SIGN	Each	4				
652.4101	PORTABLE-CHANGEABLE MESSAGE SIGN	Calendar Day	90				
652.45	TRUCK MOUNTED ATTENUATOR	Calendar Day	290				
652.452	AUTOMATED TRAILER MOUNTED SPEED LIMIT SIGN	Each	3				
652.47	SEQUENTIAL FLASHING WARNING LIGHTS	Each	30				
655.012	INSTALLATION OF CASH LANE CONTROLLER CABINET	Each	6				
655.02	DVAS MOUNT INSTALLATION	Each	8				
655.041	INSTALLATION OF SENSOR LOOPS - SOUTHBOUND	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:							
655.042	INSTALLATION OF SENSOR LOOPS - NORTHBOUND	Lump Sum	1				
655.05	INSTALLATION OF AVI ANTENNAS	Each	10				
655.07	TRAFFIC CONTROL PEDESTAL PREPARATION WORK	Each	6				
655.101	#6 AWG WIRE	Linear Foot	100				
655.102	#2 AWG WIRE	Linear Foot	7,870				
655.12	#12 AWG WIRE	Linear Foot	24,500				
655.125	500 MCM WIRE	Linear Foot	1,060				
655.13	#14 AWG WIRE	Linear Foot	100				
655.141	4PR/24 (CATEGORY 5E) CABLE	Linear Foot	6,600				
655.151	LMR 600 CABLE	Linear Foot	600				
655.16	6 STRAND MULTI-MODAL FIBER OPTIC CABLE	Linear Foot	12,900				
655.17	IVIS HOMERUN LOOP CABLE (IMSA 50-2 #14)	Linear Foot	100				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
655.200	1-1/2" SCHEDULE 40 PVC CONDUIT	Linear Foot	60				
655.201	3" SCHEDULE 40 PVC CONDUIT	Linear Foot	100				
655.2021	1" SCHEDULE 80 PVC CONDUIT	Linear Foot	360				
655.203	1-1/2" SCHEDULE 80 PVC CONDUIT	Linear Foot	700				
655.2031	2" SCHEDULE 80 PVC CONDUIT	Linear Foot	440				
655.204	3" SCHEDULE 80 PVC CONDUIT	Linear Foot	12,000				
655.205	4" SCHEDULE 80 PVC CONDUIT	Linear Foot	350				
655.2052	5" SCHEDULE 80 PVC CONDUIT	Linear Foot	425				
655.206	1" GALVANIZED RIGID METAL CONDUIT	Linear Foot	475				
655.207	1-1/2" GALVANIZED RIGID METAL CONDUIT	Linear Foot	270				
655.2071	2" GALVANIZED RIGID METAL CONDUIT	Linear Foot	450				
655.208	3" GALVANIZED RIGID METAL CONDUIT	Linear Foot	130				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
655.209	1/2" LIQUID TIGHT METALLIC FLEXIBLE CONDUIT	Linear Foot	50				
655.2101	1-1/2" LIQUID TIGHT METALLIC FLEXIBLE CONDUIT	Linear Foot	100				
655.2102	2" LIQUID TIGHT METALLIC FLEXIBLE CONDUIT	Linear Foot	100				
655.211	1-1/2" ELECTRICAL METALLIC TUBING CONDUIT	Linear Foot	100				
655.215	3/4" ELECTRICAL METALLIC TUBING CONDUIT	Linear Foot	100				
655.221	TYPE A PULL BOX INSIDE	Each	10				
655.222	TYPE C PULL BOX INSIDE	Each	12				
655.223	TYPE D PULL BOX OUTDOOR	Each	8				
655.224	TYPE E PULL BOX INSIDE	Each	8				
655.225	TYPE F PULL BOX OUTDOOR	Each	16				
655.226	TYPE G PULL BOX OUTDOOR	Each	16				
655.30	12"x12"x6" GALVANIZED JUNCTION BOX	Each	16				

CARRIED FORWARD:

Item No	Item Description	Units	Approx. Quantities	Unit Prices in Numbers		Bid Amount in Numbers	
				Dollars	Cents	Dollars	Cents
BROUGHT FORWARD:							
655.42	36"x30"x20" NEMA 4X CABINET	Each	2				
655.421	EXIT TOLL POWER AND COMMUNICATION CABINET	Each	2				
655.501	1" PVC CONDUIT CONDULETS	Each	10				
655.502	1-1/2" PVC CONDUIT CONDULETS	Each	10				
655.503	2" PVC CONDUIT CONDULETS	Each	24				
655.504	3" PVC CONDUIT CONDULETS	Each	16				
655.505	4" PVC CONDUIT CONDULETS	Each	2				
655.506	5" PVC CONDUIT CONDULETS	Each	4				
655.512	1" RIGID METAL CONDUIT CONDULETS	Each	20				
655.513	1-1/2" RIGID METAL CONDUIT CONDULETS	Each	20				
655.514	2" RIGID METAL CONDUIT CONDULETS	Each	16				
655.515	3" RIGID METAL CONDUIT CONDULETS	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:							
655.57	1-1/2" ELECTRICAL METAL TUBING CONDULETS	Each	20				
655.58	3/4" ELECTRICAL METAL TUBING CONDULETS	Each	10				
655.63	4"x4" PLASTIC NEMA 4R WIREWAY	Linear Foot	160				
655.64	6"x6" PLASTIC NEMA 4R WIREWAY	Linear Foot	160				
655.801	LIGHTNING SUPPRESSION SYSTEM - SOUTHBOUND ENTRY AND EXIT	Lump Sum	1				
655.802	LIGHTNING SUPPRESSION SYSTEM - NORTHBOUND ENTRY AND EXIT	Lump Sum	1				
655.81	KEY SWITCH	Each	12				
655.82	DUPLEX RECEPTACLE	Each	10				
655.84	QUADPLEX RECEPTACLE	Each	18				
655.92	LED CANOPY LIGHT FIXTURE	Each	12				
655.941	STAND-BY GENERATOR AND TRANSFER SWITCH - SOUTHBOUND	Lump Sum	1				
655.942	STAND-BY GENERATOR AND TRANSFER SWITCH - NORTHBOUND	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:							
655.99	LED BUMPER BEACON	Each	6				
656.50	BALED HAY, IN PLACE	Each	150				
656.60	TEMPORARY BERMS	Linear Foot	3,500				
656.62	TEMPORARY SLOPE DRAINS	Linear Foot	220				
656.632	30 INCH TEMPORARY SILT FENCE	Linear Foot	22,200				
659.10	MOBILIZATION	Lump Sum	1				
670.011	SEPTIC SYSTEM - SOUTHBOUND	Lump Sum	1				
670.012	SEPTIC SYSTEM - NORTHBOUND	Lump Sum	1				
673.01	STORMWATER SOIL FILTER BED	Cubic Yard	290				
800.01	TOLL ADMINISTRATION BUILDING - SOUTHBOUND	Lump Sum	1				
800.02	TOLL ADMINISTRATION BUILDING - NORTHBOUND	Lump Sum	1				
800.30	TOLL PLAZA BOOTHS, CANOPY AND GANTRY DEMOLITION	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:							
800.401	NEW TOLL BOOTH INSTALLATION - SOUTHBOUND	Lump Sum	1				
800.402	NEW TOLL BOOTH INSTALLATION - NORTHBOUND	Lump Sum	1				
800.901	GENERATOR PAD - SOUTHBOUND	Lump Sum	1				
800.902	GENERATOR PAD - NORTHBOUND	Lump Sum	1				
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., 202____

Witnesses:

CONTRACTOR

_____ (SEAL)

SURETY

_____ (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)

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART II – SPECIAL PROVISIONS

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MAINE TURNPIKE AUTHORITYSPECIFICATIONSPART 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 highway, bridge, and toll system construction at the Exit 45 South Portland Interchange. The work includes a new bridge, new southbound and northbound ramps, a new southbound toll plaza on the west side of the Maine Turnpike with a signalized intersection and a new northbound toll plaza on the east side of the Maine Turnpike, Route 703 reconstruction, demolition of the existing toll plaza and bridge underpass, pavement, concrete, signing, overhead sign structure, concrete barrier, guardrail, bridge rails, electrical work, highway lighting, lightning suppression systems, and maintenance of traffic. The toll plaza work includes installation of tolling equipment administration buildings, canopies, and toll booths 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 2021.07 – Exit 45 Interchange Reconfiguration – Mile 44.9. The right is reserved by the Resident to make such minor corrections or alterations in the Plans as he deems necessary without change in the unit prices on the Schedule of Prices of the Proposal.

101.2 DefinitionHolidays

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

Christmas Day 2022	6:00 a.m. preceding Friday to 6:00 a.m. the following Tuesday
New Year's Day 2023	12:01 p.m. preceding Friday to 6:00 a.m. the following Tuesday
Independence Day 2023 (Fourth of July)	12:01 p.m. preceding Friday to 6:00 a.m. the following Thursday

103.4 Notice of Award

The following sentence is added:

The Maine Turnpike Authority Board is scheduled to consider the Contract Award on February 25, 2021.

104.2.2 Furnishing of Permits

The Maine Turnpike Authority will obtain and provide the building permits.

The Contractor shall obtain the following permits:

State Electrical and State Plumbing Permits.

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:

WAGE RATES WILL BE ISSUED WITH AN ADDENDUM.

WAGE RATES WILL BE ISSUED WITH AN ADDENDUM.

WAGE RATES WILL BE ISSUED WITH AN ADDENDUM.

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

CENTRAL MAINE POWER COMPANY (CMPCo)

Distribution:

160 Canco Road

Portland, ME 04103

ATTN: Alpay Balkir

Tel: (207) 239-8372

Email: alpay.balkir@cmpco.com

CMP Distribution has aerial crossings at the approximate station locations listed below:

- Route 703 Station 1062+00, Ramp C Station 296+60, and Ramp D Station 422+10
- Along the north side of Route 703 running from Station 1062+00 LT to STA 1068+30 LT

CMP will install new poles along the Access Road and new three phase electrical services and transformers for both the northbound and southbound plazas as depicted on the plans. The Contractor shall be responsible for the new service from the transformer to the building and CMP will make the connections and install the meter. The Authority will arrange for the new three

phase service accounts and the contractor shall coordinate with CMP for the installation of the service

CMP provides power to the existing toll building and will be responsible for disconnecting service prior to demolition of the existing toll building.

CMP shall also disconnect the highway lighting service at Sta. 2251+25, RT (Running Hill Road) after existing highway lighting is connected to the new power source at the northbound toll administration building.

The Contractor shall notify CMP ten (10) working days prior to the utility coordination meeting. The coordination effort is to relay the Contractor's construction schedule, determine possible covering of aerial conductors, and scheduling of the new service and pole sets.

In addition, it is anticipated that CMP will install a new service for MaineDOT Highway lighting near the Route 703 Westbound On Ramp at Sta. 1070+00, LT.

Transmission:

83 Edison Drive
Augusta, ME 04336
ATTN: Jenna Muzzy
Tel: (207) 629-2029
Email: jenna.muzzy@cmpco.com

CMP has three existing transmission lines that cross Ramp B between Sta. 211+50 and Sta. 213+50 and Ramp C between Sta. 310+00 and Sta. 311+50. After crossing Ramp C, one of the transmission lines turns north and parallels Ramp C and the Maine Turnpike mainline. The other two cross Maine Mall Road and then cross Route 703 between Sta. 1064+80 and Sta. 1065+90.

Depending on the Contractor's selected equipment, access, schedule, and method for roadway construction, the Contractor may be working next to, or under the existing wires with limited clearance. 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. The bidding contractors are encouraged to visit the site, prior to bid, to determine how to construct safely.

CHARTER COMMUNICATIONS (SPECTRUM)

118 Johnson Road
Portland, ME 04102
ATTN: Mark Pelletier
Tel: (207) 253-2324
Email: mark.pelletier@charter.com

Charter Communications will have a service to the southbound toll plaza along the Access Road. The contractor shall be responsible for coordinating the new service with the Authority.

The Contractor shall notify Charter Communications ten (10) working days prior to the utility coordination meeting. The coordination effort is to relay the Contractor's construction schedule, determine possible covering of aerial conductors, and scheduling of the new service and pole sets.

The Maine Turnpike Authority will establish the new account with Charter Communications (Spectrum) for the new Administration Buildings and Toll Plazas. William Yates will be the point of contact for the Maine Turnpike Authority.

COMMUNICATIONS:

Maine Turnpike Authority
2360 Congress Street, Portland, Maine
ATTN: William Yates
Tel: (207) 482-8300
Email: wyates@maineturnpike.com

CONSOLIDATED COMMUNICATIONS

5 Davis Farm Road, Floor 2
Portland, ME 04103
ATTN: Marty Pease
Tel: (207) 272-7993
Email: martin.pease@consolidated.com

Consolidated Communications will have both copper and fiber services to the southbound toll plaza along the Access Road. The contractor shall be responsible for coordinating the new service with the Authority.

Consolidated Communications provides copper and fiber services to the existing toll building and will be responsible for disconnecting service prior to demolition of the existing toll building.

The Contractor shall notify Consolidated Communications ten (10) working days prior to the utility coordination meeting. The coordination effort is to relay the Contractor's construction schedule, determine possible covering of aerial conductors, and scheduling of the new service and pole sets.

The Maine Turnpike Authority will establish the new account with Consolidated Communications for the new Administration Buildings and Toll Plazas. William Yates will be the point of contact for the Maine Turnpike Authority.

COMMUNICATIONS:

Maine Turnpike Authority
2360 Congress Street, Portland, Maine
ATTN: William Yates
Tel: (207) 482-8300

Email: wyates@maineturnpike.com

FIRSTLIGHT FIBER (OXFORD NETWORKS)

491 Lisbon Street
Lewiston, ME 04240
ATTN: Michael Ellingwood
Tel: (207) 333-3471
Email: mellingwood@firstlight.net

MCI WORLD COMMUNICATIONS (VERIZON)

82B Northside Road PO Box 600
Charlton, MA 01507
ATTN: Tremain Fernandes
Tel: (617) 953-9575
Email: tremain.k.fernandes@verizon.com

AUTHORITY'S PROPANE SUPPLIER

The Authority's propane supplier shall be responsible for inspecting the underground propane piping installation prior to burial, inspecting the above ground propane piping, fittings, and regulators prior to delivery and filling the new propane tanks supplied and installed by the Contractor at the Administration Buildings. The Contractor will be responsible for furnishing and installing new propane piping and tanks as shown on the plans.

The Authority's propane supplier shall also be responsible for disconnecting and pumping the existing tanks at the existing toll building prior to the contractor removing and disposing of the propane tanks.

The Contractor shall notify the Authority ten (10) working days prior to any work to coordinate with the Authority's Propane Supplier.

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

FEDERAL AVIATION ADMINISTRATION (FAA)

The Contractor shall review and comply with the Special Conditions contained in all Aeronautical Studies contained in Appendix K – FAA Restrictions and Advisory Circular AC No. 70/7460-1M, Obstruction Marking and Lighting. These documents are contained in Appendix K – FAA Restrictions. The FAA has determined equipment that is 150 feet tall or less (above ground level) 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 150 feet above ground level will require an additional application process, review and approval of the FAA before the equipment can be used.

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.

The Contractor shall contact the manager of the Portland International Jetport (207)-756-8310 at least 3 business days prior to any crane being erected and again when the crane is removed.

The Contractor shall contact the manager of the Air Traffic Control Tower at the Portland International Jetport (207)-780-3396 at least 3 business days prior to any crane being erected and again when the crane is removed. The contractor shall also provide contact information for the onsite operator to the Air Traffic Control Tower.

The Contractor must submit FAA Form 7460-2 Notice of Actual Construction or Alteration to the Resident within 3 days of when construction reaches its greatest height (see FAA Form 7460-2, Part 2). This applies to all crane locations, final pavement on the bridge, and all light poles.

The crane operator shall maintain a form of direct two-way communication at all times with the PWM Airport Manager (207) 756-8310 and PWM Air Traffic Control Tower (207) 780-3396 and shall provide his name and phone number on initial contact.

UNDERGROUND UTILITIES

ELECTRIC (LIGHTING):

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

The Maine Turnpike Authority owns highway lighting and communications facilities within the project limits.

The Contractor shall note that the utility poles and electric drop for the highway lighting are being relocated in conjunction with MTA Contract 2018.19 Cummings Road Bridge Replacement. The Contractor shall coordinate with MTA and CMPCo to prior to impacting lighting facilities.

The Contractor shall notify the Authority ten (10) working days prior to the utility coordination meeting. The coordination effort is to relay the Contractor's construction schedule and scheduling of the new service and pole sets.

Maine Department of Transportation
16 State House Station, Augusta, Maine
ATTN: Ron Cote
Tel: (207) 446-2305
Email: ron.cote@maine.gov

MaineDOT owns highway lighting within the project limits located at the Route 703 On and Off Ramps between Sta. 1070+00 and the limits of work, including a conduit under Route 703 at approximately 1069+75.

MaineDOT anticipates coordinating with CMPCo to install a new service pole and will install a new pedestal mounted cabinet prior to construction. The Contractor will be responsible for running new conduit from the new service to any relocated light standards.

The Contractor shall notify MaineDOT ten (10) working days prior to the utility coordination meeting. The coordination effort is to relay the Contractor's construction schedule, and scheduling of the new service and pole sets.

GAS:

Granite State Gas
325 West Road
Portsmouth, NH 03801
ATTN: Brian Chaput
Tel: (603) 812-5982
Email: chaputb@unitil.com

Granite State Gas owns one transmission main of unknown size within this project area. It is located just to the east of the Maine Mall Road Bridge. The main crossed Ramp C at approximate station 296+70, Route 703 at approximate station 1062+80 and Ramp D at approximate station 422+00. No work to their facility is expected during this contract.

SEWER:

175 Running Hill, LLC
Managed By:
Maine Realty Advisors
100 Commercial Street, Suite 202
Portland, ME 04101
ATTN: Josh Soley & Cole Libby

Tel: (207) 744-3084

Email: josh@mainerealtyadvisors.com
Cole@mainerealtyadvisors.com

175 Running Hill, LLC owns a 12-inch ductile iron gravity sewer service that crosses the Maine Turnpike at approximately STA. 2237+40, and crosses the northbound on ramp (Ramp C) at approximately STA. 316+45. No work to their facility is expected during this contract.

WATER:

Portland Water District (PWD)
P.O. Box 3553
Portland, ME 04104
ATTN: Joe Parent
Tel: (207) 523-5261
Email: jparent@pwd.org

Portland Water District owns two facilities within the project limits; a 16-inch underground trunk water main within a 42-inch concrete casing crosses the Maine Turnpike southbound on ramp (Ramp A) near STA. 109+75, the Access Road near STA. 0+95, and the northbound off ramp (Ramp D) near STA. 401+65; and a 30-inch trunk water main within a 54-inch concrete casing crosses the Maine Turnpike and northbound on ramp (Ramp C) near STA 316+00. PWD has extended the 42-inch concrete casing toward Cummings Road, and the 16-inch water main has renewed and relocated with a combination of High Density Polyethylene and restrained Ductile Iron piping under MTA Contract 2019.13. PWD also renewed and relocated the 30-inch concrete water main with a combination of HDPE and restrained ductile iron piping under MTA Contract 2019.13. No work to their facility is expected during this contract.

Portland Water District provides water service to the existing toll building. The Contractor shall contact customer service 2 days in advance to request the water shut off.

Portland Water District will provide water service to the new toll administration buildings. The Contractor will provide and install all water service materials, except for the meter which will be supplied and installed by Portland Water District. This shall include but is not limited to, meter pits, service lines, shut off valves, and service valves.

The Contractor shall notify Portland Water District ten (10) working days prior to the utility coordination meeting. The coordination effort is to relay the Contractor's construction schedule, and scheduling of the new service and pole sets.

104.4.6.1 Temporary Utilities

The Contractor will be required to maintain all services and utilities to the existing facility until the new toll plazas are operational. Existing services and utilities include, but are not limited to, power, telephone, communications, water, propane, and lighting. The Contractor shall be responsible for any temporary connections, service runs, relocations, disconnections, reconnections, etc. required to maintain these services due to phasing of construction and constraints of the site and work area.

Prior to the start of construction, the Contractor shall submit a plan and schedule for maintaining existing services and utilities. The plan shall identify any proposed temporary connections, service runs, relocations, disconnections, reconnections, etc. and shall reflect construction phasing and the Contractor's proposed sequence of work. Maintaining existing services and utilities and all temporary utility work including proposed temporary connections, service runs, relocations, disconnections, reconnections, etc. shall be incidental to item 800.30 – Toll Plaza Booths, Canopy, and Gantry Demolition.

104.4.7 Cooperation With Other Contractors

This Subsection is amended by the addition of the following:

Adjacent contracts currently scheduled for the 2021 construction season include:

MTA Contract 2018.19 – Cummings Road Underpass, MM 44.6.

MTA Contract 2020.03 – Portland Area Widening & Safety Improvements, MM 43.0 to 46.4. The Contractor shall provide two weeks of notice to the Resident for removal of any materials and equipment stored within the project limits from Contract 2020.03.

MTA Contract 2021.08 – Portland Area Widening & Safety Improvements, MM 46.4 to 49.0.

The following Subsection is added:

105.2.4.2 Lead Paint

The Contractor shall note that the existing bridge structure and toll plaza canopy contains lead based paint. A copy of the Lead Determination Report is attached as **Appendix A**. The Contractor shall institute every precaution when working with materials coated with lead based paints.

Lead Paint Removal

The Contractor is required to remove and dispose of lead based paint and paint residue before cutting, grinding, drilling and sandblasting existing materials in preparation of completing the work except as provided under the Drilling of Lead Based Paint subsection in this Special Provision. All lead based paint and paint residue shall be removed, handled, stored and disposed of in conformance with all local, State and Federal laws and regulations governing lead based paint. The Contractor may use his own properly trained employees to abate the lead based paint in accordance with applicable regulations and requirements; or he may hire a licensed lead abatement subcontractor to abate the lead based paint in accordance with applicable regulations and requirements.

The Contractor, or licensed lead abatement subcontractor, shall submit a Project specific Health and Safety (OSHA) Plan and a Hazardous Waste Management Plan (EPA/DEP) a minimum of two (2) weeks prior to undertaking the removal of lead based paint.

Drilling of Lead Based Paint

The Contractor may drill lead based painted steel, without lead based paint removal, provided the Contractor collects and recycles the drill cuttings at a licensed metal recycling facility. If the Contractor chooses not to collect and recycle the drill cuttings at a licensed metal recycling facility he will be required to abate the area where drilling is to occur in full accordance with the lead based paint removal, storage and disposal requirement of this Special Provision.

The Authority will require a signed statement from the Contractor stating the drill cuttings were collected and recycled at a licensed metal recycling facility and the name the recycling facility.

Health and Safety Plan

The Health and Safety Plan submittal shall describe how the Contractor/licensed lead abatement subcontractor intends to remove the lead based paints; and shall outline how the Contractor/licensed lead abatement subcontractor will adhere to all Federal, State and local ordinances which govern worker (including authorized representatives of the Authority) exposure to lead based paints, and ensure the safety of the workers performing lead removal. Copies of current worker training certificates (OSHA), medical screenings, and respirator fit up shall be included in the submittal.

Hazardous Waste Management Plan

The Hazardous Waste Management Plan submittal shall describe how the Contractor/licensed lead abatement subcontractor intends to manage the hazardous waste that will be generated, temporarily accumulated, stored, transported off-site and disposed; adhere to ordinances associated with the management of hazardous wastes; and ensure protection of the environment.

The Hazardous Waste Management Plan shall:

- Be signed by the Contractor;
- State whether Contractor or licensed lead abatement subcontractor will be undertaking the work; and,
- State whether abated lead materials will be accumulated and stored on-site (required if Contractor is not licensed by DEP/EPA to transport and temporarily store lead based hazardous waste), or be removed in HEPA vacuums daily to the removal Contractor's licensed waste storage facility (permitted only if Contractor is licensed by DEP/EPA to transport and temporarily store lead based hazardous waste).

If abated lead materials are to be accumulated and stored on-site, the Hazardous Waste Management Plan shall include (at a minimum) the following:

- Container size and labeling standards:
 - Containers must be 55 gallons or less
 - Containers must have the labeled "HAZARDOUS WASTE"
- Accumulation requirements:

- Labels will include accumulation start date and container full date
- On-site storage will not exceed 180 days from full date
- Total on-site storage shall not exceed 55 gallons or 220 pounds

- Inspections (including frequency and checklist):
 - Inspections shall be performed each day the Contractor works
 - Inspection checklist shall be similar to MaineDEP format (Refer to Appendix A1 of MaineDEP Handbook for Hazardous Waste Generators – January 2008)
- Transport and DOT “pre-transport requirements”:
 - Specify the licensed hazardous waste transporter to be used
 - Obtain Generator’s EPA ID No. (typically a provisional ID # is obtained through the licensed hazardous waste transporter)
 - USDOT – approved containers must be used for shipment
 - Schedule MTA for signing Hazard Waste Manifest

- Recordkeeping requirements:
 - Describe where at the jobsite the required records (e.g., inspection logs, training records, Lead Determination report/hazardous waste characterization, etc.) will be maintained
 - Describe how and when copies of the required documents specified above will be transferred to the MTA Environmental Services Coordinator’s office

The Contractor/licensed lead abatement subcontractor, shall provide documentation to the MTA that the employees who will be removing, handling, managing and/or directly supervising the hazardous waste operations have received required Resource Conservation and Recovery Act (RCRA) hazardous waste management training, and all training is current.

The lead based hazardous waste must remain on-site, unless the removal is being performed by a licensed lead abatement subcontractor that collects the paint residue in HEPA vacuums and is licensed by DEP/EPA to transport and temporarily store lead based hazardous waste at the removal Contractor’s licensed waste storage facility. Both on-site and licensed off-site lead based hazardous waste storage facilities require secure storage and daily inspection of the stored waste.

If the removal Contractor is not licensed by DEP/EPA to transport and temporarily store lead based hazardous waste off-site, then an EPA licensed Hazardous Waste transporter(s) shall be used to remove hazardous waste from the site. All removal and disposal documentation will be required when the hazardous waste leaves the site. As the Generator, only the Authority’s Environmental Services Coordinator or his trained designee shall sign waste manifests when material is removed from the Project site.

The removal, storage, handling, transporting, and disposal of lead based paint and lead based paint residue will not be measured separately for payment, but shall be incidental to the various Contract work items.

The following Subsection is added:

105.2.4.3 Asbestos

The Contractor shall note that the existing structure(s) have undergone Asbestos Containing Material Determination Survey(s) and have tested positive for asbestos containing materials. A copy of the Asbestos Containing Determination Survey report is attached as **Appendix A**. The removal and disposal of the asbestos containing materials is specified in Special Provision 202, Removing Structure and Obstructions (Removing Asbestos Containing Materials).

Whereas no Asbestos Containing Material Determination Survey is 100 percent accurate, building demolition activities shall be accomplished under the supervision of a "competent person", as defined by OSHA, to evaluate whether materials uncovered/exposed are asbestos containing materials. If the "competent person" observes, or believes he has observed, asbestos containing materials while demolition is underway, the "competent person" shall immediately stop the demolition, secure the site and notify the Project Resident/Inspector.

The Owner shall have the area sampled and analyzed for asbestos containing materials. No work will be permitted in the area until samples show that no asbestos containing materials exists, or if asbestos containing materials are present, the conditions are abated. Compensation for delays resulting from stopping the demolition, testing for asbestos containing materials, and abating asbestos containing materials, if they exist, shall be limited to a time extension.

105.8.2 Permit Requirements

The Project is being constructed under the Maine Department of Environmental Protection (DEP) Natural Resources Protection Act Tier III. Additionally, the Project impacts environmental resources that have been permitted under a Maine Turnpike Authority's Portland Area Widening project permit, which requires a DEP Natural Resources Protection Act Individual Permit attached in Appendix B.

The Project is being permitted under Section 404 of the Clean Water Act, through the US Army Corps of Engineers Individual Permit. Additionally, the Project impacts environmental resources that have been permitted under the Maine Turnpike Authority's Portland Area Widening project permit, which also requires a US Army Corps of Engineers Individual Permit attached in Appendix C.

The Project is subject to the requirements of the Maine Pollutant Discharge Elimination System (MPDES) General Permit for Stormwater Discharge from Construction Activity, as promulgated by the US Environmental Protection Agency (US EPA) and Administrated by the Maine Department of Environmental Protection (DEP).

A Notice of Intent (NOI), accompanied by a preliminary Limit of Disturbance (LOD) plan was submitted by the Authority to the DEP for coverage under the Maine Construction General Permit (MCGP). Compliance with the erosion and sedimentation control requirements outlined in this Contract is required by the Contractor.

The Contractor shall prepare a LOD plan illustrating the Contractor's proposed limit of earthwork disturbance. The LOD plan shall show all construction access locations, field office locations, material and temporary waste storage locations, as well as include the Contract limits of earthwork disturbance. All applicable erosion and sedimentation control devices needed shall be

detailed on the Contractor's LOD plan and are not limited to those devices shown on the Contract LOD plan. **This Plan shall be submitted for review and approval, to the Resident within 14 days of Contract award.** Payment for creating, revising, and completing this plan shall be incidental to Item 659.10, Mobilization.

The LOD for this Contract, which were submitted as part of the NOI, has been estimated to be **35.98 acres.**

At any time during the Contract, if the Limit of Disturbance needs to be adjusted to accommodate construction activities, the Contractor shall resubmit the LOD plan (including any additional erosion and sedimentation control measures needed) to the Resident for review and approval prior to any additional disturbance taking place:

- If the cumulative area of disturbance exceeds the estimated LOD noted above, by less than one acre, the Resident shall have a minimum of five (5) working days to approve the revised LOD plan.
- If the cumulative area of disturbance exceeds the estimated LOD noted above, by over one acre, the Resident shall first approve of the plan and then possibly resubmit the NOI for MaineDEP approval. The approval may take a minimum of 21 working days.

Compliance with the erosion and sedimentation control requirements outlined in this Contract is required by the Contractor.

The Contractor shall comply with the conditions outlined in the Army Corps General Permit, Maine Department of Environmental Protection NRPA Tier III and Individual Permits, the US Army Corps of Engineers Individual Permit, and the Maine Pollutant Discharge Elimination System General Permit for stormwater discharge associated with construction activity. 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.

This Project is also subject to the requirements of the Maine Pollutant Discharge and Elimination System (MPDES) General Permit for the Discharge of Stormwater from MTA's Municipal Separate Storm Sewer Systems (MS4), because it is located within an Urbanized Area (UA) as defined by the 2000 census by the U.S. Bureau of the Census. MS4 compliance requires all Contractors to be properly trained in Erosion and Sedimentation Control (ESC) measures (as per Special Provision Subsections 105.8.1 and 656.07) and implement measures to reduce pollutants in stormwater runoff from construction activities.

107.1 Contract Time and Contract Completion Date

This Subsection is amended by the addition of the following:

All work shall be completed on or before September 1, 2023. The construction for the Exit 45 Interchange Reconfiguration shall be substantially complete by August 18, 2023.

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 work is complete except punch list items.

Supplemental Liquidated damages on a calendar day basis in accordance with Subsection 107.8 shall be assessed for each calendar day that substantial completion is not achieved.

107.3.2 Night Work

This Subsection is amended by the addition of the following:

Nightwork will be allowed within the limitations defined in Section 652. The Contractor shall formally notify the Resident of their intent to perform night work a minimum of 14 calendar days ahead of the planned nightwork.

107.3.3 Sundays and Holidays

This Subsection is amended by the addition of the following:

Sunday work operations will be allowed within the limitations defined in Section 652. The Contractor shall formally notify the Resident of their intent to work on a Sunday a minimum of 14 calendar days ahead of the planned Sunday work.

107.4.6 Prosecution of Work

The Contractor shall incorporate the following operations and schedule restrictions into their Schedule of Work:

Interim Completion Date A

The contractor shall complete the work associated with the maintenance of traffic Ramp B (Station 40+00 to 47+00) and maintenance of traffic Ramp A/B (Station 731+60 to 736+10) crossing embankment construction and the temporary realignment of Ramp A and the ramps must be operational as shown on the maintenance of traffic Plans by May 27, 2021. All culverts, drainage elements, gravels, pavement, temporary pavement markings, traffic control devices and temporary barrier or guardrail must be installed prior to reopening the ramps. Two separate weekend ramp closures will be allowed as stated in Special Provision Section 652 Project Specific Maintenance of Traffic Requirements to complete this work.

The Contractor shall complete the work associated with the two-foot Aggregate Subbase Course – Gravel (Type D) located at the west bridge approach from Station 1046+90 to Station 1048+48 by May 27, 2021. The limits of the two-foot surcharge are shown on the Route 703 Profile sheet number PR-01 and cross-section sheet numbers XS-25 and XS-26. Fine grading and paving of this area shall not occur prior to June 6, 2022.

Interim Completion Date B

The contractor shall complete the embankment construction of permanent Ramp A to the top of Aggregate Base Course -Type A from Sta. 100+00 to Sta. 111+50 by July 16, 2021 to provide one year of preload settlement. Placement of additional Aggregate Base Course – Type A will be required to correct any settlement over the one year duration, fine grading, and paving of this area and the Southbound Toll Administration building access road shall occur after July 16, 2022.

Permanent Ramp C from station 304+50 left to station 306+00 left, permanent Ramp C from station 315+25 to station 317+25, and Northbound On Emergency Vehicle Ramp from station 353+00 to station 354+50 shall be constructed to the top of Aggregate Base Course – Type A by July 16, 2021. Placement of additional Aggregate Base Course – Type A will be required to correct any settlement over the one year duration, fine grading, and paving of this area and the Southbound Toll Administration building access road shall occur after July 16, 2022.

Interim Completion Date C

The contractor shall complete the work associated with the proposed Exit 45 bridge, Southbound Toll Plaza Facilities (Entry and Exit) and Northbound Toll Plaza Facilities (Entry and Exit), including commissioning of the tolling systems by the System Integrator and the Authority, Southbound Toll Administration building and Northbound Toll Administration building, traffic signal system, including the final wearing course of pavement for Ramp A between station 106+00 and 119+25, Ramp B between stations 200+00 and 210+25, Ramp C between stations 300+00 and 318+00, Ramp D between stations 406+00 and 415+00 and Route 703 between stations 1046+20 and 1052+25, and all reconfigured ramps are operational and open to traffic by September 30, 2022. A weekend interchange closure will be allowed as stated in Special Provision Section 652 Project Specific Maintenance of Traffic Requirements to complete this work. The Authority will transfer fare collection operations from the existing toll plaza facility to the new southbound and northbound toll plaza facilities during the weekend closure. The Authority will be collecting fares at the new southbound and northbound toll plaza facilities when the interchange is reopened at the end of the weekend closure. The Contractor must account for 14 sequential calendar days per toll lane, in the construction schedule, that is required by the System Integrator for testing and commissioning of the toll lanes in their schedule. Multiple lanes will NOT be commissioned simultaneously but instead, sequentially. The administration building official acceptance date shall be considered the date that the Authority occupies the building for operations associated with fare collection at the completion of work associated with Interim Completion Date C. This date shall define the start of the buildings warranty period and all utility services shall become the responsibility of the Authority.

Interim Completion Date D

The contractor shall complete all work associated with demolition of the existing toll plaza and toll administration building including reconstruction of the roadway within the demolition limits and the westbound right shoulder from station 2066+00 to station 2070+80 and shall have traffic established as shown in the Route 703 Phase 5 Maintenance of Traffic plans by November 11, 2022. The Authority will allow a Thursday overnight closure of the interchange ramps for demolition of the toll gantry and toll canopy in their entirety and a sequential weekend closure of the interchange ramps for the phase 1 demolition of the existing toll plaza. Traffic shall be established in accordance with the Route 703 Phase 4 maintenance of traffic plans when the interchange reopens to traffic at the completion of the weekend closure.

Interim Completion Date E

The contractor shall complete all work associated with I-95 mainline pavement including the median concrete barrier work, drainage, shoulder work, and guardrail from Station 2200+50 to STA 2244+50 by June 29, 2023.

The Contractor shall provide the Authority 14 days advance notification of the anticipated ramp closure date to allow the Authority to coordinate with municipalities and local businesses. Seven (7) days ahead of the ramp closure, the Contractor shall provide up to seven portable changeable message signs along the Turnpike adjacent to the ramp notifying the public of the upcoming closure. The detour shown on the Plans shall be installed to accommodate traffic during this road closure and covered or removed immediately following the road closure. The Contractor will reimburse the Authority at the rate of \$2,500.00 for each one-hour period, or portion thereof, that the ramp(s) remains closed to traffic in excess of the 57-hour limit, as per Section 652 Specific Project Maintenance of Traffic Requirements. Total penalty shall be deducted from the next pay estimate.

The Contractor shall submit to the Authority a construction schedule which shall document that the Contractor has the necessary labor and equipment to work immediately and continuously at the project site once the ramps are closed for the weekend durations as described under Interim Completion Dates A, C, and D. The intent of this specification is to minimize the amount of time for ramp closure, while providing the Contractor sufficient time to complete the work in a diligent manner and reopen the ramp as prescribed by the project Prosecution of Work and Interim Milestone Dates.

107.4.7 Limitations of Operations

The contractor shall complete the excavation, drainage, subbase, pavement, toll booths, concrete slabs, and electrical work associated with the three (3) Northbound and the three (3) Southbound cash lanes, the one (1) Northbound exit toll lane and the one (1) Southbound exit toll lane in a condition suitable for commissioning and testing of the toll lanes by the System Integrator and Authority. The electrical systems associated with the two Administration buildings shall be complete prior to beginning the testing and commissioning of the cash toll lanes, including all interconnect fiber cables. The System Integrator shall commence commissioning testing once the cash lanes are in a suitable condition and complete the testing no later than 14 calendar days for each entry or exit lane. The commissioning and testing on the Northbound and Southbound entry and exit lanes can be done separately to facilitate the construction schedule.

Due to the presence of marine deposits, material stockpiles will not be permitted on the project site to minimize the potential for slope instability without prior approval by the Engineer. The Contractor shall spread materials delivered for embankment construction as they arrive on site.

Completion of the surcharge period will be determined by the Engineer based on the collection and evaluation of instrumentation data and in-situ undrained shear strength measurements within the marine clay deposit. The ongoing surcharge duration for embankments built during Contract 2019.13 have anticipated surcharge removal dates for specific locations listed on plan sheets GT-09 and GT-10. The removal of surcharge fill shall not begin until directed by the Engineer. The Contractor shall consider the anticipated durations as noted on plan sheets GT-09 and GT-10 in the development of their bid and in the sequencing and scheduling the work.

The contractor shall not place geofoam within 30 feet of the abutments until the pile foundations are complete.

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

The Contractor shall submit their proposed staging and storage areas for approval by the Authority. All stored equipment must be outside of the clear zone. Proposed equipment storage locations shall be selected based on (1) proximity to Urban Impaired Streams / Protected Natural Resources; (2) minimizing rutting or other actions that may hinder sheet flow from roadway; and (3) spill control and prevention, in the event of a fluid release from the equipment.

The Contractor shall complete the work as shown on the phasing and maintenance of traffic plans. Modifications to the phasing or associated maintenance of traffic plans will not be permitted unless submitted in writing a minimum of 14 days prior to anticipated implementation, including detailed plans, and approved by the Authority.

All roadway lanes, ramps, bridges and driveways shall remain open at all times and in accordance with the restrictions of Special Provision 652 unless otherwise noted herein or approved by the Authority.

Ramps shall not be closed on holiday weekends or weekends between Thanksgiving and Christmas.

The Contractor shall progress the work in a manner that minimizes disruption to the public to the extent practical.

The Contractor shall secure all catch basin grates with Sikaflex 1a or approved equal before being allowed to shift traffic onto the shoulder.

Long-term lane closures and shoulder closures along I-95 mainline shall only be used during periods of construction activity. During periods of inactivity (periods of inactivity for long-term lane closure and shoulder closures is considered to be greater than two weeks), the Contractor shall remove the lane closure and relocate the temporary barrier and other maintenance of traffic devices to reestablish normal traffic conditions.

The existing Exit 45 southbound off ramp currently has a wide load restriction of 12 feet that will remain active until the reconfigured interchange is opened to traffic.

All work associated with the Northbound Administration Building water service connection to the water main along Payne Road shall be accessed from Route 703.

The Contractor shall be responsible for coordinating and scheduling work activities with adjacent contracts in overlapping work zones. Contract 2020.03 maintenance of traffic operations will take precedence over Contract 2021.07 maintenance of traffic operations. The Contractor shall coordinate access and operations with the Contractor on Contract 2020.03.

Wide loads will be allowed to pass through the Project area during daylight hours as authorized by the Authority. Wide loads are restricted from moving on the turnpike from a half hour after sunset until a half hour before sunrise. Wide loads must be able to safely pass all daytime work areas. The wide load lane may be closed when wide loads are not permitted on the Turnpike by the Authority, including the existing toll plaza after fare collection begins at the new northbound and southbound toll plazas prior to completing the phase 1 demolition. The temporary wide load lane closures must be scheduled one week in advance and occur outside of the various Holiday restrictions.

Between November 15th and April 1st the Contractor shall provide, at a minimum, 4'-0" inside shoulders and 8'-0" outside shoulders along the Maine Turnpike mainline.

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

The Contractor shall review and comply with the Special Conditions contained in all Aeronautical Studies contained in Appendix K – FAA Restrictions and Advisory Circular AC No. 70/7460-1M, Obstruction Marking and Lighting. These documents are contained in Appendix K – FAA Restrictions. The FAA has determined equipment that is 150 feet tall or less (above ground level) 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 150 feet above ground level will require an additional application process, review and approval of the FAA before the equipment can be used.

107.6 Completion Incentives and Disincentives

This Contract will include Completion Incentives of \$5,000 per Calendar Day ahead of Interim Milestone Date C, up to a maximum of 15 days. The Contract will include Completion Disincentives as identified in subsections 107.4.6 Prosecution of Work and 107.8 Supplemental Liquidated Damages.

107.8 Supplemental Liquidated Damages

This Subsection is amended by the addition of the following:

Interim Milestone	Supplemental Liquidated Damages Date	Supplemental Liquidated Damages Per Calendar Day
Date A	May 27, 2021	\$2,500.00
Date B	July 16, 2021	\$2,500.00
Date C	September 30, 2022	\$5,000.00
Date D	November 11, 2022	\$2,500.00
Date E	June 29, 2023	\$2,500.00

107.8.1 Fabrication Time

The Authority has budgeted for the following amounts of continuous full time fabrication/shop inspection for certain Work components:

<u>Element</u>	<u>Time</u>	<u>Supplemental LD</u>
1) Bridge Structural Steel	60 calendar days	\$500 per calendar day
2) Toll Canopy Structural Steel	28 calendar days	\$500 per calendar day

The Contractor is responsible for requiring their fabricators and suppliers to produce these products for the Work continuously until finished, including any needed actions to correct unacceptable workmanship or materials. If the Authority determines that shop inspection beyond these times is required, then the corresponding Supplemental Liquidated Damages will be deducted as they occur from the amounts otherwise due the Contractor. The Contractor will be notified by the Department when these times begin and when the allotted time will expire.

If a fabricator or supplier works more than one shift per day and the Authority determines that inspection is required for each shift, each shift will count as a calendar day and the LD rate will be the noted amount per shift per calendar day in lieu of per calendar day.

Inspection is required for the following activities:

For metal fabrication work – welding, including tack welding, heat correcting, nondestructive examination, assembly verification.

SPECIAL PROVISIONSECTION 202REMOVING STRUCTURES AND OBSTRUCTIONS

(Removing Asbestos Containing Materials)
(Removing Buildings)

202.01 Description

The following paragraphs are added:

The work shall also consist of removing and disposing of all asbestos containing materials (ACM) identified in the Asbestos Containing Determination Survey prior to the demolition of the existing toll administration building and toll plaza booths and canopies. The licensed asbestos abatement Contractor shall meet the asbestos abatement requirements outlined in **Appendix A**.

The work shall also consist of removing the existing toll plaza administration building and generator building as specified herein.

All asbestos containing materials shall be removed by a licensed asbestos abatement Contractor prior to the general demolition of the identified buildings. All asbestos containing materials shall be disposed of at licensed asbestos containing material disposal sites in compliance with current EPA and MaineDEP regulations. The Contractor shall submit to the Resident the original disposal receipts acknowledging proper disposal of asbestos containing materials prior to the payment of Removing Asbestos Containing Material pay items.

All non-asbestos containing materials shall become the property of the Contractor and shall be removed from the site prior to the completion of the Project. The Contractor shall provide the Resident with an affidavit stating the final location of all disposed material and that the material was disposed of in accordance with the Maine Department of Environmental Protection Solid Waste Regulations.

202.02 Removing Buildings

The following paragraphs are added:

The following items/equipment will be removed and stacked at the MTA Sign Shop in Cumberland by the Contractor. The exact stacking location will be as approved by the Resident. **Items include: generator and transfer switch, safe, and two-way radio. The contractor shall coordinate with the propane supply company to empty the tanks prior to removal.**

The following items/equipment will be removed by the Authority prior to the buildings being released to the Contractor for asbestos containing material removal and subsequent demolition. **Items to be removed by the Authority include: bulletin boards, MSDS box, and needle stick box.**

The septic tank(s) shall be pumped out to remove waste material and shall be broken up as approved by the Resident to preclude accumulation of water. Tank(s) shall then be backfilled with gravel as required under the provisions regarding excavations below.

The foundations, including floor slabs, shall be completely removed. Concrete shall be disposed of off-site. The cellar hole shall then be filled to surrounding levels as required under the provisions regarding excavations below.

All steps, walks, slabs, piers, posts, decks, and associated debris shall be completely removed.

Excavations shall be filled to ground level with two foot layers of good grade common borrow that meets the requirements of Subsection 703.18 of the Standard Specifications except in locations that are designated to receive special fill material, such as under proposed footings, concrete slabs and pavement. In this process, the contour and grades of site plan and sections are to be followed.

All buildings and materials contained therein and any items connected with the property of a personal property nature shall become the property of the Contractor and shall be completely removed from the Exit 45 Administration building and generator building. Ownership of the buildings reverts to the Contractor upon the Notice to Proceed issued by the Authority. All debris and unusable materials shall be removed to an approved transfer station or approved landfill. Under no circumstances shall any material or debris be disposed of by burning on the premises nor shall the debris be burned at an off-premise site.

The Contractor shall provide and maintain all temporary barricades, signs or other safety measures necessary.

The Contractor shall remove all utility service connections prior to demolition of the buildings. All existing sewer connections shall be cutoff and sealed with a water and gas tight seal to the satisfaction of the Authority's Engineer before such connections are covered by any fill material. Water connections or services shall be cut and completely capped or plugged in a manner to prevent any flow or seepage of water into any excavated area.

The new toll plaza and toll system shall be completely operating and, prior to the Authority providing approval to demolish the building and disconnecting the electric, water and utility services.

The Contractor shall obtain any and all permits or licenses necessary for the performance of the work and shall familiarize himself with and conform to all local, State and Federal laws, regulations or ordinances applicable to the work.

The following Subsection is added:

202.021 Removing Asbestos Containing Materials

The Authority had an Asbestos Containing Material Determination Survey performed at the Exit 45 Toll Plaza Facility in August 2020. All areas, except concealed spaces and components internal to mechanical devices, have been tested for asbestos. The location of asbestos is

documented in **Appendix A** – Asbestos/Lead Determination Impact Assessment, Exit 45 South Portland, Maine, dated August 28, 2020. The Inspection and bulk sample analysis indicate that there are Materials that do contain asbestos within the toll plaza booths and toll administration building utility room tested and must be removed by a State of Maine certified asbestos abatement contractor. Should any additional suspect building materials be found during any of the demolition/renovation work, the work shall immediately stop until additional sampling can be conducted.

The asbestos determination investigation did not include demolition of the structure or equipment to locate asbestos containing materials. Should additional suspect asbestos containing materials be observed during the demolition process, the provisions of Special Provision Subsection 105.2.4.5 shall apply.

A licensed asbestos abatement Contractor shall properly abate and dispose of all asbestos containing materials identified in the Asbestos/Lead Determination Impact Assessment, Exit 45 South Portland, Maine, dated August 28, 2020 and as specified in this Special Provision.

The licensed asbestos abatement Contractor shall restrict access around the building perimeters by installing barrier tape at minimum 40 feet offsets to the building lines and barricading entrances that lead into asbestos abatement areas.

The General Contractor or building demolition Contractor may sub-contract the removal of the asbestos containing material (ACM) to a licensed asbestos abatement Contractor or use his own trained and licensed personnel. The licensed asbestos abatement Contractor must prepare a work plan for the removal of the ACM and submit a copy to the Resident for approval prior to commencing with the removal of ACM.

Disposal of all ACM shall comply with current EPA and Maine DEP regulations. The Contractor shall submit to the Resident the original disposal receipts acknowledging proper disposal of ACM prior to the payment of Removing Asbestos Containing Material pay items.

At the asbestos abatement Contractor's option non-asbestos containing and non-asbestos contaminated materials, removed for access to ACMs, may be neatly stacked inside the building until the building demolition Contractor takes possession of the ACM abated building.

The licensed asbestos abatement Contractor will be responsible for all work associated with the asbestos removal, including the Asbestos Removal Plan, MaineDEP Notification, demolition, final clearances, legal disposal and abatement certification.

The licensed asbestos abatement Contractor shall obtain any and all permits or licenses necessary for the performance of the work and shall familiarize himself with, and conform to, all local, State and Federal laws, regulations or ordinances applicable to the work.

202.05 Method of Measurement

The first and third sentences of the first paragraph are deleted and replaced with the following:

Removing Asbestos Containing Materials will be measured by the lump sum.

Removing Buildings will be measured by the lump sum.

202.06 Basis of Payment

This Subsection is amended by the addition of the following:

Removing Asbestos Containing Materials will be paid for at the Contract lump sum price which price shall be full compensation for the legal removal and disposal of all asbestos containing meeting materials, shall include all materials, labor, tools and equipment necessary to complete this work.

Removing Buildings will be paid for at the Contract lump sum price which price shall be full compensation for the legal removal and disposal of all Toll Administration Building and Generator Building materials, including removal of reinforced concrete floors, walls and foundations, termination of utilities, removing and stacking of equipment and items, and shall include all materials, labor, tools and equipment necessary to complete this work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
202.071	Removing Asbestos Containing Materials	Lump Sum
202.081	Removing Buildings	Lump Sum

SPECIAL PROVISION

SECTION 202

REMOVING STRUCTURES AND OBSTRUCTIONS

(Removing Existing Structural Concrete)

202.01 Description

The following paragraphs are added:

This work shall include removal and disposal of the existing pavement, approach slabs, and toll island slabs including bumpers and booth enclosures, as well as the toll plaza tunnel and access hatch as shown on the Plans. Only a portion of the tunnel is to be removed as shown on the Plans.

All removed concrete materials shall become the property of the Contractor and shall be removed from the site at the completion of the Project. The Contractor shall provide the Resident with an affidavit stating the final location of all disposed material and that the material was disposed of in accordance with the Maine Department of Environmental Protection Solid Waste Regulations.

202.07 Method of Measurement

The following paragraph is added:

Any excavation required to remove existing concrete will not be measured separately for payment, but shall be incidental to Item 202.17, Removing Existing Structural Concrete.

SPECIAL PROVISIONSECTION 202REMOVING STRUCTURES AND OBSTRUCTIONS

(Removing Existing Bridge)

202.01 Description

This section is amended by the addition of the following:

Prior to starting any demolition work, the Contractor shall submit a demolition plan to the Resident for approval. The demolition plan shall be stamped by a Professional Engineer licensed in the State of Maine. The demolition plan shall consider the effect of construction equipment, methods of operation, and sequence of work on the capacity and stability of the bridge. The capacity of the structure shall be calculated to demonstrate the proposed work activities will not result in unacceptable overstress in the structure.

No demolition will be permitted until the approved method of shielding is completely installed. Traffic will not be permitted to use the travelway directly under the demolition work; a lane closure will be required.

All materials removed as part of this work shall become the property of the Contractor unless otherwise noted. The Contractor shall provide the Resident with an affidavit stating the final location of all disposed material and that the material was disposed of in accordance with the Maine Department of Environmental Protection Solid Waste Regulations.

202.03 Removing Existing Superstructure, Structural Concrete, Railings, Curbs, Sidewalks and Bridges

The first sentence of the fifth paragraph is deleted and replaced with the following:

The steel barrier on the existing structure and approaches shall be retained by the Authority. The Contractor shall carefully dismantle it, and all materials shall be loaded on trucks, transported and neatly stacked by the Contractor at the Crosby Maintenance Facility as specified on the plans.

The seventh paragraph is deleted and replaced with the following:

All materials not specified to be retained by the Authority shall become the property of the Contractor and shall be removed from the site at the completion of the Project. The Contractor shall provide the Resident with an affidavit stating the final location of all disposed material and that the material was disposed of in accordance with the Maine Department of Environmental Protection Solid Waste Regulations.

SPECIAL PROVISIONSECTION 202REMOVING STRUCTURES AND OBSTRUCTIONS

(Removing Pavement Surface)

202.01 Description

The following sentences are added:

This work shall also consist of removing the surface of the bituminous concrete pavement in all locations to the depth, width, grade, and cross section on the mainline as shown on the Plans or as directed by the Resident.

Removal of existing pavement surface shall be completed through the use of a milling machine. The milling machine(s) shall be capable of accurately establishing profile grades by referencing from a floating straight edge, a minimum of 30 feet.

Areas requiring shim pavement to reach final pavement grade shall not be milled.

This work shall also consist of construction of temporary ramps at all butt joints as shown in the MaineDOT Standard Details, November 2014 Edition – Pavement Overlay Butt Joint Detail (Roadways), Page 202(01) or as approved by the Resident. The length of the temporary ramp shall be at least 1/2 L.

202.061 Removing Pavement Surface

This Subsection is deleted and replaced with the following:

The equipment for removing the bituminous surface shall be a power-operated milling machine or planer capable of removing the bituminous concrete pavement to the required depth, transverse cross slope, and profile grade by use of an automated grade and slope control system. The controls shall automatically increase or decrease the pavement removal depth as required, and readily maintain desired cross slope to compensate for surface irregularities in the existing pavement course. The mill head on the machine shall have a maximum 8mm tooth spacing pattern and a minimum triple wrap configuration. The milling machine shall be capable of accurately establishing profile grades by referencing from a floating straight edge, minimum of 30± feet. The equipment shall also have an effective means for removing excess material from the surface and preventing flying material in compliance with Subsections 105.2.5 Compliance with Health and Safety Laws and 105.2.6 Convenience of the Public, of the Specification.

The contractor shall operate the milling machine such that the forward operating speed of the machine in feet per minute (fpm) does not exceed 65% of the mill head in revolutions per minute (rpm). i.e. 100 rpm head speed equals maximum forward operating speed of 65 fpm. The contractor shall avoid stopping the milling operation during truck exchanges by staging the haul units accordingly.

The Contractor shall locate, identify and remove all objects in the pavement through the work area that would be detrimental to the milling machine.

The Contractor shall be responsible for the layout of the longitudinal centerline between the travel lane and passing lane.

The finished milled surface will be inspected before being accepted, and any deviations in the profile exceeding 3/8 inch under a 16 foot string line or straightedge placed parallel to the centerline will be corrected. Any deviations in the cross slope that exceed 3/8 inch under a 10 foot string line or straightedge placed transversely to the centerline will be corrected. In no case shall the cross slope in a single lane width be inverted resulting in a depression as measured transverse to the direction of travel. Any cross slope inversions or depressions shall be corrected by spot shimming the area with HMA as directed by the resident prior to installing any leveling or wearing course. These corrections shall be done with no additional expense to the Authority.

All surplus pavement grindings shall be disposed of by the Contractor off the turnpike right-of-way. All grindings shall be disposed of in accordance with the Maine Department of Environmental Protection Solid Waste Management Requirements.

202.07 Method of Measurement

The removal of existing bituminous concrete pavement will be measured by the square yard of material removed to the required depth.

The following sentences are added:

Transporting and stockpiling of the pavement grindings at the maintenance facilities will not be measured separately for payment, but shall be incidental to the Removing Pavement Surface items.

Installation of temporary bituminous ramps will not be measured separately for payment, but shall be incidental to the Contract.

Removal of temporary bituminous ramps will not be measured separately for payment, but shall be incidental to the Contract.

202.08 Basis of Payment

Removing Pavement Surface will be paid for at unit price per square yard which price shall be full compensation for removing and disposing of the bituminous and gravel materials.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
202.202 Removing Pavement Surface	Square Yard

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 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 203

EXCAVATION AND EMBANKMENT

203.02 Materials

The following sentence is added:

All Granular Borrow used on this project shall meet the requirements of Granular Borrow for Underwater Backfill.

SPECIAL PROVISIONSECTION 203EXCAVATION AND EMBANKMENT

(Geofoam Lightweight Fill)

203.01 Description

The following sentence is added:

This work shall include furnishing all qualifications, shop drawings, material and equipment, placing and providing approved field quality control personnel to install, oversee and certify the installation of the Geofoam Lightweight Fill, referred to in this Specification as expanded polystyrene (EPS), complete, as specified herein, and shown on the Plans.

The following Subsection is added:

203.011 Reference Publications

Some or all of the publications referred to hereinafter form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The latest edition of the referenced publication shall govern.

AMERICAN SOCIETY OF TESTING MATERIALS (ASTM) PUBLICATIONS

ASTM DESIGNATION	TEST METHOD FOR
C203	Breaking Load and Flexural Properties of Block-Type Thermal Insulation
C578	Rigid Cellular Polystyrene EPS Thermal Insulation
D732	Shear Strength of Plastics by Punch Tool
C272	Water Absorption of Core Materials for Sandwich Construction
D1621	Compressive Properties of Rigid Cellular Plastics
D1622	Apparent Density of Rigid Cellular Plastics
D6817	Standard Specification for Rigid Cellular Polystyrene Geofoam

203.02 Materials

The EPS block supplier shall provide the EPS blocks, mechanical fasteners, shop drawings for installation, and full time on-site supervision of the EPS block installation. Upon completion of the installation, the EPS block supplier shall provide a letter certifying that the EPS blocks were manufactured and installed in accordance with the Plans and Specifications and the approved shop drawings.

The following Subsections are added:

203.021 EPS Block Supplier Qualifications Submittal – (60 Days Prior to Delivery)

At least 60 calendar days prior to first delivery of EPS to the site, the Contractor and/or Geofoam supplier shall submit the following:

- List at least three (3) similar projects using EPS blocks in a load bearing or embankment application.
- Provide contact reference for each project with telephone number, address, and email.
- Provide resumes of the Project Manager and the field quality control personnel listing specific geofoam lightweight fill project experience. Personnel to be assigned to this Project must be identified by the supplier and approved by the Authority or its Geotechnical Consultant. Alternate personnel may be used only after their qualifications are reviewed and approved by the Authority or its Geotechnical Consultant.

Written documentation verifying that the Geofoam Supplier has a third-party certification program in force. If multiple Geofoam suppliers are used, each Supplier shall have a program in force. If multiple suppliers are used, third-party certification must be acceptable for each and every Supplier; otherwise, it will be denied for each and every molder. The documentation shall identify the business entity providing the third party certification, the firm's experience and qualifications, and shall describe in detail the steps to be taken by the agency to verify the Geofoam Supplier(s) compliance with the specific requirements described herein.

- Provide detailed description of manufacturing and field QA services to be provided for this Project.

A review of the EPS block supplier's qualifications, the third-party inspection firm qualifications, and quality assurance plan will be completed by the Authority or its Geotechnical Consultant within 10 days of receipt.

At least ten working days prior to the first delivery of Geofoam to the site, the Contractor shall provide certifications, in the form of a letter prepared by the Geofoam Supplier, that the Geofoam will be, or has been, manufactured in accordance with these Specifications and that the specified minimum physical property requirements will be, or have been, met.

No geofoam shall be shipped to the site until such time as all qualification related submittals have been reviewed and approved by the Authority.

Upon completion of the installation, the Contractor shall provide a letter certifying that the Geofoam was manufactured and installed in accordance with the Specifications and approved shop drawings. The letter shall include copies of all QA certification testing completed for the project.

203.022 EPS Block Supplier Shop Drawing Submittal – (60 Days Prior To Delivery)

At least 60 days prior to delivery of material to the site, the approved EPS block supplier shall submit complete shop drawings for the installation. The drawings shall indicate a placement pattern for all blocks in each layer. The blocks shall be labeled to match the approved shop

drawings. The submitted drawings shall include plans, elevations, and cross sections needed to clearly show the configuration and limits of the geofoam.

A review of the shop drawings or revised shop drawings will be completed by the Authority or its Geotechnical Consultant within 10 working days of receipt. If revisions are required, the supplier shall submit the revised shop drawings for review. EPS blocks shall not be shipped to the site prior to notification that the shop drawings have been approved for construction.

203.023 Geofoam Lightweight Fill

Geofoam Lightweight Fill shall be ASTM C 578 Type I (EPS-15) and Type II (EPS-22) conforming to this Specification, as supplied by:

Poly Molding Corp.

96 4th Avenue
Haskell, NJ 07420

Tel.: 800.229.7161
Fax: 973.835.2438

Insulation Technology, Inc.

P.O. Box 578
35 First Street
Bridgewater, MA 02324

Tel.: 508.697.6926
Fax: 508.697.6934

Thermal Forms, Inc.

P.O. Box 1981
6173 South Bay Road
Cicero, NY 13039

Tel.: 315.699.8734
Fax: 315.699.4969

Branch River Plastics

15 Thurber Boulevard
Smithfield, RI 02917

Tel.: 401.232.0270
Fax: 401.231.3434

or an approved supplier.

EPS shall be fabricated using virgin feedstock manufactured into blocks having no more than five percent regrind content. Blocks shall initially have a height of at least two feet, a width of at least four feet, and length of at least eight feet except when otherwise approved by the Engineer. All blocks shall be shop-trimmed as necessary so that all surfaces are smooth and flat, and are within tolerances of 0.5 percent of respective height, width and length dimensions. The blocks shall be labeled to match the approved shop drawings. Additional field and/or shop trimming and cutting will be required as necessitated by the geometry of the fill being constructed.

EPS blocks shall conform to the specified type category in ASTM C-578 and have the following physical properties:

Physical Property	ASTM Test Procedures	Accepted Value		
		Type I (EPS-15)	Type II (EPS-22)	Units
Density	D1622	0.9 (14.4)	1.35 (21.6)	pcf (Kg/m ³)
Compressive Resistance	D1621	3.6 (25)	7.3 (50)	psi (kN/m ²) Minimum @ 1% Deformation
Flexural Strength	C203	25 (172)	40 (276)	psi (kN/m ²) Minimum
Water Absorption	C272	4.0	3.0	%, Less than by volume

The EPS shall contain a flame retardant additive and shall have UL Certification of Classification as to External Fire Exposure and Surface Burning Characteristics. EPS should be considered combustible and should not be exposed to open flame or any source of ignition. EPS shall be treated with a tested and proven termite treatment for below grade applications in accordance with the ICC ES EG239 – Evaluation Guidance for Termite-Resistant Foam Plastics, to prevent insect attack and shall be protected from burrowing animals and vector intrusion. The treatment shall be an EPA registered agent for use with plastic foam, and the manufacturer shall present proposed treatment methods to the Resident for review and approval.

The Contractor shall furnish the Resident with a third party certified test report showing all data required to indicate compliance with the Specifications. The Contractor shall also furnish the Resident with the ICC code report certifying the EPS supplier for manufacture of expanded polystyrene foam meeting all above requirements.

EPS Connector Plates shall be used to restrain EPS blocks from moving laterally in layer over layer application. Connectors shall be galvanized steel or stainless steel with a two-sided multi-barbed design capable of piercing EPS. Each connector shall have a lateral holding strength of at least 60 lbs. when tested with ASTM D 6817 EPS, with a safety factor of two.

The following Subsections are added:

203.041 Sampling and Testing

Quality assurance testing and sampling, to monitor the conformance of the EPS with the Specification requirements, will be completed as approved by the Resident. Density and geometry (dimensional tolerances) testing shall be conducted using full-size blocks. Blocks in conformance with Contract requirements can be used to make required fills.

Testing to monitor the quality of the EPS shall be done at the discretion of the Resident. The Resident has the right to randomly sample at the manufacturing plant and/or at the jobsite. If any block does not conform to the physical requirements, or if it is damaged in any way, it may be rejected by the Resident.

203.042 Protection

The EPS, as delivered, shall be free of defects or flaws that affect its workability quantities. The Contractor shall prevent damage to the EPS during delivery, storage, and construction. Prior to delivery of EPS to the Project site, the Contractor shall review and be thoroughly knowledgeable with the manufacturer's care and handling recommendations. The Contractor shall protect the EPS blocks from exposure to organic and petroleum based solvents. Any EPS to be exposed to sunlight for more than 30 days shall be covered with opaque material which will prevent ultraviolet light degradation.

Placement of embankment will require special procedures and careful selection of appropriate construction equipment to prevent damage to the EPS. No heavy construction equipment or vehicles shall be allowed directly on the EPS or geomembrane. Damage to the EPS or geomembrane resulting from the Contractor's vehicles, equipment, or operations shall be replaced at the contractor's cost and to the satisfaction of the Resident. EPS must be protected from petroleum-based solvents such as gasoline and diesel fuel.

Damage to EPS shall be corrected as follows:

Slight damage (less than 0.12 cubic feet) with no linear dimension greater than one foot may be left in place as-is.

Moderate damage (less than 0.35 cubic feet) with no linear dimension greater than 3.3 feet shall be filled with leveling sand.

EPS blocks with excessive damage (i.e., exceeding the "moderate" category) shall be replaced with EPS blocks which meet the damage criteria. EPS blocks not meeting the damage criteria may be cut to eliminate the excessive damage and the remaining undamaged portion of the block may be used within the fill, provided the undamaged portion of the block meets all other requirements.

Leveling sand, HDPE Geomembrane and embankment fill over the side slopes of the EPS shall be placed starting at the bottom of the slope in such a manner as to prevent damage to the EPS. Finished EPS on side slopes shall have a minimum of 1.5 feet of embankment fill cover.

Embankment fill over the side slopes of the EPS shall be placed starting at the bottom of the slope in such a manner as to prevent damage to the EPS.

The embankment fill over the side slopes shall be compacted using approved manually-operated compaction equipment.

203.043 Subgrade Preparation

Clear and grub site in accordance with Section 202, Clearing Right-of-Way, and Section 203, Excavation and Embankment. If necessary, provide temporary construction dewatering during subgrade preparation, placement of non-woven geotextile fabric, crushed stone and geofoam installation and filling until adequate cover is in place to prevent flotation of geofoam blocks. Temporary construction dewatering shall be provided at no additional cost to the Authority.

Bench into existing slope as required to provide a level subgrade to support each layer of geofoam. Recompact subgrade to a minimum of 90 percent of maximum dry density as determined by AASHTO T180 or as specified on the Plans. Place a uniform layer of leveling sand over the prepared surface, with a six inch minimum thickness. Level to 1/4 inch per 10 feet horizontal. Compact leveling sand to a minimum of 90 percent of maximum dry density as determined by AASHTO T180.

203.044 Placement

EPS shall be placed to the lines and grades shown in the approved shop drawings and as directed by the Geotechnical Consultant. The Contractor shall strictly adhere to placing the appropriate EPS type (Type I and Type II) within the zones indicated on the plans. All blocks shall accurately fit relative to adjacent blocks and structures. No gaps greater than 1/2 inch will be allowed on vertical joints. The finished surface of the EPS beneath pavement sections shall be constructed to within the tolerances of zero to minus 0.2 foot of the indicated grade. The finished surface of the EPS on side slopes that receive soil cover shall be constructed to within a tolerance of plus 0.3 feet to minus 0.3 feet of the indicated grade.

Blocks placed in a row in a particular layer shall be offset two feet relative to blocks placed in adjacent rows of the same layer or as shown on the approved shop drawings. In order to avoid continuous joints, each subsequent layer of blocks shall be offset two feet relative to blocks placed in the previous layer. The long axis of all blocks will be placed perpendicular to the embankment centerline for the first layer. For multiple layers orient the successive layer of EPS at 90° to the direction of the layer underneath. Connector plates should be placed between horizontal layers of blocks. Blocks shall be cut using a saw or hot wire, where necessary.

Because of the low unit weight of the EPS, it is the Contractor's responsibility to provide temporary weighing and/or guying as necessary until all blocks are built into a homogeneous mass, and the soil cover and pavement section are in place. Also, the Contractor is responsible for temporarily resisting buoyancy during construction.

Install a minimum of three connectors for each four foot by eight foot section of geofoam material, or as shown on approved shop drawings, or directed by the Resident. For other block sizes, a minimum of 1 plate per 8 square feet of face shall be used. Press firmly into the rigid foam until the connector is flush with the surface. Position the next foam block as specified and set firmly before placing subsequent blocks.

EPS blocks shall have a minimum size of 4' wide by 8' long by 1' tall, though isolated exceptions may be necessary at the edge and transition zones subject to the approval of the Engineer.

203.18 Method of Measurement

The following sentences are added:

Geofoam Lightweight Fill furnished and placed in accordance with the Plans and Specifications shall be measured by the cubic yard in place and accepted.

203.19 Basis of Payment

The following paragraphs are added:

Geofoam Lightweight Fill will be paid for at the Contract unit price per cubic yard which shall be full compensation for furnishing all qualifications, on-site supervision from supplier, shop drawings, labor, materials, equipment, dewatering and incidentals necessary to complete the work. Both types of Geofoam (Type I and Type II) shall be paid at the same unit price.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
203.43 Geofoam Lightweight Fill	Cubic Yard

SPECIAL PROVISION

SECTION 203

EXCAVATION AND EMBANKMENT

(Leveling Sand)

203.01 Description

The following sentence is added:

This work shall include furnishing, placing, grading and densifying leveling sand as shown on the Plans or as approved by the Resident.

203.02 Materials

The following sentence is added:

Leveling sand shall meet the requirements of Subsection 703.05, Aggregate for Sand Leveling.

203.04 General

The following paragraph is added:

Leveling sand shall be placed to the lines and limits shown on the Plans and graded to a uniform slope. Compaction shall be achieved with an approved manually-operated power compactor or as directed by the Resident.

203.18 Method of Measurement

The following sentence is added:

Leveling Sand shall be measured by the cubic yard complete and accepted in place.

203.19 Basis of Payment

The following sentences are added:

Leveling Sand will be paid for at the Contract unit price per cubic yard which shall be full compensation for all labor, materials, equipment, and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
203.45	Leveling Sand	Cubic Yard

SPECIAL PROVISIONSECTION 203EXCAVATION AND EMBANKMENT

(Low Permeability Fill)

203.01 Description

The following sentence is added:

This work shall consist of the placement of Low Permeability Fill as an impermeable soil barrier within the embankment of the Underdrained Soil Filters as shown on the Plans.

203.02 Materials

The following paragraphs are added:

Low Permeability Fill shall conform to the following requirements:

A. Impermeable Soil Barrier

1. Soil to be used as a barrier such as a compacted clay barrier shall consist of glaciomarine silt-clay material with a hydraulic conductivity of less than 10^{-5} (0.0001) cm/sec. Soil barrier material shall be free of organic material, debris, ice, snow, and other deleterious material, with no stone larger than one inch. Unless approved otherwise by the Resident, materials used for the impermeable soil barrier shall contain greater than 90 percent silt and clay content (minus No. 200 U.S. Std. Sieve) by dry weight, a Liquid Limit greater than or equal to 28, and a Plasticity Index greater than or equal to 11.

203.04 General

The following paragraphs are added:

The placement of the Low Permeability Fill shall conform to the following requirements:

1. Moisture Control: The workability of silt clay is acutely sensitive to moisture content. The water content of silt Low Permeability Fill used as fill shall be controlled by the Contractor to stay in the range of two percent dry of the laboratory-determined optimum water content to four percent wet of optimum water content. Silt clay not meeting this range of water contents shall be removed or reworked until the moisture content is within these limits, unless approved otherwise by the Resident.
2. Thickness: The final lift shall be a six inch compacted layer as specified on the Plans.

3. Compaction Criteria: Silt Low Permeability Fill shall be compacted to at least 95 percent of maximum dry density as determined by ASTM D698. The Contractor shall adjust the moisture content of the silt Low Permeability Fill as necessary to achieve the required degree of compaction.
4. Placement: Silt Low Permeability Fill shall be placed in continuous, approximately horizontal layers, not more than 12 inches in loose depth for material compacted by heavy construction equipment, and not more than six inches in loose depth for material compacted by hand-operated tampers. Fill material shall not be placed on surfaces that are muddy, frozen, or contain frost or ice.

The distribution and gradation of the silt Low Permeability Fill throughout earthwork components shall be such that the fills will be free from lenses, pockets, streaks, or layers of material differing substantially in texture, gradation, or moisture from the surrounding material. The combined excavation, separation, and placement operations shall be such that the materials, when compacted, will be blended sufficiently to secure the best practicable distribution of the material.

5. Compaction: When each layer of material has been conditioned to have the specified moisture, it shall be compacted by at least four passes of the compaction equipment. The passage of compaction equipment in either direction (forward or backward) is considered a single "pass". When compacted, the density shall be essentially uniform throughout the layer. Compacted earth material having a moisture content or dry density that does not meet the criteria specified shall be reworked or re-compacted, as approved by the Resident to obtain the specified moisture content and dry density.
6. Heavy construction equipment shall not operate over the adjacent soil filter bed and underdrain system. Any damage or over compaction of these areas shall be corrected at no additional cost to the Authority.

203.18 Method of Measurement

The following sentence is added after the second paragraph:

Low Permeability Fill will be measured for payment by the cubic yard using the lines, grades and dimensions shown on the Plans.

203.19 Basis of Payment

The following is added after the first paragraph:

The accepted quantity of Low Permeability Fill will be paid for at the Contract unit price per cubic yard. Payment shall be full compensation for obtaining Low Permeability Fill and excavating, loading, hauling, placing, grading and compacting necessary for the formation of the Low Permeability Fill. It shall also include full compensation for disposing of excavated material and surplus material when necessary, and shall include all materials, labor, tools and equipment necessary to complete this work.

Payment will be made under:

Pay Item

Pay Unit

203.52 Low Permeability Fill

Cubic Yard

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 304

AGGREGATE BASE AND SUBBASE COURSE

304.03 Placing

The following paragraph is added:

All aggregate subbase course gravel shall be from excavating the surcharge within the project limits. MTA Contract 2019.13 installed aggregate subbase course gravel in embankment preload surcharge locations on this project. The aggregate subbase course gravel surcharge material installed under MTA Contract 2019.13 met testing requirements for Aggregate Subbase Course Gravel and is a very coarse gap-graded 4-inch crushed gravel.

304.04 Shaping, Compacting and Stabilizing

The following paragraph is added:

The shaping, compacting and stabilizing work associated with reuse of the surcharge aggregate subbase course gravel material may require additional efforts to prevent and eliminate pockets of segregation and surface voids prior to placing aggregate base course gravel. All additional work associated with reusing the existing surcharge material shall be incidental to the Aggregate Subbase Course Gravel item.

SPECIAL PROVISIONSECTION 401HOT 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 [140°F]	3.0mm [1/8 in] max
Bond, non-immersed	Three 12.7mm [1/2 in] specimens pass 3 cycles @ 200% extension @ -29°C [-20°F]
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 [140°F].

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 401.03 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)				Voids Filled with Binder (VFB) (Minimum %)	Fines/Eff. Binder Ratio
				Nominal Maximum Aggregate Size (mm)					
	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 (°C)	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 5°F with the use of WMA except for HMA being placed over bridge deck membrane.

Section 401.04 Temperature Requirements

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 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 paragraph:

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.

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 401.111 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. 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 subplot 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

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

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 subplot (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 subplot for core density only. The original core density and the recut core density shall be averaged together to determine payment for the subplot. 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 PROVISIONSECTION 401HOT MIX ASPHALT PAVEMENT

(HMA using Hydrated Lime)

The following sections of Section 400 have been revised with following additional requirements.

401.01 Description

The Contractor shall compose Hot Mix Asphalt (HMA) Pavement with aggregate, Performance Graded Asphalt Binder (PGAB), hydrated lime, and mineral filler if required. Hydrated Lime shall be utilized in all mixtures so denoted in Special Provision 403 - Hot Mix Asphalt Pavement.

401.02 Materials

Materials shall meet the requirements specified.

Hydrated Lime

AASHTO 216

401.03 Composition of Mixtures

The Contractor shall compose the Hot Mix Asphalt Pavement with aggregate, Performance Graded Asphalt Binder (PGAB), hydrated lime 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).

Hydrated lime shall be used in all HMA at a rate of one percent (1%) by weight of the total dry aggregate including RAP aggregate, if used. The Contractor shall obtain a shipping ticket for each shipment of hydrated lime. The Contractor shall provide the Resident with a copy of each shipping ticket from the supplier, including the date, time and weight of hydrated lime shipped and used in HMA production. The Contractor shall submit a material data sheet for the hydrated lime to the Resident for approval.

The Contractor shall provide the following information with the proposed JMF:

Safety Data Sheets (SDS) for hydrated lime

Supplier and source for Hydrated Lime

401.13 Preparation of Aggregates

The Contractor shall add water to the aggregates as required to maintain a minimum total aggregate moisture content of 3 percent. The Contractor shall mix the lime uniformly with the aggregate before introducing the aggregate into the dryer or dryer drum. Hydrated lime introduction systems must be controlled by a proportioning device to the amount required on the JMF plus or minus 0.1% of the target.

The Contractor shall add lime to the aggregate by one of the following methods:

- A. The Contractor shall add lime to the combined cold feed aggregate using an enclosed in-line cold feed mechanical pugmill mixer. The Contractor shall use a twin-shaft, continuous mixing pugmill with mixing paddles to thoroughly blend the lime with the aggregate. The Contractor shall adjust the retention time of the mixture in the pugmill so no unmixed lime is visible after the lime and aggregate exit the pugmill.
- B. The Contractor shall add lime to the combined cold feed aggregate by introducing the lime between aggregate layers as the aggregate flows from the cold feed bins. The Contractor shall thoroughly mix the lime and aggregate on the conveyor belt. The Contractor shall provide a lime introduction system so that no unmixed lime is visible before the lime and combined aggregate enter the drum.

The cold storage for hydrated lime shall be a separate bulk storage bin with a vane feeder or other approved feeder system which can be readily calibrated. The system shall provide a means for convenient sampling of the hydrated lime additive and verifying the quantity of lime dispensed. If the hydrated lime is to be introduced directly into the plant then the additive equipment shall be synchronized with the cold feed controls to operate concurrently with the cold feed operation. The system will be configured to automatically adjust the hydrated lime feed to variations in the cold aggregate feed. The hydrated lime system shall have out-of-tolerance sensing ability by weight, and have a means to indicate the out-of-tolerance condition.

401.14 Mixing

Hydrated lime shall be added into the HMA aggregate mixture prior to the aggregate blend mixing with the PGAB. Aggregate feed rate, or pugmill mixing times shall be adjusted to ensure complete blending of Hydrated Lime and aggregate before the PGAB is added.

401.18 Quality Control

The Contractor shall provide a written supplement to the project specific QCP outlining the proposed methods of adding and mixing the hydrated lime for approval by the Authority. This written summary shall also provide information describing how the Contractor will perform quality control on the addition of hydrated lime, specifically the method of introduction and how the lime use will be measured to assure that the specified percentage is consistently added, and appropriately mixed. The supplemental QCP covering hydrated lime introduction shall be provided to the Authority at least one week prior to the prepave meeting.

SPECIAL PROVISIONDIVISION 401HOT MIX ASPHALT PAVEMENT

(Asphalt Rich Base Mixture)

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

401.01 Description

The Contractor shall furnish and place one or more courses of Asphalt Rich Base Hot Mix Asphalt (ARBHMA) on an approved base in accordance with the contract documents and in reasonably close conformity with the lines, grades, thickness, and typical cross sections shown on the plans or established by the Resident. The Department will accept this work under Quality Assurance provisions, in accordance with these specifications and the requirements of Section 106 – Quality, the provisions of AASHTO M 323 except where otherwise noted in sections 401 and 703 of these specifications, and the Maine DOT Policies and Procedures for HMA Sampling and Testing.

401.02 Materials

This section has been modified with the following revision:

The Asphalt Rich Base HMA shall be designed for an Air Void Target of 2.5% at 65 Gyration.

401.03 Composition of Mixtures

This section has been modified with the following revision: The Asphalt Rich Base HMA shall meet the following design criteria.

DESIGN CRITERIA

Gradation	PGAB Minimum
9.5mm mixture	7.0 %
12.5mm mixture	6.5 %
19.0mm mixture	5.8 %

The mixture shall meet the gradation requirements of a current MaineDOT approved 9.5mm, 12.5mm, or 19.0mm 65 Gyration JMF, as required by the contract, and the minimum PGAB content noted above. The Acceptance Limit targets for gradation will be as specified on the JMF.

ACCEPTANCE LIMITS

Property	USL and LSL
Passing 4.75 mm and larger sieves	Target +/-7%
Passing 2.36 mm to 1.18mm sieves	Target +/-4%
Passing 0.60 mm	Target +/-3%

Passing 0.30 mm to 0.075 mm sieve	Target +/-2%
PGAB Content	Target +/-0.4%
Air Voids	2.5% +/-1.5%
Fines to Effective Binder	0.4 to 1.2
Voids in the Mineral Aggregate	LSL Only from Table 1
Voids Filled with Binder	72 -87.0 *
% TMD (In place density)	96.0% +/- 2.5%

*A production tolerance of 4.0% will apply for the USL.

401.21 Method of Measurement

The following replace the pay tables in section 401.21

<u>CORE DENSITY VS. CORE THEORETICAL MAXIMUM DENSITY COMPACTION 93.5-98.5 PERCENT</u>	
<u>PERCENT COMPACTION</u>	<u>PERCENT PAYMENT</u>
93.5 – 98.5	100
92.5-93.4, 98.6 – 99.0	95
92.4-91.5, 99.1 – 99.5	85
<91.5, > 99.5	75
<u>Note:</u> Percent compaction is the percentage of the field core density as compared to the Theoretical Maximum Density (TMD) of that core.	

<u>AIR VOIDS – 1.0 – 4.0 PERCENT</u>	
<u>VOIDS</u>	<u>PAYMENT PERCENT</u>
1.0 to 4.0	100
0.5-0.9, 4.1-4.5	90
<0.5, >4.5	75
<u>Note:</u> Voids are based on the average of the test specimens fabricated at the plant for each subplot (500 tons).	

Payment for PGAB content shall be based on the JMF aim with an allowable production tolerance of +/-0.4% except that test results which fall below the minimum PGAB content shall not be permitted:

Gradation	PGAB Minimum
9.5mm mixture	7.0 %
12.5mm mixture	6.5 %
19.0mm mixture	5.8 %

9.5 mm Asphalt Rich Base PGAB CONTENT	
% PGAB	% PAYMENT
JMF Aim ± 0.4	100
JMF Aim + 0.5 , - 0.5 , < 7.0	95
JMF Aim + 0.6 , - 0.6 , < 6.9	90
JMF Aim + 0.7 , - 0.7 , < 6.8	85
<u>Note:</u> PGAB content is based on samples tested at the plant for each 500 Ton subplot	

12.5 mm Asphalt Rich Base PGAB CONTENT	
% PGAB	% PAYMENT
JMF Aim ± 0.4	100
JMF Aim + 0.5 , - 0.5 , < 6.5	95
JMF Aim + 0.6 , - 0.6 , < 6.4	90
JMF Aim + 0.7 , - 0.7 , < 6.3	85
<u>Note:</u> PGAB content is based on samples tested at the plant for each 500 Ton subplot	

19.0 mm Asphalt Rich Base PGAB CONTENT	
% PGAB	% PAYMENT
JMF Aim ± 0.4	100
JMF Aim + 0.5 , - 0.5 , < 5.8	95
JMF Aim + 0.6 , - 0.6 , < 5.7	90
JMF Aim + 0.7 , - 0.7 , < 5.6	85
<u>Note:</u> PGAB content is based on samples tested at the plant for each 500 Ton subplot	

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
403.2072	19.0mm Asphalt Rich Base HMA	Ton

SPECIAL PROVISIONSECTION 403HOT MIX ASPHALT PAVEMENT403.01 Description

This work shall also consist of the construction, maintenance and removal of all temporary bituminous ramps at locations as shown on the Plans or as directed by the Resident.

403.02 General

The Contractor shall compose the Hot Mix Asphalt Pavement with aggregate, Performance Graded Asphalt Binder (PGAB), and mineral filler if required. The Performance Graded Asphalt Binder (PGAB) shall be polymer modified as detailed in this special provision and shall conform to the requirements of AASHTO M 332 (including Appendix 1). The PG64E-28 Binder shall contain a minimum of 2.25% Styrene-Butadiene-Styrene (SBS) polymer {BWT} in a homogeneous blend with a minimum average percent recovery of 75% as determined by AASHTO T350 @ 3.2 kPa (R3.2) on RTFO residue at 64°C to assure significant polymer load and performance. The stability of the modified binder shall be verified in accordance with ATSM D7173 using the Dynamic Shear Rheometer (DSR). The DSR $G^*/\sin(\delta)$ results from the top and bottom sections of the ATSM D7173 test shall not differ by more than 10%. The results of ASTM D7173 shall be included on the Certified Test Report.

When required PG70E-34 Binder shall be modified with Styrene-Butadiene-Styrene (SBS) polymer {BWT} in a homogeneous blend with a minimum average percent recovery of 75% as determined by AASHTO T350 @ 3.2 kPa (R3.2) on RTFO residue at 70°C to assure significant polymer load and performance. The stability of the modified binder shall be verified in accordance with ATSM D7173 using the Dynamic Shear Rheometer (DSR). The DSR $G^*/\sin(\delta)$ results from the top and bottom sections of the ATSM D7173 test shall not differ by more than 10%. The results of ASTM D7173 shall be included on the Certified Test Report.

403.03 Construction

All areas which have been milled or overlaid shall have a minimum length temporary ramp constructed as determined by the Resident at the milled or overlaid limits prior to opening the roadway to traffic. Temporary ramps shall be constructed using the same material as being placed on that day or as directed by the Resident. All temporary ramps are to be constructed on a sand joint. The Contractor shall be responsible for all repairs and maintenance required for the temporary ramps.

The Contractor shall be responsible for the layout of the longitudinal centerline between the travel lanes.

The sand and loose debris adjacent to the median guardrail shall be removed and disposed of by the Contractor off of Turnpike property.

The forty-five degree pavement safety edge needed between lanes 1 and 2 shall be incidental to the 202 pay items.

A minimum test strip of 100 tons placed at a nominal depth of 1 ½ inches, full lane width, shall be required. It shall be evaluated under testing requirements for mix volumetric and density. The exact location will be identified by the Authority. Prior to placement of the test strip, a leveling course (Item 403.211) shall be placed at the chosen location. A fog coat of Item 409.15, Bituminous Tack Coat, shall be applied to the level course prior to the placement of the HMA surface course, payment to be made under the 409.15 pay item. The test strip will be excluded from the remainder of the projects' QA analysis. The Contractor shall notify the Authority at least 48 hours in advance of placing the test strip. The test strip is intended to allow the Contractor to establish a method of compaction and adjust plant settings prior to mainline plant production.

403.04 Method of Measurement

The construction and removal of temporary ramps on sand joints, and maintaining the ramps will not be measured separately for payment, but shall be incidental to Items 403.

The removal of sand and loose debris will not be measured separately for payment, but shall be incidental to paving items.

Hot Mix Asphalt, 12.5 mm (Polymer Modified) pavement with (up to) 15% RAP, placed as a wearing surface will be measured under Item 403.2081 Hot Mix Asphalt, 12.5 mm (Polymer Modified) - RAP.

403.05 Basis of Payment

Hot Mix Asphalt, 12.5 mm (Polymer Modified) pavement with (up to) 15% RAP, placed as a wearing surface will be paid under Item 403.2081 Hot Mix Asphalt, 12.5 mm (Polymer Modified) – RAP.

The following pay items are added:

<u>Pay Item</u>	<u>Pay Unit</u>
403.2081 Hot Mix Asphalt, 12.5 mm (Polymer Modified) – RAP	Ton

SPECIAL PROVISIONSECTION 403HOT MIX ASPHALT PAVEMENT

Course	HMA Grading	Item Number	Total Thickness	No. of Layers	Complimentary Notes
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Northbound and Southbound Mainline and Shoulder Construction

Intermediate	12.5mm	403.2081	1.5"	1	A,D,E,F,H,I,J,K
Base	19.0mm	403.207	2.5"	1	C,I
Base	19.0 mm	403.2072	4.5"	2	D,I

Northbound and Southbound Median Construction

Intermediate	12.5mm	403.213	1.5"	1	C,I,
Base	19.0mm	403.207	2.5"	1	C,I

Mainline – Ramp Prior to Merge with Mainline at Physical Gore

Intermediate	12.5mm	403.2081	1.5"	1	A,D,E,F,H,I,J,K
Intermediate	12.5mm	403.213	1.5"	1	C,I
Base	19.0mm	403.207	2.5"	1	C,I

Route 703 – Eastbound and Westbound and Shoulder Construction

Wearing	12.5mm	403.2081	1.5"	1	A,D,E,F,H,I,J,K
Intermediate	12.5mm	403.213	1.5"	1	C,I
Base	19.0mm	403.207	2.5"	1	C,I
Base	19.0mm	403.2072	4.5"	2	D,I

Route 703 – Mill, Shim & Overlay

Wearing	12.5mm	403.2081	1.5"	1	A,D,E,F,H,I,J,K
Intermediate	12.5mm	403.213	1.5"	1	C,I
Base	19.0mm	403.207	2.5"	1	C,I
Base	19.00mm	403.207	4.5"	2	C,I
Shim	4.75mm or 9.5mm	403.212	Varies	Varies	C,I

Access Road

Wearing	12.5mm	403.208	2"	1	C,I,
Base	12.5mm	403.213	2"	1	C,I

Ramp A – Raised Island and Median Drainage Waterway

Handwork	9.5mm	403.209	2”	2	C
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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 PROVISIONSECTION 409BITUMINOUS TACK COAT409.01 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/yd²

409.05 Equipment

Add “or as determined by the Resident”, after the words “gal/yd²” 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:

<u>Pay Item</u>		<u>Pay Unit</u>
409.15	Bituminous Tack Coat RS1 or RS1h– Applied	Gallon

SPECIAL PROVISIONSECTION 419SAWING 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:

<u>Pay Item</u>	<u>Pay Unit</u>
419.30 Sawing Bituminous Pavement	Linear Foot

SPECIAL PROVISIONSECTION 470BERM DROP OFF CORRECTION

(Berm Dropoff Correction - Grindings)
(Berm Correction)

470.01 Description

This work shall consist of furnishing and placing bituminous grindings to eliminate the berm dropoff along the inside and outside shoulder edges at all locations, including guardrail sections at locations shown on the plans or as directed by the Resident.

The work shall also consist of removing materials at the inside and outside shoulder edges at all locations, including guardrail sections at locations shown on the plans or as directed by the Resident.

470.02 Bituminous Materials

The recycled bituminous pavement shall be reprocessed (crushed) to meet the following gradations:

Sieve Designation	Percentage by Weight Passing Square Mesh Sieve
3/4"	100
1/2"	95-100
No. 4	50-80
No. 50	18-28
No. 200	3-10

470.03 Method of Construction

Work under this item shall be in accordance with the details as shown on the Plans or as directed by the Resident.

At a minimum, a walk behind plate compactor shall be used for compaction. Other methods may be used upon approval by the Resident.

470.04 Method of Measurement

Berm Dropoff Correction – Grindings will be measured by the ton of Pavement grindings delivered and installed.

Material included in the delivery slips and not used or rejected shall be deducted from the amount being measured for payment.

Berm Correction will be measured by the linear foot for material removed.

470.05 Basis of Payment

The accepted quantity of “Berm Dropoff Correction – Grindings” will be paid for at the contract unit price per ton, which price shall include all materials, crushing to gradation range, weighing, transportation, placement, labor, equipment, and all incidentals necessary to accomplish the work.

The accepted quantity of “Berm Correction” will be paid for at the contract unit price per linear foot, which price shall include removing all materials, grading, transportation, labor, equipment, and all incidentals necessary to accomplish the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
470.08	Berm Dropoff Correction – Grindings	Ton
470.081	Berm Correction	LF

SPECIAL PROVISIONSECTION 502STRUCTURAL CONCRETE(Toll Plaza Entry and Exit Points)502.01 Description

The following is added to the end of the section:

This work shall also consist of furnishing and placing Portland Cement Concrete for toll plaza pile caps, toll plaza pavement slabs, toll islands, bumpers, curtain walls and utility pits, mast arm pedestals and footings, and incidental construction in accordance with these Specifications and in conformity with the lines, grades and dimensions shown on the Plans.

502.035 Construction Requirements

All horizontal and vertical joints shall be sealed with Sikasil 728 RCS and Sikasil 728 NS respectively or an approved equal. Sealing of horizontal and vertical construction joints shall be considered incidental to their respective pay items.

Broadcast sealant shall be applied to top surface of Entry Toll Plaza and Exit Toll Point slabs after 60 calendar days of concrete cure. Broadcast sealant shall be in accordance with Special Provision 515.

502.18 Method of Measurement

The following is added to the end of the section:

Structural concrete satisfactorily placed and accepted will be measured by the lump sum, in accordance with the dimensions shown on the Plans or authorized changes in the Plans.

The limits to be used in determining the quantities of the aforementioned structural concrete items will be as follows:

1. Structural Concrete, Pavement Slabs The limits will be the entire structural slab bounded transversely and longitudinally by the extreme ends as per plans.
2. Structural Concrete, Plaza Islands, Bumpers and Curtain Walls. The limits will be the entire concrete island, outside to outside, both transversely and longitudinally including curbing, as per plans. Concrete bumpers and curtain walls placed atop the plaza islands are included in this item.
3. Structural Concrete Utility Pits. The limits will be the entire concrete utility pit, outside to outside, both transversely and longitudinally, as per plans.

- 4. Structural Concrete Pedestals and Footings. The limits will be the entire concrete gantry and VMS sign foundations from the bottom of the spread footing to the top of the pedestal as per plans.

502.19 Basis of Payment

The following is added to this section:

The accepted work done under structural concrete, of the classes and for the types of work required, will be paid for at the Contract unit price per lump sum for the respective Contract items involved. Payment for miscellaneous construction items such as asphalt for painting or covering various types of joints, all required sandblasting, bonding, curing, joint sealing, and joint sawing shall be incidental to the respective 502 pay items. No direct payment will be made for concrete admixtures with the exception of Synthetic Fiber Reinforcement, which shall be paid for under its respective Pay Item, 503.90.

Steel reinforcing and GFRP reinforcing will be measured and paid for separately as outlined in Section 503.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
502.261	Structural Concrete, Pile Caps	Lump Sum
502.262	Structural Concrete, Pavement Slabs	Lump Sum
502.263	Structural Concrete, Plaza Islands, Bumpers and Curtain Walls	Lump Sum
502.265	Structural Concrete, Utility Pits	Lump Sum
502.266	Structural Concrete, Pedestals and Footings	Lump Sum

SPECIAL PROVISION

SECTION 502

STRUCTURAL CONCRETE

(Distribution Slab)

502.14 B. Structural Concrete Slab Structures

This first paragraph is deleted and replaced with the following:

Include, but not limited to, structural concrete deck slabs, wearing surfaces, slabs on precast superstructures, top and bottom slabs of box culverts, approach slabs, distribution slabs, rigid frame structures and simple slab spans, as applicable. Screed rails shall be set entirely above the finished surface of the concrete and shall be supported in a manner approved by the Resident. Where shear connector studs are available, welding to the studs will be permitted. No welding will be permitted directly on the stringer flanges to attach either screed rail supports or form supports of any type.

502.18 B. Method of Measurement

The following is added to the end of the section:

11. Structural Concrete Distribution Slabs. The limit will be the entire distribution slab or slabs as shown on the Plans.

502.19. Basis of Payment

The following is added to this section:

<u>Pay Item</u>	<u>Pay Unit</u>
502.452 Structural Concrete Distribution Slab	Lump Sum

SPECIAL PROVISION

SECTION 503

REINFORCING STEEL

(GFRP Reinforcing)

503.01 Description

The first paragraph is amended to read:

This work shall consist of fabrication, delivery and placing glass fiber reinforced polymer (GFRP) reinforcement in accordance with these Specifications and in conformance with the Plans, General Provisions and Special Provisions.

503.02 Materials

The following paragraphs are added:

Materials shall meet the following requirements:

All GFRP reinforcement shall conform to the requirements shown in AASHTO LRFD Bridge Design Specifications for GFRP-Reinforced Concrete, Second Edition, 2018, except as shown on the Plans, and as stated herein. All GFRP reinforcement bar shall be deformed or sand coated.

GFRP bars shall be from one of the following approved manufacturers:

1. Aslan 100 by Hughes Brothers Inc.
2. V-Rod by Pultrall Inc.
3. ComBAR by Schoeck Bauteile.
4. Mateen-Bar by Sigma Development Group, LLC.

All GFRP bars in the same structural component shall be supplied by the same manufacturer.

Documentation

For all GFRP reinforcement bar used on Authority projects, the bar manufacturer shall furnish the Resident with one hardcopy and one electronic copy of written certifications that the GFRP reinforcement meets the requirements of this specification. In addition, the certification shall list the test values and test procedures used to determine the physical properties of the GFRP reinforcement. Certifications bearing the notarized signature of a responsible authorized representative of the bar manufacturer are required. Each bundle of GFRP reinforcement shall be identified with a corresponding lot number with the lot numbers affixed to each bundle by means of a durable tag.

Repair Material

The material used to repair the cut ends of GFRP reinforcement shall comply with the requirements established by the bar manufacturer.

503.04 Protection of Material

The following paragraphs are added:

Delivery, storage and handling of GFRP reinforcing bars shall be in accordance with these Specifications. Prevent bending, coating with earth, oil, or other material, or otherwise damaging the reinforcement. When handling reinforcement, use equipment to avoid damaging or abrading the bar. Do not drop or drag reinforcement.

GFRP reinforcement shall be stored on skids or other supports a minimum of 12 inches above the ground surface and protected at all times from damage and surface contamination. The storage supports shall be constructed of wood, or other material that will not damage the surface of the reinforcement. Bundles of bars shall be stored on supports in a single layer. Each bundle shall be placed on the supports out of contact with adjacent bundles. Reinforcing bars expected to be stored outdoors for a period in excess of two months, shall be protected from ultraviolet radiation. Prevent exposure of reinforcing to temperatures above 120 degrees Fahrenheit during storage.

All handling of reinforcing bars by mechanical means shall be done by equipment having padded contact areas, or by the use of nylon webbing slings. The use of chains or wire rope slings shall not be allowed, even when used with padding. All bundles of bars shall be lifted with a strong back, spreader bar, multiple supports or a platform bridge to prevent bar-to-bar abrasion from sags in the bundles. Support points during lifting or transporting of bundled reinforcing bars shall be spaced at a maximum of 15 feet, or as required by the manufacturer, whichever is more restrictive.

Bundled bars shall be strapped together with non-metallic or padded straps in a manner to prevent bar-to-bar abrasion due to relative movement between bars.

Bars loaded for transport shall be loaded and strapped down in a manner that will prevent damage from motion and vibration, to the greatest extent possible. Bundles of bent bars shall be transported strapped to wooden platforms or shall be crated. All individual bundles and layers of bundles shall be separated, and supported by dunnage.

Individual bars shall be handled in a manner that prevents damage due to abrasion or impact, and at no time shall any bar be moved by dragging over any surface, including other reinforcing bars. Sufficient personnel shall be assigned to assure compliance with the above.

For GFRP bars the maximum total visible damage permitted on each linear foot shall not exceed two percent of the surface area in that linear foot of bar. The depth of the permissible damage shall not exceed 0.04 inches.

503.06 Placing and Fastening

The following paragraphs are added:

All reinforcement shall be accurately placed in the positions shown on the Plans and shall be firmly held there during the placing and setting of the concrete. Immediately before placing concrete the reinforcement shall be free from all foreign material which could decrease the bond between the reinforcing and concrete. Such foreign material shall include, but not be limited to: dirt, paint, oil, bitumen and dried concrete mortar.

Reinforcing bars within the formwork shall be secured to prevent movement during concrete placement. The bars must be adequately supported or tied to resist settlement, floating upward, or movement in any direction during concrete placement.

Field bending of GFRP shall not be allowed.

Field cutting of GFRP will be permitted only with the approval of the Resident. The field cutting shall be with a high speed cutter, fine blade saw, diamond blade or masonry saw. The GFRP bars shall not be shear cut.

Proper distances from the forms shall be maintained by means of stays, blocks, ties, hangers or other approved means. Blocks used for this purpose shall be precast Portland cement mortar blocks of approved shape and dimensions. Chairs may be used for this purpose and, when used, must be GFRP or plastic. The use of pebbles, pieces of broken stone or brick, metal pipe or wooden blocks shall not be permitted. The placing of reinforcement as concrete placement progresses, without definite and secure means of holding the bar in its correct position, shall not be permitted. Reinforcing bars used as support bars and spreader bars shall be the same type used for the main reinforcing.

Bars shall be fastened together at all intersections except where spacing is less than one foot in either direction, in which case, fastening at alternate intersections of each bar with other bars will be permitted providing this will hold all the bars securely in position. This fastening may be plastic or nylon ties only.

Minimum embedment lengths of reinforcing bars shall comply with the manufacturers published recommendations for the anchoring material selected. These embedment lengths shall be verified by the Resident before installation of the reinforcing bars. The reinforcing bar lengths indicated on the Plans may be reduced, at the Contractor's option, to the determined minimum embedment lengths.

Reinforcement shall be inspected and approved by the Resident before any concrete is placed.

503.07 Splicing

The following sentence is added:

Lap splice length for GFRP bars shall be as per manufacturers' recommendation.

503.10 Method of Measurement

The first sentence of the first paragraph is amended as follows:

GFRP reinforcing bars shall be measured by the computed number of linear foot of reinforcement authorized.

503.11 Basis of Payment

The following is added:

The accepted quantity of GFRP reinforcing will be paid for at the Contract unit price per linear foot for each item involved, completed, and accepted.

<u>Pay Item</u>		<u>Pay Unit</u>
503.18	Glass Fiber Reinforced Polymer (GFRP) Reinforcing Bars, Fabricated and Delivered	Linear Foot
503.19	Glass Fiber Reinforced Polymer (GFRP) Reinforcing Bars, Placing	Linear Foot

SPECIAL PROVISION

SECTION 503

REINFORCING STEEL

(Synthetic Fiber Reinforcement)

The following Subsection shall be added:

503.01 Description

This work shall consist of furnishing synthetic fiber reinforcement to be used as temperature and shrinkage reinforcement in the structural concrete pavement slabs.

503.02 Materials

The following sentence shall be added:

Synthetic fibers shall be STRUX 90/40 as manufactured by W. R. Grace & Co. or an approved equal.

The following Subsection shall be added:

503.03 Dosage

The dosage rate for synthetic fibers shall be three pounds per cubic yard of concrete.

503.10 Method of Measurement

The following sentence shall be added:

Synthetic fiber reinforcement will be measured by the pound.

503.11 Basis of Payment

Payment will be made under:

Pay Item

Pay Unit

503.90 Synthetic Fiber Reinforcement

Pound

SPECIAL PROVISION

SECTION 504

STRUCTURAL STEEL

504.03 Drawings

This Subsection is amended by the addition of the following:

When structural steel erection is to take place over travel ways, the Contractor shall submit a structural steel erection plan stamped by a Professional Engineer licensed in the State of Maine. The erection plan shall include the number and location of crane(s), the weight of the pick, crane capacities, bracing locations and all other pertinent information needed to demonstrate the structural steel can be safely erected and assembled.

504.641 Method of Measurement

There will be no additional payment for the required erection plan. The cost shall be incidental to the Structural Steel Erection pay item.

SPECIAL PROVISIONSECTION 504STRUCTURAL STEEL

(Toll Plaza Canopy and Dual Purpose Mast Arm)

504.01 Description

This work shall consist of the furnishing and installing materials and components to construct a new toll plaza canopy over the new NB and SB entry lanes and a new dual purpose mast arms over the new NB and SB exiting lanes, as well as all other related electrical and communication facilities and drainage facilities needed for the new toll plaza that will be attached to the canopy and mast arm as described in the Plan drawings and herein as required for the installation of new canopy and new mast arm sections at Interchange 45.

504.02 Materials

This section is amended by the addition of the following:

Steel Supports	720.03
Anchor Bolts	720.07

All steel components shall be hot dip galvanized after fabrication.

504.53 Construction Requirements

The work in this item generally includes, but is not limited to reconstruction of, or portions thereof, the following:

- a. Toll Plaza Canopy: The contractor shall install the proposed canopy over new NB and SB entry lanes as shown in the plan drawings and described within these specifications. The canopy installation shall include shop painted structural steel, EPDM roofing system, canopy and toll booth pit drains, and all electrical and toll systems mounted to or routed through the canopy, installation of canopy sign supports, canopy signs and all material, labor, equipment and incidentals required to complete the work.
- b. Toll Dual Purpose Mast Arm: The contractor shall install the proposed mast arm over the NB and SB exit lanes as shown in the Plans and described within these Specifications. The mast arm installations shall include all electrical and communication for the toll system, with galvanized or stainless steel mounting hardware, and all materials, labor, equipment and incidentals required to complete the work. The work will also include installing two highway lighting luminaires and offset arms, which will be paid separately under item 634.175 - Replacement LED Fixture.

504.03 Drawings

This subsection is amended by the addition of the following:

Approval for deviations from the contract drawings and/or specifications shall be requested in writing and shall be approved by the Fabrication Engineer before being incorporated in the manufacturer's drawings. Requests for substitution of all specified material shall be submitted in writing, with full documentation (specifications, mill certification, etc.) enabling the Turnpike to evaluate the proposal.

Subsections 504.14 through 504.15 are deleted in their entirety and are not replaced.

504.16 Fabrication

The first sentence of the first paragraph of this section is deleted and replaced with the following:

Fabrication shall be in accordance with the AWS D1.1 *Structural Welding Code* (the D1.1 Code), as modified herein, and these Specifications.

504.17 Nondestructive Examination

All references to the "D1.5 Code" in this section are deleted and replaced with the "D1.1 Code".

504.26 Camber and Curvature

All references to the "D1.5 Code" in this section are deleted and replaced with the "D1.1 Code".

Subsections 504.28 through 504.29 are deleted in their entirety and are not replaced.

The following subsection is added:

504.28 Welding

All welding shall be completed in accordance with the D1.1 Code.

The following subsection is added:

504.29 Inspection of Welds

Weld inspection shall be completed in accordance with the D1.1 Code and these requirements.

Unless otherwise specified, all welds shall be inspected in accordance with Subsection 504.64.

The Contractor shall have the fabricator make his own inspection to maintain quality control. Such inspection shall comply with the D1.1 Code and shall be completed by AWS certified welding inspectors in accordance with the appropriate subsections thereof. All welds shall meet the "quality of welds" requirements specified in the sections on "Design of New Bridges" and "Tubular Structures" of the structural welding code.

All welds not meeting these quality requirements shall be repaired and/or replaced by the Contractor to meet these requirements and check tests, without additional cost to the Authority. The procedures, techniques, standards of acceptance, and methods of repair shall be in accordance with the requirements of AWS D1.1

- a) All testing of welds, as herein required, shall be certified by a qualified laboratory engaged by the Contractor and approved by the Resident. The Contractor shall forward the certifications to the Resident and shall pay for all costs of weld inspection and certification as herein specified.
- b) The Authority reserves the right to inspect by nondestructive testing techniques all welds and adjacent base metal as he deems warranted. All such additional testing shall be paid for by the Turnpike and at no cost to the Contractor.

Subsection 504.31 is deleted in its entirety and is not replaced.

504.32 Tolerances

This subsection is deleted and replaced with the following:

Before erection, the assembled structural steel shall not exhibit a sweep in excess of 0.2 percent of the nominal height or length, as measured with the element in a horizontal position.

Elements that do not conform to the sweep requirements shall be corrected with a method approved by the Engineer.

The following subsection is added:

504.401 General Construction requirements

The erection of steel structures shall be in accordance with the following:

- a) The erection of toll dual purpose mast arms and toll plaza canopies shall be in accordance with the erection procedure as described on the Plans, as approved by the Resident, and as specified herein.
- b) Attention is directed to the maintenance and protection of traffic during work adjacent to or over active roadways. The Contractor is advised that any work on the erection of the toll mast arms, or other work that might endanger traffic on active lanes, shall not be commenced until the proper lane closures have been made, or traffic slowdowns have been instituted, in accordance with the requirements of the Contract Documents.

- c) Attention shall be paid to the erection procedure notes and field assembly requirements as shown on the plans. Strict conformance with these notes and procedures will be enforced at all times.
- d) Under no circumstances shall the toll dual purpose mast arms and toll plaza canopies be erected before the expiration of the curing period of all pedestal concrete.

Subsections 504.57 and 504.6 are deleted in their entirety and are not replaced.

The following subsection is added:

504.641 Method of Measurement

Toll Plaza Canopy and Toll Dual Purpose Mast Arms, shall be measured as one lump sum, fabricated, delivered, erected and accepted.

Electrical and communication items associated with the toll system will be paid for under their respective pay items.

504.65 Basis of Payment

Payment shall include all labor, material, equipment, and incidentals required to complete the canopy and mast arm installations in accordance with the plans and these specifications.

All canopy drains shown on the plans, including material, labor and equipment, shall be incidental to this item.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
504.50 Toll Plaza Canopy - Southbound	Lump Sum
504.51 Toll Plaza Canopy - Northbound	Lump Sum
504.61 Toll Dual Purpose Mast Arm – Southbound	Lump Sum
504.62 Toll Dual Purpose Mast Arm – Northbound	Lump Sum

SPECIAL PROVISION

SECTION 506

SHOP APPLIED PROTECTIVE COATING - STEEL

(Thermal Spray Coating– Shop Applied)

506.05 Inspection

This section is amended by the addition of the following:

The QAI shall be given ample notice in order to inspect the product prior to coating, recoating or removal of paint from the area. “Ample notice” shall be defined at the Pre-Job meeting depending on shop or site conditions.

Substrates that are coated without notification of the QAI may be rejected and no further coating shall be done on the piece until further notice from the Resident. Coating applied without notification of the QAI may be investigated by destructive and non-destructive testing as approved by the Resident and by a review of the JCR. The Resident may reject, conditionally accept, or accept the coating based on documentation and test results. Rejected coating shall be removed and re-applied. Conditionally accepted coatings shall be made acceptable as approved by the Resident. The cost of additional testing and repairs shall be borne by the Contractor.

506.11 Materials

This section is amended by the addition of the following:

Thermal Spray Coating shall utilize metallized 85-15 zinc-aluminum wire.

506.16 Touch-up and Repairs

This section is amended by the addition of the following:

The Contractor shall repair any damage that is done to the coating after the members have left the shop at no expense to the Authority. The Contractor shall document any damage and propose a repair that is in accordance with the manufacturer’s recommendations to the Resident for approval. No repairs shall be done prior to receiving approval of the proposed method of repair.

506.30 Description

This section is replaced in its entirety with the following:

This work shall consist of surface preparation and application of Thermal Spray Coatings (TSC) in accordance with the Plans and this Specification. Application of TSC to steel substrate shall be done in accordance with requirements, recommendations and appendices stated herein, and within referenced Specifications.

The applicator shall provide copies of application procedures, operator qualifications, QC Manuals and repair procedures.

506.32 Surface Preparation

Paragraph 2 in this section is replaced in its entirety with the following:

The anchor profile shall be 2.5-4.0 mils. Measure and record the anchor profile in accordance with ASTM D4417 Method B (depth micrometer) or C (Replica Tape) or both on each plane to be sprayed or at 120° intervals on pipe or tube. The applicator shall take measurements of blast profile every 200 sq. ft. for manual blast operations and every 2000 sq. ft. for automated blast operations. Readings shall be recorded, or replica tape shall be affixed to inspection records. If the anchor profile fails to meet the minimum required profile, re-blast the substrate until the required anchor profile is achieved.

506.35 Seal Coat and Top Coat Application (Paint)

This section is amended by the addition of the following:

The metallized girders shall be sealed with clear seal coat only; additional coatings and pigmentation are not required. The clear seal coat shall be compatible with an epoxy intermediate coat and a polyurethane top coat from the MaineDOT NEPCOAT QPL. Provide certification of compatibility between the seal coat and epoxy intermediate coat and polyurethane top coat from the intermediate coat/top coat manufacturer.

The clear seal coat shall be applied within 8 hours after thermal spraying. If a sealer cannot be applied within 8 hours, it shall be verified that the TSC (a) has not been contaminated by visual inspection, and (b) is dust-free using the clear cellophane tape test per ISO 8502-3 before applying the sealer.

Top flanges of beams requiring shear connectors shall receive a 1.5 to 3 mil primer coat from the MaineDOT NEPCOAT QPL primer or be thermal sprayed. All faying surfaces shall be masked off during seal coat application.

All metallizing shall be done before assembly. The seal coat shall be adequately cured before handling, but under no circumstances shall the product be handled before the coating has achieved the manufacturer's published minimum cure time.

Material shall not be loaded for shipment until the seal coat has adequately cured and been inspected and accepted. The components will be stamped "APPROVED" only after the loading has been completed and approved, and no material shall be shipped without the prior approval of the Resident.

506.61 Basis of Payment

This section is amended by the addition of the following:

All costs for clear seal coat shall be considered incidental to Thermal Spray Coating (Shop Applied).

SPECIAL PROVISION

SECTION 506

SHOP APPLIED PROTECTIVE COATING - STEEL

(Toll Plaza Canopy and Dual Purpose Mast Arm)

506.11 Description

This specification covers the shop cleaning and painting of the new structural steel members including all connection components.

Interchange 45: All new entry and exit toll plaza structural steel members.

The work shall consist of furnishing all supervisory personnel, competent person(s), labor, tools, equipment, Quality Control activities, materials, and incidentals necessary for satisfactory completion of the Work.

506.12 Materials

Materials shall comply with the requirements of the respective Subsections of this Specification.

506.13 Submittals

The Contractor shall submit for review by the Authority a materials list and other such details as described within the Plans and the respective Subsections of this Specification.

506.15 Inspection

For the purpose of this Specification, the following definitions shall apply:

Quality Assurance Inspector (Q.A.I.): The Authority's authorized representative for shop inspection.

Quality Control Inspector (Q.C.I.): The Contractor's authorized representative for shop surface preparation and application.

Quality Control (Q.C.) is the responsibility of the Contractor. The Q.C.I. shall inspect all aspects of the work and shall supervise required testing. The Q.C.I. shall record measurements and test results in a Job Control Record (JCR). The Q.C.I. shall reject materials and workmanship that do not meet Contract requirements. The results of all testing shall be documented and a copy made available to the Q.A.I. on a daily basis or as requested by the Resident or Q.A.I.

The JCR shall include the following, as applicable:

- Surface Preparation Cleanliness and Anchor Profile – before application of the first or primer coat.

- Environmental Conditions – Ambient temperature, surface temperature, relative humidity, and dew point.
- Dry Film Thickness (DFT) – After the coating has cured and before the application of any subsequent coating.
- Type of testing equipment, model, serial number, and calibration data, if applicable.
- Type of application equipment.
- Coating batch and/or lot number, date of manufacture, and shelf life.
- Manufacturer's certification of conformance.
- Name(s) of applicator(s).
- Cure data, cure times, temperature, and relative humidity.
- Final inspection by the Q.C.I. and acceptance by the Resident or Q.A.I.

Quality Assurance (Q.A.) is the prerogative of the Authority. The Q.A.I. will ensure that the Q.C. is being performed properly, verify documentation, periodically inspect workmanship and witness testing. Q.A. testing deemed necessary by the Resident in addition to the minimum test requirements shall be scheduled to minimize interference with the production schedule.

506.16 Quality Assurance Inspector's Authority

The Q.A.I. will have the authority to reject material or workmanship that does not meet the Contract requirements. The acceptance of material or workmanship by the Q.A.I. will not preclude subsequent rejection, if materials or workmanship is found unacceptable, by other authorized representatives of the Authority.

506.17 Rejections

Rejected material or workmanship, as described above, shall be corrected or replaced by the Contractor at no additional cost to the Authority.

506.18 Contractor Qualification

Shop applied coating systems shall be applied in facilities holding a current AISC Sophisticated Paint Endorsement (SPE) or has been qualified in accordance with SSPC QP3-Standard Procedure for Evaluating Qualifications of Shop Painting Applicators.

All Contractor and Subcontractor SSPC certifications specified above shall be current and in-place prior to bid opening. The Contractor shall ensure that all required SSPC certifications are kept current throughout the duration of the Contract until final acceptance of the work. A copy of valid current certifications shall be transmitted with the Bid Package.

506.26 Coating Repairs and Touch-up

Repairs and touch-up shall be done in accordance with the manufacturer's product data sheet and this Specification. Areas to be touched-up shall be prepared to assure proper adhesion of each coat. Each existing coat shall be feathered back to assure that each touch-up coat is continuous with each corresponding existing coat. Environmental conditions, cure times, and DFTs shall be in accordance with manufacturer's product data sheet for the coating being applied. Repairs to the topcoat shall be smooth and result in a uniform gloss and color match. The Resident shall have final authority concerning acceptable appearance.

COATING SYSTEMS

506.30 Description

Work shall consist of the shop application of coating systems in accordance with the Plans and Specification. Each coat shall be applied in accordance with the manufacturer's product data sheet and this Specification.

506.31 Materials

SHOP COATING SCHEDULE

The following coating system shall be used. Alternately, an equivalent system may be proposed and used by the Contractor, subject to approval by the Authority:

Manufacturer:	The Sherwin Williams Company
Primer:	Corothane I Galvapak 1K zinc-rich primer
Intermediate:	Corothane I Ironox B moisture-cure urethane
Finish:	Corothane I HS moisture-cure urethane

All three coats of the paint system shall be contrasting colors as follows:

Primer:	Default by the manufacturer
Intermediate:	As approved by the Resident
Finish:	“Toll Booth Dark Blue”: Color formula to be provided by the Resident

The Contractor shall provide a dried sample of the specified finish color to the Authority for approval prior to the batching of the finish coat. Sample size, shape, and material shall be agreed upon with the Resident prior to submission.

The Contractor shall provide the paint batch description, lot number, date of manufacture, shelf life, and the manufacturer's published storage requirements to the Resident. The Contractor shall provide the manufacturer's product data sheet for each coating. The product data sheets shall include the manufacturer's recommended requirements for the equipment, surface cleanliness, mixing, thinning, application, environmental conditions, touch-up/repair procedures, and cure times for the entire range of allowable environmental conditions. All product data sheets and MSDS shall be submitted to the Resident for approval prior to initiating any coating work.

The product data sheets shall also provide the minimum and maximum recoat times for the primer and intermediate coat over the expected range of temperatures, relative humidity, and range of acceptable dry film thicknesses. The manufacturer's product data sheets at the time of submission shall be those used during the duration of the Project. Newly published product data sheets may be substituted as approved by the Resident.

506.33 Surface Preparation

Prior to abrasive blast cleaning, all corners and edges of members and plates, whether rolled cut or sheared, exposed in the assembled product shall be rounded to approximately an 1/8 inch radius. A series of tangents to the approximate radius will be considered as a rounded. The Contractor shall prepare a plate approximately 2 inch x 12 inch with the appropriate rounded corner and edge. The Q.C.I. and Q.A.I. shall agree upon the acceptability of the corner preparation and the plate shall become the Job Standard. The plate shall remain the property of the Contractor.

Surfaces to be coated shall be abrasive blast cleaned to meet the requirements of SSPC-SP 10/NACE No. 2 or the coating manufacturer's published recommendations, whichever is the more stringent. SSPC-VIS 1 shall be used to determine acceptable cleanliness. The Q.C.I. and Q.A.I. shall evaluate the first piece using VIS 1 as a comparator. No further blast cleaning shall be done until the Q.C.I. and Q.A.I. agree upon the acceptable Job Standard for cleanliness. If more than one method of abrasive blast cleaning is used (e.g., centrifugal blast and compressed air), the acceptable Job Standard shall be established for each method. At the Contractor's option, a sample piece may be abrasive blast cleaned and sealed with a clear coating to preserve the surface preparation and the sample piece may be used as a comparator to establish the agreed upon Job Standard.

After abrasive blast cleaning, the surface shall be visually inspected for fins, tears, delamination and other discontinuities. Fins, tears and other discontinuities shall be removed with a grinder or other suitable power tool and the area shall be blended at a slope of approximately 1:20. The affected area(s) shall be abrasive blast cleaned to develop an acceptable anchor profile.

The anchor profile shall meet the requirements of the coating manufacturer's published recommendations. The blast media shall contain enough grit to provide an angular anchor profile. The anchor profile shall be measured in accordance with ASTM D 4417 Method C. If the anchor profile fails to meet the minimum requirements, the Contractor shall re-blast the substrate until the minimum required anchor profile is achieved. If the anchor profile exceeds the maximum allowed in the manufacturer's published recommendations, the substrate shall be coated only with the approval of the Resident.

The Q.C.I. shall measure the anchor profile of the substrate on each plane of the first piece and each additional piece with a significant change in size or geometry. The Q.A.I. will witness the testing. After it has been established to the satisfaction of the Resident, that the abrasive blast equipment is capable of providing uniform, acceptable surface preparation, a diminished degree of testing may be agreed upon by the Q.C.I. and Q.A.I. The Quality Assurance Inspector may require that the anchor profile be measured and recorded on any surface that is, in the judgment of the Quality Assurance Inspector, unacceptable. Failure to measure anchor profile as required will result in rejection of the surface preparation on the piece in question.

If there is a significant change in surface cleanliness or anchor profile due to blast media degradation or other reasons, the Contractor shall cease the blast operation until corrective action is taken.

If compressed air is used for abrasive blast cleaning, a blotter test shall be performed in accordance with ASTM D 4285 at the beginning of each shift and at any other time the Q.A.I. directs it. The Q.C.I. and Q.A.I. shall be present to witness the blotter test.

The allowable time between abrasive blast cleaning and primer application shall not exceed the manufacturer's published recommendations or eight-hours, whichever is less. If the substrate develops flash rust (rust bloom) before the primer is applied or before the primer application is completed, the piece shall be re-blasted to bare substrate and re-coated.

506.34 Application

All protective coating shall be applied using either conventional or airless spray equipment meeting the manufacturer's published recommendations. Striping and touchup of areas less than 36 in² may be applied by other methods with the approval of the Resident. Protective coating shall not be applied when the ambient temperature in the immediate vicinity of the piece(s) in question is above 90°F or below 40°F. Thinning and mixing of coatings shall be in conformance with the manufacturer's published instructions. Thinner shall be measured using a graduated cup or other container that clearly indicates the amount of thinner being added. Mixing shall be done using the method, equipment and for the amount of time recommended by the coating manufacturer.

Primer, intermediate, and top coat shall be applied in accordance with the manufacturer's published recommendations. Environmental conditions in the immediate vicinity of the surfaces to be coated shall be within the range of the manufacturer's published requirements both during the coating operation and during the curing period. Primer shall not be force-cured.

Environmental conditions shall be measured by the Q.C.I. in the immediate vicinity of the surfaces to be coated. The Q.A.I. may perform environmental testing in addition to the testing performed by the Q.C.I. If there are significant differences between the test results, the differences shall be resolved or explained to the satisfaction of the Resident prior to coating application. The results of the environmental testing shall be recorded in the JCR.

Corners, fasteners, welds and inaccessible locations shall be striped in accordance with SSPC-PA 1. The Contractor shall meet the minimum Dry Film Thickness (DFT) requirements on all surfaces. The Contractor may stripe with the intermediate coat if approved by the Resident.

Recoat time shall be in accordance with the manufacturer's published requirements for the environmental conditions at the time of application and cure. If the coating is contaminated with dust, debris, over spray or other deleterious material, the surface shall be cleaned in accordance with SSPC-SP 1 immediately prior to recoating. Other methods of cleaning may be used if approved by the Resident.

The Q.A.I. shall be given ample notice in order to inspect the product prior to coating, recoating or removal of paint from the area. "Ample notice" shall be defined at the Pre-Job meeting depending on shop or site conditions.

Substrates that are primed or surfaces that are recoated without notification of the Q.A.I. will be rejected and no further coating shall be done on the piece. Coating applied without notification of the Q.A.I. will be investigated by destructive and non-destructive testing as approved by the Resident and by a review of the JCR. The Resident may reject, conditionally accept, or accept the coating based on documentation and test results. Rejected coating shall be removed and re-applied. Conditionally accepted coatings shall be made acceptable as approved by the Resident. The cost of additional testing and repairs shall be borne by the Contractor.

506.35 Dry Film Thickness

DFT shall be measured in accordance with SSPC-PA 2. The results shall be documented in the JCR. The JCR documentation shall include the actual gage readings, spot average and the location(s).

506.36 Coating Repairs and Touch-up

Touch-up shall be done in accordance with the manufacturer's product data sheet and this Specification. Areas to be touched-up shall be prepared to assure proper adhesion of each coat. Each existing coat shall be feathered back to assure that each touch-up coat is continuous with each corresponding existing coat. The top-coat shall be smooth and uniform in appearance.

Damaged or unacceptable coatings shall be repaired using the same coating system. Environmental conditions cure times, and DFTs shall be in accordance with manufacturer's product data sheet for the coating being applied. Repairs to topcoat shall result in a uniform gloss and color match. The Resident shall have final authority concerning acceptable appearance.

506.37 Handling and Storage

The coating shall be adequately cured before handling, but under no circumstances shall the product be handled before the coating has achieved the manufacturer's published minimum cure time. Coated steel members shall be handled in a manner to avoid damage to the coating. Members shall be lifted and moved using non-metallic slings, padded chains and beam clamps, softeners or other non-injurious methods. Material shall be stored, both at the coating facility and in the field, in a manner that prevents damage to the coating.

Material shall not be loaded for shipment until the shop coating has adequately cured and been inspected. The components will be stamped "APPROVED" only after the loading has been completed and approved, and no material shall be shipped without the prior approval of the Resident.

Damage to the coating that is discovered after the product is loaded for shipment to the jobsite shall be documented by the Q.C.I. Repairs shall not be made unless the damaged area is repaired in accordance with Subsection 506.26 Coating Repairs and Touch-up. Repairs that cannot be acceptably done on the truck shall be done in the shop or in the field at the Contractor's option.

HOT-DIP GALVANIZING

506.40 Description

This work shall consist of surface preparation and application of hot-dip galvanizing in accordance with the Plans and this Specification. Hot-dip galvanizing shall meet the requirements of AASHTO M 111/ASTM A 123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel (A 123), including any applicable requirements listed in Section 2-Referenced Documents. The minimum average coating thickness grade shall conform to Table 1. The

frequency of testing shall be in accordance with Section 6. The choice of the test method is the prerogative of the Contractor. Record the test results and provide them to the Department. Provide certification of compliance and written test results to The Department in accordance with A 123 - Section 10.

506.41 Surface Preparation

Abrasive blast-clean the steel to a minimum of SSPC-SP 6, Commercial Blast Cleaning (SP 6) prior to galvanizing. Grind all corners exposed in the assembled product to a 1/16 inch radius prior to galvanizing.

506.42 Repairs

Repairs to galvanizing shall be in accordance with ASTM A 780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings (A 780), Annex A1 or A3. Zinc-rich paints for repairs may only be used with approval of the Fabrication Engineer.

506.43 Top-coating Galvanized Surfaces

Areas of galvanized surfaces to be top-coated will be described on the Plans or in the Special Provisions.

Do not use chromate quenching or other types of quenching after galvanizing. Remove runs, sags, dross and other deleterious material from surfaces to be painted. Provide a smooth uniform surface, free of heavy build areas or other discontinuities that will project through the finish coat. Perform repairs to galvanizing in accordance with A 780. Remove visible surface contaminants in accordance with SSPC-SP 1, Solvent Cleaning (SP 1) prior to blast cleaning. Blast-clean surfaces to be coated in accordance with SSPC-SP 7/NACE No.4-Brush-Off Blast-Cleaning (SP 7). Measure the anchor profile in accordance with ASTM D 4417 Method C (replica tape). Record the results in a manner acceptable to the Fabrication Engineer. Assure that the anchor profile corresponds with the anchor profile requirements on the Manufacturer's Product Data Sheet.

506.93 Basis of Payment

All work for Shop Coating of New Steel will be incidental to respective 504 pay items for the Proposed Canopy and Mast Arm Installation.

SPECIAL PROVISION

SECTION 507

RAILINGS

507.09 Basis of Payment

Payment will be made under:

Pay Item

Pay Unit

507.091 Aluminum Bridge Railing, 1 Bar

Lump Sum

SPECIAL PROVISIONSECTION 511COFFERDAMS

(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 of foundation units, to permit and protect the construction of bridge or other structural units, 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, abutment footings, 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 footings or approach 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.

When required, the elevation of the bottom of footing of any substructure unit may be lowered, without change in the price to be paid for Temporary Earth Support Systems. However, if the average elevation of more than 25 percent of the area of the excavation is more than three feet below the elevation shown on the Plans, and if requested by the Contractor, then the entire cost of the Temporary Earth Support Systems will be paid in accordance with Subsection 109.7, Equitable Adjustments to Compensation, instead of the Contract lump sum price.

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 513

SLOPE PROTECTION

513.02 Materials

The following sentences are added:

Unless otherwise noted epoxy coated wires and/or epoxy coated welded steel wire fabric shall be used and meet the requirements of ASTM A884.

SPECIAL PROVISIONSECTION 515PROTECTIVE COATING FOR CONCRETE SURFACES

(Clear Concrete Protective Coating)

Section 515, Protective Coating for Concrete Surfaces, is deleted in its entirety and replaced with the following:

515.01 Description

The work shall include the surface preparation and application of a clear protective coating on concrete surfaces to protect new cast-in-place concrete, precast concrete and masonry structures. The coating system shall be applied to piers, endposts, curbs and fascia in accordance with the Plans, Specifications and the manufacturer's published recommendations.

515.02 Materials

The penetrating sealer shall be StandOff® SLX100 Water & Oil Repellent, as manufactured by ProSoCo, Inc., or an approved equal. The sealer shall have the following properties:

Active Substance:	modified alkyl alkoxy silane
Active Content:	> 90%
Form:	clear liquid
VOC:	< 3.5 pounds per gallon

The product shall comply with regulations limiting the Volatile Organic Compound (VOC) content of architectural and industrial maintenance coatings.

The Contractor shall submit the ProSoCo's product data sheets, material safety data sheets and recommended instructions for application of the StandOff® SLX100.

Materials shall be delivered to the site in original packages or containers bearing the manufacturer's labels and identification.

515.021 Substitute Materials

The Contractor shall submit a written request for approval of proposed substitute material naming the proposed manufacturer and product. This request shall be accompanied by:

1. Test data from an independent testing laboratory stating that the proposed substitute meets or exceeds the specified requirements as listed and has been tested in accordance with the specified test standards.

2. Documentation that the proposed material has a proven record of performance when used in the intended application as confirmed by actual field tests and successful installations in place on at least five similar projects.
3. Certification that if two or more types of products are intended to be used as part of a system, they will be supplied by the same manufacturer to ensure compatibility of materials, and to maintain single source manufacturer responsibility.

The Resident reserves the right to require additional testing to evaluate any proposed substitute product at no additional cost to the Authority. The Resident's decision as to the acceptability or non-acceptability of the proposed product shall be final.

515.03 Surface Preparation

All caulking, patching, and joint sealant shall be installed prior to application of the sealer. On new surfaces to be treated, all voids shall be dressed by dry rubbing to remove form marks and blemishes to present a neat appearance. Concrete and masonry surfaces shall be cleaned free of dust, surface dirt, oil, efflorescence and contaminants to ensure penetration of the sealer. The surface may be slightly damp at the time of treatment.

The Contractor may use, when required, appropriate cleaning materials recommended by the sealer manufacturer in conjunction with high pressure water for cleaning the concrete or masonry.

515.04 Application

The Contractor shall apply the clear concrete protective coating in strict accordance with the manufacturer's published recommendations.

The application shall not be conducted when surface and air temperatures are below 40°F or above 90°F. The work shall not be conducted when there is a chance of the surface temperature falling below 40°F in the 24-hours following application; nor should it be applied on hot, windy days.

The treatment shall not be applied during rain to wet surfaces or when there is a chance of rain within 24-hours after application. After treatment, surfaces should be protected from rain for not less than 48-hours. It shall not be applied when winds are sufficient to carry airborne chemicals to unprotected surfaces.

Prior to applying the sealer, the Contractor shall protect all surrounding non-masonry/non-concrete surfaces, landscape and lawn areas, and surfaces not designated for treatment, from contact with the penetrating sealer, and prevent overspray of the penetrating sealer caused by wind drift.

The Contractor shall ensure that all safety equipment, facilities and precautions recommended by the product manufacturer are furnished and/or strictly adhered to.

The sealer material shall be applied in the manner and with the equipment recommended by the product manufacturer. Coverage will vary depending on condition, texture and porosity of the surfaces. Pre-testing is required.

Sealer shall be applied as packaged without dilution or alteration. The sealer shall be applied with low pressure (20 psi) airless spray equipment or with a heavily saturated brush or roller unless otherwise permitted by the Resident. Sufficient material shall be applied to thoroughly saturate the surface making sure to brush out excess material that does not penetrate.

When the sealer is applied to horizontal surfaces, it shall be applied in a single saturating application with sufficient material and applied so the surface remains wet for one to two minutes before penetration into the concrete. Surface residues, pools and puddles shall be broomed-out thoroughly until they completely penetrate into the surface.

When the sealer is applied to vertical and sloped surfaces, it shall be applied in a "wet-on-wet" application for best results on most porous materials. In the case of extremely dense concrete, it may be necessary to restrict the amount of material applied to one saturating application in order to prevent surface darkening. Apply from the bottom up with sufficient material to thoroughly coat the surface and create a slight rundown below the spray pattern. Allow the first application to penetrate the concrete surface, and within a few minutes after the first coat appears dry, reapply in the same saturating manner.

When the sealer is applied to vertical and sloped surfaces, it shall be applied in two applications, 10 minutes apart, with a low pressure (20 psi) airless sprayer.

515.05 Method of Measurement

Clear Protective Coating for Concrete Surfaces will be measured for payment by the square yard, satisfactorily applied and accepted.

515.06 Basis of Payment

Clear Protective Coating for Concrete Surfaces will be paid at the Contract unit price per square yard which price shall be full compensation for all labor, materials, equipment and incidentals required for furnishing and applying the clear concrete protective coating as shown on the Plans, in accordance with these Specifications or as approved by the Resident.

Surface preparation, vegetation removal, and protection of surfaces not designated for treatment will not be measured separately for payment, but shall be incidental to the Clear Concrete Protective Coating item.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
515.202 Clear Protective Coating for Concrete Surfaces	Square Yard

SPECIAL PROVISIONSECTION 515PROTECTIVE COATING FOR CONCRETE SURFACES

(Broadcast Sealant for Concrete Surfaces)

Section 515, Protective Coating for Concrete Surfaces, is deleted in its entirety and replaced with the following:

515.01 Description

The work shall include surface preparation and application of a broadcast sealant on concrete surfaces to the concrete wearing surface of the toll plaza exit and entry slabs. The coating system shall be applied to the slab wearing surface in accordance with these Specifications and the manufacturer's published recommendations.

515.02 Materials

The broadcast sealer shall be one of the following products, or an approved equal.

- T-78 Methyl Methacrylate Crack Sealer, as manufactured by Transpo Industries, Inc.
- KBP 204 P Seal, as manufactured by Kwik Bond Polymers
- MasterSeal 630, as manufactured by BASF

The product shall comply with regulations limiting the Volatile Organic Compound (VOC) content of architectural and industrial maintenance coatings.

The Contractor shall submit the product data sheets, material safety data sheets and recommended instructions for application of the proposed sealer.

Materials shall be delivered to the site in original packages or containers bearing the manufacturer's labels and identification.

515.03 Surface Preparation

Concrete surfaces shall be cleaned to remove dust, surface dirt, oil, laitance and other contaminants to ensure proper coverage and penetration of the sealer. Surface preparation shall be performed in strict conformance with the manufacturer's published recommendations.

The Contractor shall use cleaning materials and methods recommended by the sealer manufacturer in conjunction with high pressure water for cleaning the concrete.

The Resident shall approve the prepared surface prior to applying the sealer.

515.04 Application

The Contractor shall apply the sealer in strict accordance with the manufacturer's published recommendations. If there is a conflict between the manufacturer's recommendations and the restrictions below, the stricter of the two criteria shall apply. Coverage will vary depending on condition, texture and porosity of the surfaces. A second coat may be required on very porous substrates. Pre-testing is required.

The application shall not be conducted when surface and air temperatures are outside the range recommended by the manufacturer. The work shall not be conducted when there is a chance of the surface and air temperature falling outside of the recommended temperature range during the appropriate cure time for the air temperature plus four hours.

The treatment shall not be applied during rain, to wet surfaces, or when there is a chance of rain within 24-hours after application. Following any rain fall, allow the concrete to air dry a minimum of 48 hours before applying broadcast sealant. After treatment, surfaces should be protected from rain for not less than 48-hours. Sealant shall not be applied when winds are sufficient to carry airborne chemicals to unprotected surfaces.

Prior to applying the sealer, the Contractor shall protect all surrounding non-concrete surfaces, landscape and lawn areas, and surfaces not designated for treatment, from contact with the penetrating sealer, and prevent overspray of the penetrating sealer caused by wind drift. Provide shielding as necessary to prevent dust, debris, and overspray from striking vehicular traffic.

The Contractor shall ensure that all safety equipment, facilities and precautions recommended by the product manufacturer are furnished and/or strictly adhered to.

Sealer shall be applied as packaged without dilution or alteration from manufacturers recommended mixing instructions. Sufficient material shall be applied to thoroughly saturate the surface making sure to brush out excess material that does not penetrate.

When the sealer is applied to horizontal surfaces, it shall be applied in a single saturating application with sufficient material and applied so the surface remains wet for one to two minutes before penetration into the concrete. Surface residues, pools and puddles shall be broomed-out thoroughly until they completely penetrate into the surface.

Broadcast sand shall be applied either by hand or mechanical means on the entire treated area of concrete surfaces prior to cure to achieve a uniform coverage. Follow the Manufacturer's requirements for the amount of sand per square area. Place the sand as the sealant begins to gel. Placing of the sand before the gelling of the sealant may cause settlement, excessive coating of the sand, and loss of friction characteristics. Additional sand that does not adhere to the sealant shall be brushed off. The surface shall be inspected and approved by the Resident before allowing traffic to resume. An alternative to sand, if the manufacturer's requirements allow, is providing a brushed finish for skid resistance.

515.05 Storage

Store in factory sealed containers of unmixed material at temperatures within the range recommended by the manufacturer away from direct sunlight and sources of heat. Once the

container is opened for product use the manufacturers requirements shall be followed for storage and the product shall not be used if the recommended shelf life is exceeded.

515.06 Method of Measurement

Broadcast Sealant for Concrete Surfaces will be measured for payment by the square yard, satisfactorily applied and accepted.

515.07 Basis of Payment

Broadcast Sealant for Concrete Surfaces will be paid at the Contract unit price per square yard which price shall be full compensation for all labor, materials, equipment and incidentals required for furnishing and applying the sealer, in accordance with these Specifications or as approved by the Resident.

Surface preparation and protection of surfaces not designated for treatment will not be measured separately for payment, but shall be incidental to the Broadcast Sealant for Concrete Surfaces item.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
515.203 Broadcast Sealant for Concrete Surfaces	Square Yard

SPECIAL PROVISIONSECTION 515PROTECTIVE COATING FOR CONCRETE SURFACES

(Epoxy Overlay)

515.01 Description

The first paragraph is amended to read:

This special provision describes furnishing and applying two layers of a two-component polymer overlay system in accordance with what is shown on the Plans or as approved by the Resident. The total thickness of the overlay system shall be 1/4 inch.

515.02 Materials

Furnish materials specifically designed for use over concrete. Pre-qualified polymer liquid binders are as follows:

<u>Product Trade Name</u>	<u>Manufacturer or Supplier</u>	<u>Telephone</u>
Mark-163 Flexogrid	PolyCarb, Inc.	(866) 765-9227
Sikadur 22 Lo-mod	Sika Corporation	(248) 569-5665
E-Bond 526 Lo-Mod*	E-Bond Epoxies, Inc.	(954) 566-6555
Propoxy DOT Type III	Unitex	(816) 231-7700
Sure Level Epoxy (J-57)	Dayton Superior	(888) 977-9600
ICO Flexi-Coat	International Coatings, Inc.	(800) 624-8919
Flexolith	Euclid Chemical Co.	(800) 321-7628

*Preferred product for the Authority.

Polymer Resin

The polymer resin base and hardener shall be composed of two-component, 100 percent solids, 100 percent reactive, thermosetting compound with the following properties:

Property	Requirements	Test Method
Gel Time ^A	15 - 45 minutes @ 75° F	ASTM C881
Viscosity ^A	7 - 70 poises	ASTM D2393, Brookfield RVT, Spindle No. 3, 20 rpm
Shore D Hardness ^B	60-75	ASTM D2240
Absorption ^B	1% maximum at 24 hour	ASTM D570
Tensile Elongation ^B	30% - 70% @ 7 days	ASTM D638
Tensile Strength ^B	>2000 psi @ 7 days	ASTM D638
Flexural Strength ^B	>4500 psi @ 7 days	ASTM D790
Chloride Permeability ^B	<100 coulombs @ 28 days	AASHTO T277

^A Uncured, mixed epoxy binder ^B Cured, mixed epoxy binder

Aggregates

Furnish natural or synthetic aggregates that have a proven record of performance in applications of this type. Furnish aggregates that are non-polishing, clean, free of surface moisture, fractured or angular in shape; free from silt, clay, asphalt, or other organic materials; and meet the following properties and gradation requirements:

Aggregate Properties:

Property	Requirement	Test Method
Moisture Content	≤0.2%	ASTM C566
Hardness	≥6.5	Mohs Scale
Fractured Faces	100% with at least 1 fractured face & 80% with at least 2 fractured faces of material retained on No.16	ASTM 5821

Gradation:

Sieve Size	% Passing by Weight
No. 4	100
No. 8	30 – 75
No. 16	0 – 5
No. 30	0– 1

515.21 Required Properties of Overlay System

The required properties of the overlay system are listed in the table below:

Property	Requirement ^A	Test Method
Minimum Compressive Strength at 8 Hrs. (psi)	1,000 psi @ 8 hours 5,000 psi @ 24 hours	ASTM C 579 Method B, Modified ^B
Thermal Compatibility	No Delaminations	ASTM C 884
Minimum Pull-off Strength	250 psi @ 24 hours	ACI 503R, Appendix A

^A Based on samples cured or aged and tested at 75°F

^B Plastic inserts that will provide 2-inch by 2-inch cubes shall be placed in the oversized brass molds.

515.22 Approval of Polymer Overlay System

Submit product data sheets and specifications from the manufacturer, and a certified test report to the Resident for approval.

For materials not pre-qualified, in addition to the above submittals, submit product history/reference projects and a certified test report from an independent testing laboratory showing compliance with the requirements of the specification.

Product data sheets and specifications from the manufacture consists of literature from the manufacturer showing general instructions, application recommendations/methods, product properties, general instructions, or any other applicable information.

515.23 Construction

Conduct a pre-installation conference with the manufacturer's representative prior to construction to establish procedures for maintaining optimum working conditions and coordination of work. Furnish the Resident a copy of the recommended procedures and apply the overlay system according to the manufacturer's instructions. The manufacturer's representative familiar with the overlay system installation procedures shall be present at all times during surface preparation and overlay placement to provide quality assurance that the work is being performed properly.

Store resin materials in their original containers in a dry area. Store and handle materials according to the manufacturer's recommendations. Store all aggregates in a dry environment and protect aggregates from contaminants on the jobsite.

Surface Preparation

Determine an acceptable shotblasting machine operation (size of shot, flow of shot, forward speed, and/or number of passes) that provides a surface a profile meeting CSP 5 according to the International Concrete Repair Institute Technical Guideline No. 03732. If the Resident requires additional verification of the surface preparation, test the tensile bond strength according to ACI 503R, Appendix A of the *ACI Manual of Concrete Practice*. The surface preparation will be considered acceptable if the tensile bond strength is greater than or equal to 250 psi or the failure area at a depth of 1/4 inches or more is greater than 50 percent of the test area. Continue adjustment of the shotblasting machine and necessary testing until the surface is acceptable to the Resident or a passing test result is obtained.

Prepare the entire surface using the final accepted adjustments to the shotblasting machine as determined above. Thoroughly blast cleans with hand-held equipment any areas inaccessible by the shotblasting equipment. Do not perform surface preparation more than 24-hours prior to the application of the overlay system.

Just prior to overlay placement, clean all dust, debris, and concrete fines from the concrete surface including vertical faces of curbs and barrier walls up to a height of one inch above the overlay with compressed air. When using compressed air, the air stream must be free of oil. Any grease, oil, or other foreign matter that rests on or has absorbed into the concrete shall be removed completely.

The Resident may consider alternate surface preparation methods per the overlay system manufacturer's recommendations. The Resident will approve the final surface profile and cleanliness prior to the Contractor placing the epoxy overlay.

Application of the Overlay

Perform the handling and mixing of the epoxy resin and hardening agent in a safe manner to achieve the desired results according to the manufacturer's instructions. Do not apply the overlay system if any of the following exists:

- a. Ambient air temperature is below 50°F;
- b. Concrete surface temperature is below 50°F;
- c. Moisture content in the concrete exceeds 4.5 percent when measured by an electronic moisture meter or shows visible moisture after two-hours when measured in accordance with ASTM D4263;
- d. Rain is forecasted during the minimum curing periods listed under C.5 ;
- e. Materials component temperatures below 50°F;
- f. Concrete age is less than 28 days unless approved by the Resident.

After the concrete surface has been shotblasted or during the overlay curing period, only necessary surface preparation and overlay application equipment will be allowed on the concrete surface. Begin overlay placement as soon as possible after surface preparation operations.

The polymer overlay shall consist of a two-course application of epoxy and aggregate. Each of the two courses shall consist of a layer of epoxy covered with a layer of aggregate in sufficient quantity to completely cover the epoxy. Apply the epoxy and aggregate according to the manufacturer's requirements. Apply the overlay using equipment designed for this purpose. The application machine shall feature positive displacement volumetric metering and be capable of storing and mixing the polymer resins at the proper mix ratio. Disperse the aggregate using a standard chip spreader or equivalent machine that can provide a uniform, consistent coverage of aggregate. First course applications that do not receive enough aggregate before the epoxy gels shall be removed and replaced. A second course applied with insufficient aggregate may be left in place, but will require additional applications before opening to traffic.

After completion of each course, cure the overlay according to the manufacturer's instructions. Follow the minimum cure times as prescribed by the manufacturer. Remove the excess aggregate from the surface treatment by sweeping, blowing, or vacuuming without tearing or damaging the surface; the material may be re-used if approved by the Resident and manufacturer. Apply all courses of the overlay system before opening the area to traffic. Do not allow traffic on the treated area until directed by the Resident.

After the first layer of coating has cured to the point where the aggregate cannot be pulled out, apply the second layer. Prior to applying the second layer, broom and blow off the first layer with compressed air to remove all loose excess aggregate.

Prior to opening to traffic, clean all debris and polymer from the roadway. If required by the Resident, a minimum of three days following opening to traffic, remove loosened aggregates from the concrete and approach pavement.

Application Rates

Apply the epoxy overlay in two separate courses in accordance with the manufacturer's instructions, but not less than the following rate of application.

Course	Minimum Epoxy Rate ^A (GAL/100 SF)	Aggregate ^B (LBS/SY)
1	2.5	10+
2	5.0	14+

^A The minimum total applications rate is 7.5 GAL/100 SF.

^B Application of aggregate shall be of sufficient quantity to completely cover the epoxy.

Minimum Curing Periods

As a minimum, cure the coating as follows:

Course	Average temperature of concrete surface, epoxy and aggregate components in °F					
	60-64	65-69	70-74	75-79	80-84	85+
1	4 hrs.	3 hrs.	2.5 hrs	2 hrs	1.5 hrs.	1 hr.
2 *	6.5 hrs.	5 hrs.	4 hrs.	3 hrs.	3 hrs.	3hrs.

*Cure course 2 for eight hours if the air temperature drops below 60° F during the curing period.

515.05 Method of Measurement

The Authority will measure Epoxy Overlay in area by square yards completed and accepted, in accordance with the Plans.

515.06 Basis of Payment

Payment is full compensation for preparing the surface; for tensile bond testing; for providing the overlay; for cleanup; for sweeping/vacuuming and disposing of excess materials; and for labor, equipment, tools, and incidentals necessary to complete the work.

Payment will be made under:

Pay ItemPay Unit

515.23 Epoxy Overlay

Square Yard

SPECIAL PROVISIONSECTION 520EXPANSION DEVICES – NON-MODULAR

(Asphaltic Plug Joint)

Section 520, Expansion Devices, Non-Modular, is deleted in its entirety and replaced with the following:

520.01 Description

This work consists of furnishing and installing asphaltic plug joint systems at the location(s) shown on the Plans, in accordance with these Specifications or as directed by the Resident. This work shall include furnishing, installation and removal of any bond breaking materials used to prevent asphalt pavement layers from adhering to waterproofing membrane, all temporary header(s) installed with the intent to form the asphaltic plug joint channel, and all preparation required for the installation of the asphaltic plug joint.

This work shall also include having the approved manufacturer provide a qualified technical representative to supervise the installation of the joint systems. The representative shall instruct, train and supervise the Contractor's personnel in the proper methods of installation. All costs associated with this service shall be included in the unit price of the work.

Bridging plates for asphaltic plug joint systems shall only be used when shown on the Contract Plans.

520.02 Submittals

Prior to construction, the Contractor shall submit the following to the Resident for review and approval:

- (a) Complete and detailed Shop Drawings of asphaltic plug joint system. Shop Drawing shall include information covering materials, their properties, installation procedures, storage and handling requirements, and Safety Data Sheets.
- (b) The resume of the manufacturer's technical representative, which shall include the representative's experience installing the asphaltic plug joint system along with the names and telephone numbers of contact persons for recent projects where technical assistance was provided.
- (c) Certified test reports of the asphaltic binder, closed cell foam backer rod, and the plastic compound.
- (d) Certificates of Compliance for bridging plates, centering nails, and aggregate.

520.03 Materials

The asphaltic plug joints shall consist of a system including bridge joint binder material, aggregate, backer rod, elastomeric concrete header material, and polysulfide joint sealant conforming to the details and dimensions shown on the Plans, in accordance with these Specifications and as directed by the Resident.

The asphaltic plug joint system shall be selected from the systems and manufacturer's listed on the contract plans.

Materials which are incorporated in or used in conjunction with approved asphaltic plug joint systems are as follows:

(a) Asphaltic Binder:

Binder shall meet or exceed requirements of AASHTO M301 (ASTM D3405) and consist of hot applied, thermoplastic polymeric modified asphalt with the following properties when tested in accordance with the following ASTM methods:

PROPERTY	REQUIREMENT	TEST METHOD
Softening Point, °F	180 min.	ASTM D36
Tensile Adhesion @ 77°F, %	700 min.	ASTM D3583
Ductility @ 77°F, inch	40 min.	ASTM D113
Penetration, 0.1 mm 77°F, 150 g, 5 s 0°F, 200 g, 60 s	90 max. 10 max.	ASTM D3407
Flow 5 hrs @ 140°F, mm	3.0 max.	ASTM D3407
Bond @ -20°F	pass 3 cycles	ASTM D3407
Resilience @ 77°F, %	40 to 70	ASTM D3407
Asphalt Compatibility @ 140°F	Pass	ASTM D3407
Recommended Pouring Temperature, °F	380 to 390	
Safe Heating Temperature, °F	400 min.	

(b) Backer Rod:

Backer rod shall be a cylindrical closed cell expanded polyethylene foam rod, with a diameter of 150 percent of joint opening width, capable of withstanding the temperature of the hot binder materials and having the following properties:

PROPERTY	REQUIREMENT	TEST METHOD
Density, lb/ft ³	2.0 min.	ASTM D1622

Tensile Strength, psi	20 min.	ASTM D1623
Water Absorption, % of wt.	1.0 max.	ASTM C509

(c) Bridging Plate:

Bridging Plate shall be either Plate Steel or Aluminum Flashing as specified on the plans.

Plate Steel Bridging Plates shall be fabricated from ASTM A36 steel, shall be a minimum of 1/4 inch thick and shall be galvanized. Holes for centering nails shall be located approximately one foot on center along the centerline of plates.

Aluminum Flashing Bridging Plates shall be rust-free roll aluminum. The aluminum flashing shall be a minimum of 6" wide and have a minimum thickness of 0.02 inches.

(d) Centering Nail:

Nail shall be 16d or larger and hot dip galvanized in accordance with ASTM A153.

(e) Aggregates:

Aggregate shall be crushed, double-washed and dried granite or basalt, and meet the ASTM C33 Size No. 6 gradation. This aggregate shall also be used for top dressing on the finished joints.

(f) Plastic Compound:

Plastic compound used for repairing overcuts in bituminous concrete overlays shall be a two-component liquid with a synthetic resin base. It shall have a minimum viscosity of 3,500 cps at 77°F and a maximum viscosity of 65,000 cps at 25°F. The plastic compound shall be cured by the addition of a specific hardener. Sufficient hardener shall be used to cure the plastic compound in approximately 30 minutes at 77°F. It shall have sufficient strength and resiliency to withstand stresses set up by vibration, expansion and contraction due to temperature changes. It shall also be resistant to most chemicals and solvents, including most salts, acids, and hydrocarbons.

520.04 Installations

Asphaltic plug joint system shall be installed in accordance with manufacturer's latest instructions and specifications. Manufacturer's representatives shall be present during the entire installation to ensure satisfactory results are obtained.

Asphaltic plug joint system shall allow for a total joint movement as specified on the Plans (extreme hot to extreme cold temperature). The installation shall be centered over the expansion joint gap as indicated on the Plans. Installation shall occur when the structure temperature is between the limits indicated on the Plans. It shall not be installed when rain is imminent, or in other environmental conditions disapproved by the Resident. The area shall be free of any dirt, dust, moisture, petroleum or solvents that might contaminate the joint materials or reduce the bond

of the joint system to the substrate or vertical faces. The use of compressed air and heat may be required to dry the area before installing the joint system.

The asphalt pavement layers shall be removed to the required dimensions shown on the plans. The asphalt pavement shall be sawcut to a depth that will not damage the waterproofing membrane, but permit the removal of the asphalt pavement layer. The pavement layer shall be removed in a manner that will not damage the waterproofing membrane. Bond breakers such as interlayers and fabrics, or temporary header(s), may be used with new hot mix asphalt placements to avoid unnecessary saw cuts and protect the waterproofing membrane from damage. The method of attaching any temporary header(s) to the concrete deck shall be approved by the Resident. The use of a temporary header shall not be allowed if it will need to be anchored into a precast prestressed concrete member. Should a concrete leveling course be required before installing the bridging plates, and the membrane layer is removed in the process, it shall be replaced before the asphaltic plug joint system is installed. Vertical surfaces of the asphalt pavement layers shall be cleaned to remove all water, dust, or other contaminants.

Backer rods shall be installed in expansion joint openings at a minimum of one inch depth as indicated on the Plans.

Unless otherwise specified by the asphaltic plug joint system manufacturer, liquid asphalt binder meeting the requirements of a 64-28 or 58-28 PGAB shall be used to coat the membrane and bridging plate surfaces.

The binder shall be heated to 350°F to 410°F, or a safe temperature as recommended by manufacturer. Heating kettles shall be equipped with continuous agitation system, temperature controller, calibrated thermometer, and double steel jacket with an oil layer in between, to prevent scorching of the binder. During application, the temperature of binder shall be maintained at a minimum of 350°F, but no greater than 410°F. It shall be poured and leveled into expansion joint openings until overfilled, and the excess binder spreads over the area covered by the bridging plates.

If called for on the plans the bridging plates, whether fabricated from steel plate or aluminum flashing, shall be placed from curb to curb on the roadway portion of expansion joints. The plates shall be centered over joint openings. Centering nails shall be placed in pre-drilled holes and hammered into secure plates.

Once the bridging plates are installed, liquid asphalt binder shall be poured and leveled over the bridging plates and adjacent membrane surfaces in a manner that ensures full coverage. Areas with excessive application, such as pooling of liquid, should be removed or dispersed along the joint area.

Asphaltic plug joint system aggregate shall be heated in a rotating drum mixer to a minimum of 350°F but no greater than 410°F, or as recommended by the manufacturer. The thermoplastic polymeric modified asphalt binder shall be added to the mixer to pre-coat aggregates.

Coated aggregate shall be placed into blockouts in layers as recommended by the manufacturer. Blockouts shall be overfilled with coated aggregate as required to compensate for compaction. Equipment for compaction shall be as recommended by the manufacturer. Additional

thermoplastic polymeric modified asphalt binder shall be screeded over the compacted joint to fill any surface voids.

Top dressing aggregate shall be applied per the manufacturer's recommendation.

Plastic compound shall be used for repairing overcuts in bituminous concrete. Cleaning, mixing and application shall be in conformance to the manufacturer's instructions.

Vehicular traffic may pass over finished joints two-hours after compaction or as recommended by the manufacturer.

520.05 Method of Measurement

The Expansion Device - Asphaltic Plug Joint system will be measured by the linear foot along the top surface of installed joints to the limits as shown on the Plan. Preparation of surfaces for the proposed joint system including cutting, grinding, and cleaning will not be measured separately for payment, but shall be incidental to the Expansion Device - Asphaltic Plug Joint pay item.

520.06 Basis of Payment

The asphaltic plug joint system will be paid for at the Contract unit price per linear foot, which price shall be full compensation for all labor, materials, equipment, and incidentals required for furnishing and installing the Expansion Device - Asphaltic Plug Joint as shown on the Plans, in accordance with these Specifications, and as directed by the Resident.

The backer rod, closed cell foam, all patching needed for the waterproofing membrane, and elastomeric sealant installed up the vertical face, and across the horizontal surfaces, of bridge curbs and sidewalks will not be measured separately for payment, but shall be incidental to the Expansion Device - Asphaltic Plug Joint pay item.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
520.23 Asphaltic Plug Joint	Linear Foot

SPECIAL PROVISIONSECTION 524TEMPORARY STRUCTURAL SUPPORTS

(Protective Shielding - Steel Girders)

524.01 Description

The following paragraph is added:

This work shall also consist of furnishing all labor, equipment and materials required to provide protection for the public during demolition and construction. This protection shall include, but not necessarily be limited to, protective shielding of existing structures during demolition work, concrete removal, and installation of temporary deck support over roadway lanes and shoulders on all existing and new bridge structures.

The following Subsections are added:

524.031 Protective Shielding Design

Prior to the start of work, the Contractor shall submit working drawings for review and comment indicating the sizes and dimensions of protective shielding. If the shielding is to be attached to prestressed concrete components the submittal shall be coordinated with the respective precast concrete shop drawings. The proposed methods of protective shielding, including connections and fasteners, shall be in accordance with the following criteria:

The protective shielding shall be designed for safely supporting all construction and dead loads, but not less than 100 pounds per square foot with a load duration of seven (7) days. Protective shielding shall be stiff enough to limit deflection to 1/2 inch under maximum loads and to be tightly sealed at all joints. The protective shielding shall be placed on the tops of the bottom flanges of the steel girders, or between the web or bottom flanges of the concrete I-girders, with edges and laps made tight to protect the turnpike motorists from dust, debris and falling objects.

Special hangers may be required to support shielding on prestressed structural concrete I-girders or prestressed structural concrete slabs. The Contractor will not be permitted to install inserts, shoot fasteners, or drill holes in the concrete I-girders or concrete slabs to support the shielding. The Contractor may propose 3/4 inch or one inch diameter sleeves be installed in the webs of the girders during fabrication for temporary fasteners to pass through. The proposed and approved sleeves shall be coordinated with the girder manufacturer; and shall be filled, and stuck flush, with an epoxy grout after the protective shielding is removed.

524.041 Protective Shielding Erection and Removal

No portion of the protective shielding installed over a roadway shall project below a plane connecting the bottoms of the bottom flanges of the steel stringers or concrete I-girders. During demolition operations, the protective shielding shall be covered with sheet plastic made tight at

edges and laps to prevent water used in the sawcutting operation from falling onto the facilities under the bridge.

The protective shielding on existing and new structures shall extend horizontally three feet beyond the fascia lines and vertically to a point one foot minimum above the top of parapet or railing. The shielding shall also extend 10 feet beyond the edge of pavement of the roadway below, unless otherwise noted on the Plans or as approved by the Resident.

Shielding shall be approved and installed prior to the start of any demolition work and shall remain in position during all demolition work. Shielding shall also be approved and installed prior to the start of any deck forming and shall remain in position during all deck work. The shielding shall be relocated or removed only as approved by the Resident.

Construction sequences may require protective shielding material to be removed, stored and then reinstalled by the Contractor. Any shielding which is damaged during this removal and reinstallation shall be replaced by the Contractor at no additional cost.

524.28 Method of Measurement

The following paragraph is added:

Protective Shielding will be measured by the square yard for shielding designed, installed, removed and disposed or stacked. For purposes of computing the area, only the horizontal plan dimensions will be used.

524.29 Basis of Payment

The following paragraphs are added:

Protective Shielding will be paid for at the Contract bid price per square yard and shall include all design, materials, transportation and stacking, labor (to install, remove and stack as needed), tools and equipment necessary to perform the work as described above or as approved by the Resident. The measurement shall include one sequence of placement, removal, and on-site storage (if applicable for intended reuse) of Protective Shielding. Where bridge and girder construction dictate that Protective Shielding is to be installed in the same location at a later date, then the quantity of Protective Shielding shall be increased accordingly to reflect the total work, and shall be tabulated on the drawings. Therefore, the calculated quantity of Protective Shielding will be the summation of each sequence noted above (placement, removal, and on-site storage). The Contractor shall note that additional timber material may be required to accommodate differing girder spacing or differing overhang dimensions.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
524.40 Protective Shielding - Steel Girders	Square Yard

SPECIAL PROVISION

SECTION 526

CONCRETE BARRIER

(Temporary Barrier Markers)

526.1 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.

526.2 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.

526.3 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 so as 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.

526.4 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.

526.5 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 PROVISIONSECTION 526CONCRETE 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):

<u>Maintenance Area</u>	<u>Linear Feet of Barrier</u>
Crosby Maintenance Area Mile 45.8 Southbound	7900

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 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 so as to withstand the force of throw from a snow plow.
9. 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.
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 fifth paragraph is 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 Concrete Barrier shall be based on a percentage of the work accomplished during that pay period.

Payment will be made under:

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

SPECIAL PROVISION

SECTION 526

CONCRETE BARRIER

(Concrete Barrier Type I – Stormwater Filter)

526.01 Description

The following sentence is added:

The work also consists of furnishing and installing concrete barrier Type I for use as a weir on the overflow spillway of the Underdrain Soil Filter (USF) Basin as shown on the Plans.

526.02 Materials

The following items are added:

- e. Joint between concrete barriers Type I shall be sealed on each side and on top, utilizing a backer rod and Sikaflex – 1a Elastomeric Sealant as manufactured by the Sika Corporation Lyndhurst, New Jersey 07071, telephone 201-933-8800, web site.
- f. Concrete for the USF footing shall be Class B (f'c-3000 psi).

The following Subsection is added:

526.031 Construction Requirements – Concrete Barrier Type I - Stormwater Filter

The overflow weir at each USF Basin overflow spillway, at a minimum, shall consist of two 10 foot section of concrete barrier type I doweled together and set on a continuous concrete footing. The ends of the barrier shall be flush and any projecting material such as steel loops used for connection pins shall be cut off flush with the concrete. The space between the two abutting barriers shall be sealed with non-shrink grout resulting in a continuous 20 foot concrete barrier. The concrete footing shall be constructed on stable compacted soil. The concrete barrier (overflow weir) shall be set level to the elevations shown on the Plans. Wood or other type shims will not be used to level the barrier.

The concrete barrier type I for the USF Basin shall remain on the site at the completion of the Contract.

526.04 Method of Measurement

The following sentence is added:

Concrete Barrier Type I – Stormwater Filter shall be measured for payment by the linear foot of barrier, complete in place.

526.05 Basis of Payment

The fifth paragraph is deleted in its entirety and not replaced.

The following paragraph is added:

Concrete Barrier Type I – Stormwater Filter will be paid for at the Contract linear foot price, complete in place. Such payment shall be full compensation for furnishing, transporting and installing concrete barrier, including connecting dowels, non-shrink grout, concrete footing, and all other incidental materials, labor and equipment, required to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
526.307	Concrete Barrier Type I – Stormwater Filter	Linear Foot

SPECIAL PROVISIONSECTION 526CONCRETE BARRIER

(Concrete Barrier – Type A)

(Concrete Barrier – Type B)

(Concrete Barrier – Type C)

(Concrete Barrier – Type D)

(Concrete Barrier – Type C Transition Barrier)

(Concrete Barrier – Median Guardrail Transition Barrier)

(Concrete Barrier – Type B Guardrail Transition Barrier)

(Concrete Barrier – Type C Guardrail Transition Barrier)

(Concrete Barrier – Type D Guardrail Transition Barrier)

526.01 Description

This Section is deleted and replaced with the following:

This work shall consist of the furnishing, constructing, erecting, and setting permanent concrete barrier and associated elements on granular base material in accordance with these Specifications and the lines and grades shown on the Plans or established by the Resident. The length of each precast barrier segment shall be in accordance with the parameters shown on the Plans. The Contractor shall minimize the number of joints in the final barrier assembly to the extent possible.

The work shall also be completed in accordance with Supplemental Specification 502, Structural Concrete, and Standard Specification 534, Precast Structural Concrete, as referenced herein.

The work shall also include the application of Clear Protective Coating for Concrete Surfaces to all concrete surfaces exposed in the final condition in accordance with Supplemental Specification 515.

Median Barrier Type A – Double faced single slope precast concrete barrier 2'-2½" wide at the base, 43½" high and 36" minimum reveal as shown on the Plans. A structural tube and I-beam connection detail is provided at each end.

Median Barrier Type B – Double faced single slope precast concrete barrier 2'-3¾" wide at the base, 47½" high and 36" minimum reveal as shown on the Plans. A structural tube and I-beam connection detail is provided at each end.

Median Barrier – Type C – Single face single slope precast concrete barrier 1'-9 3/8" wide at the base, 59½" high, and 54" reveal as shown on the Plans. A structural tube and I-beam connection detail is provided at each end.

Median Barrier – Type D – Single face single slope concrete barrier 1'-11" wide at the base, 82" high, 54" reveal and an 87" footing as shown on the Plans. Barrier may be cast-in-

place or precast at the Contractor's option. Optional structural tube and I-beam connection detail is provided at each end. Alternatively, the barrier may be cast integral with transition.

Bridge Endpost Transition Barrier – Cast-in-place concrete barrier to transition from Median Barrier – Type A/B to F-shape bridge endposts as shown on the Plans. A structural tube and I-beam connection detail is provided at one end and a doveled connection for matching into the bridge end post is provided at the other end.

Type C Transition Barrier – Precast concrete barrier to transition from Median Barrier – Type A/B to Median Barrier - Type C, shown on the Plans. A structural tube and I-beam connection detail is provided at each end.

Type D Transition Barrier – Barrier to transition from Median Barrier – Type A / B to Median Barrier – Type D as shown on the plans. Barrier may be cast-in-place or precast at the Contractor's option. A structural tube and I-beam connection is provided at one end.

OHSS Foundation Transition Barrier – Barrier to transition from Median Barrier – Type A / B to match existing overhead sign structure foundations as shown on the plans. A structural tube and I-beam connection details is provided at both ends.

526.02 Materials

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

Concrete for precast components shall be Class P in accordance with Supplemental Specifications, Section 502.05, Composition and Proportioning, with a minimum compressive strength of 4,500 psi and an air entrainment of 6.5% ±1%. Self Consolidating Concrete (SCC) mix designs will be considered for approval provided the mix design is in conformance with the proportion limits specified in Supplemental Specification 502.05. The provisions for slump shall be waived for SCC.

Concrete for cast-in-place components shall be Class AAA-Deck (without synthetic reinforcement) in accordance with Supplemental Specifications, Section 502.05, Composition and Proportioning, with a minimum compressive strength of 4,500 psi and an air entrainment of 6.5% ±1%.

Steel components and hardware for barrier connection assemblies shall be in accordance with MaineDOT Standard Specification 504. All barrier connection assemblies shall be hot dip galvanized after fabrication in accordance with ASTM A123 or A153, as applicable.

All reinforcing steel for concrete barrier shall be epoxy coated. Reinforcing steel shall be fabricated and placed in accordance with the Standard Specifications, Section 503.

Reflective delineators for concrete median barrier shall meet the requirements of Special Provision 645, Highway Signing.

Clear Protective Coating for Concrete Surfaces shall be in accordance with Supplemental Specification 515.

526.03 Construction Requirements

The first paragraph, including items “a” through “c”, and the second paragraph are deleted and replaced with the following:

The Contractor shall collect any necessary field data to supplement the Plans, including ground survey and field measurements, required for the development of working drawings. The Contractor shall submit working drawings for approval showing the fabrication details of each proposed barrier section as well as layout drawings indicating station to station plan layout of the barrier, the type of barrier proposed at each location, the length of each barrier segment, the quantity of each barrier segment, and the overall length of each barrier run in accordance with Section 105.7, Working Drawings, and Section 526.031, Submittals. Additionally, working drawings for precast elements shall be submitted in accordance with Standard Specification 535.03, Drawings. Relevant field data, survey, and calculations used in the development of the barrier layout shall be included in the working drawing submittal.

All cast in place components shall be constructed in accordance with the provisions of Supplemental Specification 502, Section 502.05, Composition and Proportioning, through Section 502.15, Curing Concrete, inclusive. Concrete barrier shall not be formed using slip forming methods.

All precast components shall be constructed in accordance with the provisions of Standard Specification 534, Section 534.05, Facilities for Inspection, through Section 534.10, Forms, inclusive, as well as Section 534.12, Inserts, through Section 534.20, Installation of Precast Units, inclusive. The provisions of Standard Specification Section 712.061, Structural Precast Concrete Units, exclusive of material requirements, shall apply. Concrete barrier shall not be formed using slip forming methods.

The following paragraphs are added at the end of this section:

- f. Sections of barrier, whether precast or concrete, shall be uniform in color and in good condition, free from cracked or spalled surfaces.

The layout and placement of the concrete barriers shall be to the alignment and elevations shown on the Plans, approved working drawings, or as directed by the Resident. Before any barrier or transitions may be placed, the subbase shall be compacted to 95 percent density and fine graded to a tolerance of $\pm 1/2$ inch of the true grade at any location under the barrier.

All Cast-in-Place barrier adjacent to precast barriers shall include hardware for the barrier connections as detailed in the Plans.

526.031 Submittals

Prior to construction, the Contractor shall submit the following to the Resident for review and approval:

- a) Complete and detailed Shop Drawings of each barrier type. Shop drawings shall include information covering materials and their properties, installation procedures, lifting devices, storage and handling requirements, reinforcing layout, protective coating information,

geometric dimensions, quantity of pieces, overall length of pieces, and all other information necessary to fabricate the pieces in accordance with the Plans and Specifications.

- b) Complete and detailed layouts for all barrier runs. The layouts shall include:
- i. A suitably formatted spreadsheet for each barrier run that includes start and end stations for all Type A and B barrier runs centered on the Turnpike median, all Type A or B barrier tapered runs, all transitions between Type A and B barrier, all Transitions between Type A or B barrier and Type C or D barrier, fixed points including but not limited to Overhead Sign Structure Locations, MCRR and Stroudwater barrier transitions, Southern Terminus of Contract 2020.03, Northern Terminus of Contract 2021.08.
 - ii. The spreadsheet shall also include the quantity and length of all standard and custom pieces of each type in the run. Standard and custom length pieces shall be quantified and included in the Shop Drawing bill of materials. The Contractor shall minimize the number of joints and maximize the number of standard length pieces in the final barrier assembly to the extent possible.
 - iii. Contractor is responsible for surveying station locations of fixed points and other necessary features before developing final layout stationing.
 - iv. Contractor shall work from fixed points to floating points when developing barrier layout runs. See barrier detail sheets for defined fixed and floating points. Contractor shall submit a proposed construction sequence for the installation of the barrier, including the start and end stations of each barrier run. The floating points shall be used for both maximizing the number of full length pieces as well as building in tolerance when setting the barrier.
 - v. Type A barrier may be substituted with Type B barrier at any location. The station ranges for Type A and B transitions between piers, overhead sign structures, overpass bridges, and other fixed objects, shown on Table 1 on BD-1 of the plans can be adjusted such that the use of standard length pieces are maximized, and joints are minimized.
 - vi. The barrier layout spreadsheet shall be formatted and contain stationing and offset information such that the Resident Engineer can check it against the requirements of the Plans and Specifications before and during construction.
- c) All comments made by the Resident Engineer shall be addressed by the Contractor. The resolution of all comments shall be tracked, reconciled, and submitted to the Authority for review and verification. Fabrication shall not proceed until written acceptance of the final barrier layout and shop drawings is received by the Contractor from the Authority.

526.04 Method of Measurement

The following paragraphs are added:

All Median Barrier, Types A, B, C, and D will be measured for payment by the lump sum satisfactorily completed and in place as shown on the Plans.

Type C Transition Barrier, Type D Transition Barrier, OHSS Foundation Transition Barrier, and Bridge Endpost Transition Barrier will be measured by each barrier satisfactorily completed and in place as shown on the Plans.

The application of Clear Protective Coating for Concrete Surfaces will not be measured for payment separately but shall be incidental to the related barrier pay items.

526.05 Basis of Payment

The following paragraphs are added:

The Contract Lump Sum price for median barrier Types A, B, C, and D shall be full compensation for: shop drawings and layout submittal; field layout; furnishing all materials, supplies, and equipment; casting; delivery; excavation; bedding material; grading; installation; reflective delineators; application of Clear Protective Coating for Concrete Surfaces; and other all incidentals necessary to complete the work.

The unit price for each for Type C Transition Barrier, Median Guardrail Transition Barrier, Type B Guardrail Transition Barrier, Type C Guardrail Transition Barrier, and Type D Guardrail Transition Barrier sections shall be full compensation for: shop drawings and layout submittal; field layout; furnishing all materials, supplies, and equipment; casting; delivery; excavation, bedding material grading; installation; reflective delineators; application of Clear Protective Coating for Concrete Surfaces; and other all incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
526.351	Concrete Barrier – Type A	Lump Sum
526.352	Concrete Barrier – Type B	Lump Sum
526.353	Concrete Barrier – Type C	Lump Sum
526.354	Concrete Barrier – Type D	Lump Sum
526.362	Concrete Barrier – Type C Transition Barrier	Each
526.366	Concrete Barrier – Median Guardrail Transition Barrier	Each
526.367	Concrete Barrier – Type B Guardrail Transition Barrier	Each
526.368	Concrete Barrier – Type C Guardrail Transition Barrier	Each
526.369	Concrete Barrier – Type D Guardrail Transition Barrier	Each

SPECIAL PROVISIONSECTION 527ENERGY ABSORBING UNIT

(Center Barrier Crash Attenuator (Smart Cushion))

527.01 Description

The following sentences are added:

This work shall include furnishing, installing and securing the energy absorbing units as described in the Plan drawings and detailed by the manufacturer. Drawings and general provisions of this Contract, including General Provisions and Special Conditions, apply to work of this section.

527.02 Materials

The energy absorbing system shall be the Smart Cushion as manufactured by Hill & Smith Inc. or an approved equal. Units must be a re-directive, non-gating crash cushion and suitable for installation on a concrete surface. Units shall have the ability to mount to a 2' wide concrete barrier. The energy absorbing units shall be as approved, and crash tested by the Federal Highway Administration. The units shall conform to the MASH Test Level 3 requirements and must be approved by the Resident.

527.03 Construction Requirements

The Contractor shall submit a set of installation drawings to the Resident for approval. The system shall be installed in accordance with the manufacturer's recommendation and the installation drawings.

The Smart Cushion shall be placed on a concrete pad meeting the requirements of the manufacturer's installation drawings. The pavement shall be sawcut to the limits of the concrete pad dimensions prior to installation to ensure the concrete surface matches the adjacent pavement.

One spare unit will be paid for at the Contract unit price which shall include delivery and stacking at the Crosby Maintenance Facility at Mile Marker 45.8 Southbound.

527.04 Method of Measurement

Center Barrier Crash Attenuator (Smart Cushion) will be measured by each unit complete, in place and accepted.

527.05 Basis of Payment

Center Barrier Crash Attenuator (Smart Cushion) will be paid for at the Contract unit price, complete in place and accepted. Payment shall be full compensation for furnishing all labor, equipment, materials and incidentals necessary to complete the work.

All work associated with pavement removal and installation of the concrete pad, including reinforcing steel, shall be considered incidental to Item 527.307.

Connection of the Smart Cushion to the concrete center barrier will not be paid for separately but shall be incidental to Item 527.307.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
527.307	Center Barrier Crash Attenuator (Smart Cushion)	Each

SPECIAL PROVISIONSECTION 527ENERGY ABSORBING UNIT

(Work Zone Crash Cushion)
(Resetting Existing Work Zone Crash Cushions)

527.01 Description

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

The Contractor shall furnish and install, or reset 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:

Work zone crash cushions fabricated prior to December 31, 2019 in serviceable condition shall meet the requirements of NCHRP 350 TL-3 crash test requirements and work zone crash cushions fabricated after December 31, 2019 shall meet the MASH TL-3 crash test requirements for use on the turnpike and local roadways with posted speeds of 45 MPH or greater. Work zone crash cushions fabricated prior to December 31, 2019 shall meet in serviceable condition shall meet the requirements of NCHRP 350 TL-2 crash test requirements and work zone crash cushions fabricated after December 31, 2019 shall meet the MASH TL-2 crash test requirements for use 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

Work Zone Crash Cushions used to protect exposed ends of guardrail for steel girder erection will not be measured separately for payment but shall be included under the Maintenance of Traffic for Steel Girder Erection item.

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.

Resetting Existing Work Zone Crash Cushion will be measured by the Unit, complete in place and accepted.

527.05 Basis of Payment

Resetting Existing Work Zone Crash Cushion will be measured by the Unit, complete in place and accepted.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
527.341 Work Zone Crash Cushions – TL-3	Unit
527.342 Work Zone Crash Cushions – TL-2	Unit
527.343 Resetting Existing Work Zone Crash Cushion	Unit

SPECIAL PROVISIONSECTION 602PIPE LINING

(Pumped Grout Fill)

602.01 Description

This work shall consist of furnishing all labor, equipment, and materials to place Pumped Grout Fill into abandoned underground pipes at the locations designated on the Plans. The material shall be capable of flowing over long distances without segregation or separation of the grout materials.

602.02 Materials

Materials shall conform to the requirements specified in the following Subsections of Division 700 — Materials:

▪ Portland Cement	701.01
▪ Water	701.02
▪ Fly Ash	701.10
▪ Fine Aggregate	703.01
▪ Chemical Admixtures	701.04

Pumped Grout Fill shall meet the following properties:

Range of Cast Density, PCF	65 minimum
Compressive Strength, PSI	110 – 500

602.03 Submittals

- The Contractor shall submit a mix design for Pumped Grout Fill for review and approval prior to installation. The mix design, at a minimum, shall include materials to be used with source information, batch tests or historical test data if reusing a mix design, targets for grout density, water cement ratio, 28-day compressive strength, and air content.
- The contractor shall submit a placing plan that provides equipment and placement methods, for review and approval prior to placing. The plan shall include: equipment specifications that demonstrate sufficient capacity to place grout in a single operation, pumping port and air vent locations, target pumping pressure, description of how the pipe end bulkheads will be formed to contain and support the pumped grout, and testing procedure(s).

602.04 Placing Pumped Grout Fill

Pumped Grout Fill shall not be placed until bulkhead forms, pump injection port(s), and air vent(s) have been checked and approved.

Pumped Grout Fill shall be placed before it has taken its initial set and shall be placed in such a manner as to avoid separation and segregation of the grout materials.

Placement of Pumped Grout Fill to fill abandoned pipes shall require a pressurized pump system with PVC piping for adequate air venting. A gauge to monitor grout pressure shall be attached immediately adjacent to each injection port. Threaded injection ports shall be suitable to withstand maximum pumping pressures. A minimum of one air vent shall be installed on the upstream bulkhead form to ensure the abandoned pipe is filled in its entirety.

Unit weight density tests may be taken at the discretion of the Resident to confirm the cast density.

602.05 Method of Measurement

Pumped Grout Fill satisfactorily placed and accepted will be measured by the cubic yard based on the volume of the pipe.

602.06 Basis of Payment

The accepted quantity of Pumped Grout Fill will be paid for at the Contract unit price per cubic yard. Payment will be full compensation for furnishing and placing Pumped Grout Fill, including all labor, materials, equipment, bulkhead formwork, pumping ports and vents, dewatering and necessary incidentals.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
602.40 Pumped Grout Fill	Cubic Yard

SPECIAL PROVISIONSECTION 603PIPE CULVERTS AND STORM DRAINS

(Reinforced Concrete Pipe)

(Concrete Collar)

(Corrugated Polyethylene Pipe)

(Temporary Culvert)

(Remove and Relay – Reinforced Concrete Pipe)

603.01 Description

The following paragraphs are added:

This work shall also consist of furnishing and installing Class III 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, installing, and removing various sizes of temporary culvert and temporary pipe extensions. Temporary Culvert and temporary pipe extensions shall consist of Corrugated High Density Polyethylene (HDPE) pipe or Reinforced Concrete Pipe, unless noted otherwise on the plans, of various size in accordance with the details as shown on the Plans.

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 Culvert and temporary pipe extensions shall 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 appropriate sized Culvert Pipe Option III pay items.

Temporary Culvert and temporary pipe extensions will be paid for at the contract unit price per linear foot, complete in place. Such payment shall be full compensation for furnishing, installing all adapters or other incidentals to ensure a soil-tight connection with any existing culverts, and removing the temporary culvert. Temporary Culverts shall become the property of the contractor once removed.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
603.101	Temporary Culvert	Linear Foot
603.102	Temporary Culvert - 15 inch RCP – Class V	Linear Foot
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
603.50	78 inch Reinforced Concrete Pipe – Class IV	Linear Foot
603.7412	Remove and Relay 12 inch Concrete Pipe	Linear Foot

SPECIAL PROVISION

SECTION 604

MANHOLES, INLETS AND CATCH BASINS

604.02 Materials

The following sentences are added:

Elastomeric sealer shall be Sikaflex 1a as manufactured by Sika or an approved equal.

Class AAA concrete shall conform to Subsection 502.05; except that the minimum cement factor shall be 750 pounds per cubic yard and the coarse aggregate size shall conform to ASTM C33 Grading 7.

The third paragraph should be deleted and replaced with:

Catch Basin Frames and Grates shall be as outlined below and be manufactured by EJ Company of Brockton, Massachusetts or an approved equal and shall meet or exceed the AASHTO M306 Loading Requirements.

Catch Basin Frames shall be manufactured by EJ Company of Brockton, Massachusetts (or an approved equal) with the following product numbers:

5521Z - 8 Inch Frame Product Number 00552111
5546Z - 6 Inch Frame Product Number 00554611
5544Z - 4 Inch Frame Product Number 00554411

Catch Basin Frames shall be 8" frames unless otherwise specified by the plans or approved by the resident.

Catch Basin Grates shall be a square holed grate as manufactured by EJ Company of Brockton, Massachusetts (or an approved equal) with the following product number:

5520M5 Grate Product Number 00552060 (170-pound weight)

If a cascade catch basin grate is specified on the plans then it shall be manufactured by EJ Company of Brockton, Massachusetts (or an approved equal) with the following product numbers depending on the direction of flow:

5520M8 Product Number 00552084 (170-pound weight) or 5520M8 Product Number 00552085 (170-pound weight)

If a beehive catch basin grate is specified on the plans then it shall be manufactured by EJ Company of Brockton, Massachusetts (or an approved equal) with the following product:

1045Z - Product Number 00104045C02

604.03 Construction Requirements

The following paragraphs are added:

The beehive catch basin frame shall be installed on the exposed catch basin structure in the underdrained soil filter basins using stainless steel hardware on the quarter-points of the frame to secure the frame to the structure. Stainless steel hardware shall consist of ½ inch diameter stainless steel expansion wedge anchor bolt, washer, and nut. The anchor bolt shall be embedded 3 inches into the structure. If the frame is ordered without holes, the contractor shall drill 5/8" diameter holes in the frame flange on quarter-points.

Bricks shall not be used to adjust frames to grade, only use of concrete riser rings will be permitted.

SPECIAL PROVISIONSECTION 604MANHOLES, INLETS, AND CATCH BASINS

(Secure Catch Basin Grate)

604.01 Description

This work shall consist of removing existing catch basin grates in the existing four foot paved shoulder, or other locations noted on the plans, cleaning existing frames, furnishing and applying elastomeric sealer to frame seats, and furnishing and installing new grates. This work shall be completed prior to opening paved shoulders to traffic.

604.02 Materials

The following sentences are added:

Catch Basin Grates shall be a square holed grate meeting or exceed the AASHTO M306 Loading Requirements and be manufactured by EJ Company of Brockton, Massachusetts (or an approved equal) with the following product number:

5520M5 Grate Product Number 00552060 (170-pound weight)

Elastomeric sealer shall be Sikaflex 1a as manufactured by Sika or an approved equal.

604.03 Construction Requirements

The following paragraphs are added:

After removal of an existing grate, the frame shall be cleaned to accept elastomeric sealer. Sealer shall be placed in a continuous bead over horizontal and vertical surfaces in accordance with the manufacturer's recommendations. Installed grates shall be preloaded and allowed to set for a minimum of 1.5-hours before receiving traffic loads to assure adequate adhesion of the sealer. The old grates shall be transported to the Crosby Maintenance Area Mile 45.8 Southbound and stacked at a location designated by the Resident. Old grates shall remain the property of the Authority.

New grates shall remain in place at the completion of construction and shall become the property of the Authority.

The Contractor is required to have two additional grates on-site at all times for use as backup devices. Unused grates shall become the property of the Authority and shall be stacked at Crosby Maintenance Area Mile 45.8 Southbound.

604.05 Method of Measurement

The following sentence is added:

Secure Catch Basin Grate will be measured for payment by each unit secured and accepted.

604.06 Basis of Payment

The following paragraphs are added:

The accepted quantity of Secure Catch Basin Grate will be paid for at the Contract unit price each. This price shall be full compensation for removing the existing grate, cleaning the horizontal and vertical surfaces, applying the elastomeric sealer, furnishing and installing the new grate, transporting and stacking the old grate, and all other labor, equipment, and materials required to complete the work.

Crosby Maintenance Area Mile 45.8 Southbound will be paid for at the Contract unit price each under the Secure Catch Basin Grate item.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
604.40 Secure Catch Basin Grate	Each

SPECIAL PROVISIONSECTION 605UNDERDRAIN

(PVC Underdrain)

605.01 Description

The following paragraph is added:

This work shall consist of the construction of underdrain for the stormwater filter system using pipe and bedding material in accordance with these Specifications and in reasonably close conformity with the lines and grades on the Plans.

605.02 Materials

The following paragraphs are added:

Material for six inch PVC Underdrain (laterals) shall conform to the requirements of AASHTO M278 or ASTM F949.

Material for eight inch PVC Underdrain (header/outlet pipe) shall conform to Subsection 706.08, PVC Pipe.

Underdrain Type B bedding material shall be well graded, clean, coarse gravel, free from organic matter and meeting Subsection 703.22, Type B with no more than two percent by weight passing the #200 sieve.

End caps for orifices shall be mechanically fastened to the outlet pipe.

605.04 Underdrain Construction

The following paragraphs are added:

The underdrain system to be installed as part of each stormwater filter consists of a series of parallel six inch PVC lateral underdrain pipes connected to an eight inch PVC underdrain header/outlet pipe as shown on the Plans. The underdrain pipe system shall be surrounded by underdrain bedding. A drainage geotextile (as specified in Section 620) shall be placed below the underdrain bedding on a graded, compacted and level base. Drainage geotextile shall also extend vertically along the walls of the underdrain bedding (and also extend vertically along the wall of the Soil Filter). A PVC underdrain cleanout shall be located at the upstream end of the eight inch PVC underdrain header/outlet pipe.

605.06 Method of Measurement

The following paragraphs are added:

All elbows, tees, wyes, or other special fittings required for connecting and fabricating underdrain for the stormwater filter system will not be measured.

605.07 Basis of Payment

The following paragraphs are added:

Payment for 6 Inch PVC Underdrain and 8 Inch PVC Underdrain will be made at the Contract unit price per linear foot in place. Payment will be full compensation for furnishing and placing bedding, 8 Inch and 6 Inch PVC Underdrain, all fittings and connections, cutting and connecting the underdrain, drilling orifice holes, and all labor and equipment necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
605.016	6 Inch PVC Underdrain	Linear Foot
605.018	8 Inch PVC Underdrain	Linear Foot

SPECIAL PROVISIONSECTION 606GUARDRAIL

- (31" W-Beam Guardrail – Mid-way Splice (7' Steel Posts, 8" Offset Blocks, Single Faced))
- (31" W-Beam Guardrail – Mid-way Splice (7' Steel Posts, 8" Offset Blocks, Over 15' Radius))
- (31" W-Beam Guardrail – Mid-way Splice (8' Steel Posts, 8" Offset Blocks, Single Faced))
- (31" W-Beam Guardrail – Mid-way Splice (7' Steel Posts, 8" Offset Blocks, Double Faced))

606.01 Description

The section is amended by the addition of the following:

This work shall consist of furnishing and installing guardrail components the required locations in accordance with the Specifications and in reasonably close conformity with the lines and grades shown on the Plans. The types of guardrail are designated as follows:

- 31" W-Beam Guardrail – Mid-way Splice (7' Steel Posts, 8" Offset Blocks)
- 31" W-Beam Guardrail – Mid-way Splice (8' Steel Posts, 8" Offset Blocks)

606.02 Materials

The section is amended by the addition of the following:

Steel posts shall be 7 feet or 8 feet long as specified in the plans.

The guardrail elements shall be per the Components' List found on Sheet No. 2 of 2 of draft Drawing SGR47 – 31" W-Beam Guardrail with Standard 8" Offset Block in the Task Force 13 Report noted above and/or as noted in the Contract Documents unless noted otherwise.

606.04 Rails

The section is amended by the addition of the following:

Height of top of rail shall be 31" measured from final grade. Height transition from 31" W-Beam, mid-spliced guardrail to existing guardrail shall occur over a 25' length.

606.08 Method of Measurement

The section is amended by the addition of the following:

31" W-Beam Guardrail – Mid-way Splice (7' Steel Posts, 8" Offset Blocks) and 31" W-Beam Guardrail – Mid-way Splice (8' Steel Posts, 8" Offset Blocks) will be paid for at the contract unit price per linear foot of rail satisfactorily installed and accepted.

606.09 Basis of Payment

The section is amended by the addition of the following:

The accepted quantity of 31” W-Beam Guardrail – Mid-way Splice (7’ Steel Posts, 8” Offset Blocks) and 31” W-Beam Guardrail – Mid-way Splice (8’ Steel Posts, 8” Offset Blocks) will be paid for at the contract unit price per linear foot of rail and shall be full compensation for furnishing all labor, equipment and materials necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
606.1301 31” W-Beam Guardrail – Mid-way Splice (7’ Steel Posts, 8” Offset Blocks, Single Faced)	Linear Foot
606.1304 31” W-Beam Guardrail – Mid-way Splice (7’ Steel Posts, 8” Offset Blocks, Over 15’ Radius)	Linear Foot
606.131 31” W-Beam Guardrail – Mid-way Splice (8’ Steel Posts, 8” Offset Blocks, Single Faced)	Linear Foot
606.132 31” W-Beam Guardrail – Mid-way Splice (7’ Steel Posts, 8” Offset Blocks, Double Faced)	Linear Foot

SPECIAL PROVISION

SECTION 606

GUARDRAIL

(31" W-Beam Guardrail – Mid-way Splice Flared Terminal)

606.01 Description

The following sentences are added:

This work shall consist of furnishing and installing a MFLEAT (MASH-compliant Flared Energy Absorbing Terminal) for use with the 31" W-Beam Guardrail – Mid-way Splice (7' Steel Posts, 8" Offset Blocks, Single Faced) as manufactured by Road Systems, Inc., 3616 Old Howard County Airport Road, Big Spring, Texas 79720, (432) 263-2435, and retroreflective adhesive sheeting in accordance with these Specifications and the manufacturer's installation instructions, and in reasonably close conformity with the lines and grades as shown on the Plans or as approved by the Resident.

606.02 Materials

The following sentence is added:

31" W-Beam Guardrail – Mid-way Splice Flared Terminal components shall be comprised of those shown in the manufacturers installation instructions. 8" blocks shall be used.

Reflective sheeting shall meet the requirements of Subsection 719.01, Reflective Sheeting – minimum ASTM Type XI; 3M™ Diamond Grade™ DG³ Reflective Sheeting Series 4000 or approved equal, color white.

The following Subsections are added:

606.045 Offset Blocks

8" Non-wood offset blocks shall be used.

606.035 Construction Requirements

The Contractor shall submit a set of installation drawings to the Resident for approval. The system shall be installed in accordance with the manufacturer's recommendation and the installation drawings.

A reflective adhesive sheeting shall be applied to the nose of the MFLEAT System after installation.

606.041 Reflective Sheeting

The color for the reflective sheeting shall be silver (white) when installed on the right shoulder and shall be black chevron on yellow background only when installed on the left shoulder.

606.08 Method of Measurement

The second paragraph is amended by the addition of: “31” W-Beam Guardrail – Mid-way Splice Flared Terminal, ” after the words “Terminal section, ”.

606.09 Basis of Payment

The first paragraph is amended by the addition of: “31” W-Beam Guardrail – Mid-way Splice Flared Terminal, ” after the words “Terminal section, ”.

The second paragraph is amended by the addition of: “, 31” W-Beam Guardrail – Mid-way Splice Flared Terminal, ” after the words “NCHRP 350 end treatments ”.

The retroreflective sheeting will not be measured separately for payment, but shall be incidental to the 31” W-Beam Guardrail – Mid-way Splice Tangent Terminal item.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
606.1307 31” W-Beam Guardrail – Mid-way Splice Flared Terminal	Each

SPECIAL PROVISIONSECTION 606GUARDRAIL

(31" W-Beam Guardrail – Mid-way Splice Terminal End – Anchored End)

606.01 Description

The section is amended by the addition of the following:

This work shall consist of furnishing and installing Terminal End – Anchored End – 31" W-Beam Guardrail end treatment in accordance with these Specifications and Plan Sheet details, the AASHTO-AGC-ARBTA Joint Committee Task Force 13 Report: A Guide to Standardized Highway Barrier Hardware, Drawing SEW31 in AASHTO Manual for Assessing Safety Hardware (MASH) approval letter B-256; and in reasonably close conformity with the lines and grades as shown on the Plans or as approved by the Resident.

606.02 Materials

The following sentences are added:

The guardrail elements shall be per the Components' List found on Sheet No. 2 & 3 of 3 of Drawing SEW31 – Trailing-end Anchorage System in the Task Force 13 Report noted above and/or as noted in the Contract Documents. The component RWM14a shall be modified to a length of 9'-4½" measured from the center of the Mid-way Splice to the center of the last guardrail post.

606.042 Terminal End - Anchored End

The following sentences are added:

Installation of the Terminal End – Anchored End - 31" W-Beam Guardrail end treatment shall be in accordance with these plans and specifications, the AASHTO-AGC-ARBTA Joint Committee Task Force 13 Report and the Details on Sheet No. 1 of 3 of Drawing SEW31 – Trailing-End Anchorage System.

606.08 Method of Measurement

The second paragraph is amended by the addition of: “, Terminal End - Anchored End – 31" W-Beam Guardrail, ” after the words “Terminal section, ”.

606.09 Basis of Payment

The first paragraph is amended by the addition of: “, Terminal End - Anchored End – 31" W-Beam Guardrail, ” after the words “Terminal section, ”.

The second paragraph is amended by the addition of: “, Terminal End - Anchored End – 31" W-Beam Guardrail, and ” after the words “NCHRP 350 end treatments ”.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
606.1351 31” W-Beam Guardrail – Mid-way Splice Terminal End – Anchored End	Each

SPECIAL PROVISION

SECTION 606

GUARDRAIL

(Bridge Transition - Type III)
(Bridge Transition - Type III, Modified)

606.01 Description

The following sentences are added:

This work shall consist of furnishing and installing Type III Bridge Transitions and Type III, Modified Bridge Transitions at bridge endposts on bridges over the turnpike as shown in the Contract Documents.

The following Subsection is added:

606.071 Guardrail Attachments at Bridges

Bridge transition - Type III, and Bridge Transition - Type III, Modified shall be used at bridge endpost locations as shown on the plans.

606.08 Method of Measurement

The following sentence is added:

Bridge transition - Type III will be measured by each unit of the type specified, installed and accepted.

Bridge Transition- Type III, Modified will be measured by each unit of the type specified, installed and accepted.

606.09 Basis of Payment

The following paragraphs are added:

Bridge Transition - Type III, and Type III, Modified, will be paid for at the Contract unit price each complete 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 following: furnishing and installing guardrail, modifications to concrete end wall to accept terminal anchor, one terminal connector, precast concrete transition curb, including terminal connector anchorage and all other detailed accessories; furnishing and installing all required posts, rails, offset brackets, back-up plates, nuts, bolts, washers, and all other items necessary to make for a complete installation as shown on the Plans or as approved by the Resident.

Payment will be made under:

Pay Item

Pay Unit

606.1723 Bridge Transition - Type III
606.1724 Bridge Transition - Type III, Modified

Each
Each

SPECIAL PROVISIONSECTION 606GUARDRAIL

(Reflectorized Beam Guardrail Delineator)

606.01 Description

The following paragraphs are added:

Reflectorized beam guardrail delineators shall be installed on existing guardrail to remain in place, guardrail noted to be removed, modified and reset (single and/or double rail) or new guardrail, at the locations noted on Maintenance of Traffic plans or as approved by the Resident. The delineators shall be installed prior to traffic being shifted closer to the identified guardrail run. The color for the reflective sheeting shall be silver (white) when installed on the outside shoulder and yellow when installed on the inside shoulder.

Reflectorized beam guardrail delineators shall be mounted as follows:

1. Delineators on guardrail adjacent to a shifted detour should be spaced every other guardrail post and located at the bolt in the valley of the guardrail beam.
2. On existing steel bridge rail, the delineators shall be mechanically attached towards the top, every 10 feet, and bottom, every 20 feet. Delineators shall also be mechanically attached in a similar pattern to concrete endposts that are 10 feet or longer.
3. If more than 25% of delineators in any 200 feet of guardrail, bridge rail, or endposts fall off for any reason, the Contractor will be responsible for reinstalling all delineators in that run at their own cost.
4. In no instance shall delineators be installed on guardrail which deviates substantially from the alignment (horizontal or vertical) of the roadway or which is located more than eight feet from the edge of pavement.
5. On Tangents, mount delineators every 62.5-feet or every 10th post.
6. On Curves, mount delineators every 31.25-feet or every 5th post.

Exceptions and/or modifications will only be made with the approval of the Resident.

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

606.02 Materials

The fourth paragraph is deleted and replaced with the following:

The reflectorized beam guardrail delineators shall be fabricated from galvanized steel.

Reflective sheeting shall meet the requirements of Subsection 719.01, Reflective Sheeting – minimum ASTM Type XI; 3M™ Diamond Grade™ DG³ Reflective Sheeting Series 4000 or approved equal.

606.08 Method of Measurement

The following paragraph is added:

Reflectorized Beam Guardrail Delineators will be measured by each unit of the kind specified and installed. Maintenance and replacement of delineators will not be measured separately for payment unless otherwise approved by the Resident.

606.09 Basis of Payment

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

Reflectorized Beam Guardrail Delineators will be paid for at the Contract unit price each when installed on existing guardrail, complete in place, which price shall be full payment for furnishing and installing all components and for all incidentals necessary to complete the installation. Reflectorized Beam Guardrail Delineators will not be paid for on new guardrail.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
606.352 Reflectorized Beam Guardrail Delineator	Each

SPECIAL PROVISIONSECTION 606GUARDRAIL

(Delineator Post – Remove and Reset)

(Delineator Post - Remove and Stack)

606.01 Description

The following paragraphs are added:

This work shall also consist of furnishing and installing new delineator posts and/or removing and resetting and/or removing and stacking existing delineator posts within the Contract limits at the Crosby Maintenance Facility at Mile Marker 45.8 Southbound. The existing reflectorized delineator panels shall be removed and replaced with new reflectorized delineator panels as required by the Resident.

Existing and new delineator posts shall be located as follows, with the indicated panel:

Outside Shoulder:

- One at guardrail trailing ends (green delineator).
- Two at guardrail approach ends (one red delineator on first post and one red delineator on angle points.)

Median:

- One at guardrail trailing ends (green delineator, facing traffic).
- Two at guardrail approach ends (one red delineator on first post of CAT units, green on guard rail side, red on median opening side; and one red (both sides) delineator at angle point.)
- One at all other median guardrail angle points (red on both sides)

Other Locations:

- One at culvert outlets (green delineator).
- Twenty per mile evenly spaced at the edge of outside shoulder (white delineator).
- One at electrical junction boxes not associated with another item (red delineator).
- One at communication only junction boxes not associated with another item (orange delineator).
- Along water service lines spaced at 200 ft (blue delineator)
- Along northbound toll plaza septic line spaced at 200 ft (green delineator)

Delineator posts that do not exist in the locations described above, shall be supplied and installed by the Contractor. The installation of the delineator post shall include the demountable reflectorized delineator panel.

White edge delineators shall not be installed on any portion of the widened shoulder for Guardrail 350 Flared Terminal installations, and shall not be installed behind the Guardrail 350 Flared Terminal rail segments.

606.02 Materials

The following paragraphs are added:

Non-guardrail Delineator Posts shall conform to Subsection 606.02 paragraph 3.

The seventh through ninth sentences of the fourth paragraph are deleted and replaced with the following:

Reflectorized flexible guardrail markers shall be a minimum of 2-inches in diameter, a maximum of 36" in length, ovalized at the top of the post to allow application of 3 inch by 9 inch high intensity reflective sheeting, and shall be capable of recovering from repeated impacts. The flexible guardrail delineator markers shall be grey and capped at the top with a flexible rubber cap; Safe-Hit Flexible Guardrail Delineator or approved equal. Reflective material shall meet the requirements of ASTM Type IX Diamond Grade VIP (Visual Impact Performance).

The demountable reflectorized delineator panels shall meet the material requirements of Subsection 719.06. The delineator panel shall be rectangles measuring 9" x 3".

606.03 Posts

The following paragraphs are added:

The top of delineator posts shall be installed 4' - 6" (54") above edge of pavement elevation. Delineators shall be installed four feet from edge of pavement except those delineating end treatments, culverts and electrical items.

Mile marker posts shall be mounted on breakaway supports. The bottom of the sign shall be 5' - 0" (60") above the pavement at the solid white line and shall be offset five feet from the edge of pavement.

A mock-up of the guardrail delineator posts shall be submitted to the Resident for approval prior to installation.

Any materials damaged by the Contractor's operations shall be replaced at no additional cost to the Authority.

Top of the delineator panel shall be flush with the top of post.

606.08 Method of Measurement

The following paragraphs are added:

Delineator Posts shall be measured by each unit satisfactorily installed. Delineator Post-Removed and Reset will be measured by each unit satisfactorily removed and reset. Delineator Posts Removed and Stacked will be measured by each unit satisfactorily removed and stacked.

Mile Marker post shall be measured for payment as Delineator Post. The breakaway supports shall be incidental to the Underdrain Delineator Post pay item.

606.09 Basis of Payment

The following sentences are added:

The accepted quantity of Delineator Posts will be paid for under the Underdrain Delineator Post item, at the Contract unit price per each which price shall be full compensation for the post and specified delineator or mile marker panel, complete in place.

The accepted quantity of Delineator Post - Removed and Reset will be paid for at the Contract unit price each, which price shall be full compensation for removing and resetting the delineator panel or mile marker panel and post and all incidentals necessary to complete the work.

The accepted quantity of Delineator Posts Removed and Stacked will be paid for at the Contract unit price each, which price shall be full compensation for removing and stacking delineator panel or mile marker panel and posts and all incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
606.3561 Delineator Post - Remove and Reset	Each
606.3562 Delineator Post - Remove and Stack	Each

SPECIAL PROVISION

SECTION 607

FENCES

(Gate – Supplied by Authority)

607.01 Description

The following paragraphs are added:

This work shall also consist of installing a LiftMaster BG790 gate, or similar to be supplied by the Authority, in reasonably close conformity as shown on the Plans or as approved by the Resident and the manufacturer's installation instructions.

The installation shall include the assembly and erection of all parts and materials complete at the locations as shown on the Plans or as approved by the Resident, including foundations and bollards.

607.03 General

The following sentences are added:

Gate shall be a LiftMaster BG790 or similar, as provided by the Authority. The Contractor shall assemble and install in accordance with the manufacturers' installation instructions.

Bollards shall be Type A Steel Site Bollards with cast in place concrete base and HDPE bollard sleeves in accordance with these Specifications and as shown on the Plans, or as approved by the Resident. Bollards shall be 6" diameter Schedule 40 steel tube.

Bollard Sleeves shall be ¼" thick high density polythene with an OSHA Safety Yellow color.

Concrete for bollard base and infill shall be Class "AAA" cement concrete.

607.03 General

The following sentences are added:

Gate foundations shall be a minimum of 60" deep.

Bollards shall be installed on both sides of the gate operator enclosure, located so that the traffic face of the bollards are at, or slightly closer, to traffic than the traffic face of the gate operator enclosure. An additional bollard shall be installed 24 inches from the cantilevered end of the gate.

607.06 Method of Measurement

Gate - Supplied by Authority will be measured by each unit of the kind specified and installed.

607.07 Basis of Payment

Gate – Supplied by Authority will be paid for at the Contract unit price Each, complete in place, which payment shall be compensation for furnishing and installing all necessary hardware, connecting power from the gate to the nearest junction box, excavation, concrete, and bollards. All junction boxes, conduit, and wiring from the power source to the nearest junction box adjacent to the gate shall be paid for under their respective items.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
607.494	Gate – Supplied by Authority	Each

SPECIAL PROVISION

SECTION 610

STONE FILL, RIPRAP, STONE BLANKET AND STONE DITCH PROTECTION

(Temporary Stone Check Dams)

610.01 Description

Paragraph (g) is added as follows:

(g) Stone Check Dams – Machine placed stone, including the placement, removal and storage of the stone used for temporary stone check dams.

610.032.e. Stone Check Dams

The following paragraph is added:

Stone check dams shall be constructed in accordance with the details as shown on the Plans, detailed in the MaineDOT's latest Best Management Practices, or as approved by the Resident. The stone shall be placed in one operation without special handling or handwork except to create a low point along the top gradient above the ditch flow lines.

The following Subsection is added:

610.033 Removing Stone

The stone for temporary stone check dams shall be removed after vegetation has been established in the ditches as approved by the Resident.

Any damage to the slopes and ditches caused by the removal of the stone check dams shall be repaired by the Contractor at his own expense.

The area directly under the temporary stone check dams shall be loamed, seeded and mulched immediately after the removal of the stone check dams. The loam, seed and mulch will be measured for payment under the appropriate pay items.

Stone used for temporary stone check dams shall be removed and stored and shall become the property of the Contractor at the completion of the Project.

The following Subsection is added:

610.034 Maintenance

Stone check dams shall be maintained by the Contractor. Sediment deposits behind check dams shall be removed when the depth of sediment reaches 50 percent of the check dam height.

610.05 Method of Measurement

The following paragraphs are added:

Stone for Temporary Stone Check Dams will be measured by the cubic yard complete in place. The removal and storage of the stone will not be measured separately for payment, but shall be incidental to the Temporary Stone Check Dam item. This shall include the transporting and unloading of the stone. If this stone is reused on the Project, it will be measured separately for payment under the appropriate pay item.

The removal and disposal of sediment from behind the Temporary Stone Check Dams will not be measured separately for payment, but shall be incidental to the Temporary Stone Check Dam pay item.

610.06 Basis of Payment

The following sentences are added:

The accepted quantities of stone for Temporary Stone Check Dams will be paid for at the Contract unit price per cubic yard.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
610.181 Temporary Stone Check Dam	Cubic Yard

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 615

LOAM

(Loam - Supplied by Authority)

615.01 Description

The following paragraphs are added:

This work shall consist of loading, transporting, and installing Loam – Supplied by Authority, as well as any work necessary to access the loam stockpile. The Authority is supplying an estimated 2700 CY of Loam located in the infield of Ramp B for use on this project. The contractor shall use the entire stockpile of Loam – Supplied by the Authority prior to importing loam to the project. The stockpile area shall be graded to match surrounding area once utilized and permanently stabilized with seed and mulch.

615.05 Method of Measurement

The following paragraphs are added:

Loam – Supplied by Authority will be measured by the cubic yard complete in place after finishing to the required depths as shown on the plans or as directed. Lateral measurements will be parallel with the slope of the ground.

615.06 Basis of Payment

The following paragraphs are added:

The accepted quantities of Loam – Supplied by Authority will be paid for at the contract unit price per cubic yard complete in place. Payment shall also include any work necessary to access the loam stockpile and restoration of the stockpile and access areas. Seeding and mulch of the stockpile and access areas shall be made under their respective pay items.

Payment will be made under:

Pay Item		Pay Unit
615.073	Loam – Supplied by Authority	Cubic Yard

SPECIAL PROVISIONSSECTION 618SEEDING(Special Seeding)618.02 Materials

The following paragraph is added:

Special Seed (wetland seed mix-moist) shall be “New England Erosion Control/Restoration Mix for the Detention basins and Moist Sites” as supplied by New England Wetland Plants, Inc., Amherst, MA or an approved equal. All fertilizers, soil conditioners, limestone and other materials required to germinate, initiate and sustain seed growth shall be materials recommended by New England Wetland Plants, Inc. or other approved seed manufacturer as determined by the Resident.

618.03 Rate of Application

Subsection (a) is deleted and replaced with the following:

- (a) Except for Special Seed mix, agricultural ground limestone shall be applied at the rate of 33 pounds per unit for all seeding methods. Liquid lime shall be applied at the rate of 1/2 pint per unit for hydraulic method. A 1/2 pint of liquid lime shall be mixed with five pints of water.

Subsection (g) is added:

- g. The Special Seeding shall be applied at a rate of 1 Unit per 1,000 SF. Fertilizers, limestone and other soil conditioners shall be applied at the manufacturers recommended rate. The Special Seed mix shall be applied directly on top of the horizontal surface of the Soil Filter (i.e., the blended mix) and lightly raked into the mix. On the sloping surfaces surrounding the soil filter up to a height of 1.5 feet above the top of the soil filter, wetland seed shall be placed on a four-inch layer of loam and lightly raked into that material. All seed shall be covered by a temporary erosion Control blanket immediately after seeding.

618.10 Maintenance and Acceptance

The second paragraph is deleted and replaced with the following:

The Contractor shall water the special seed as necessary and shall insure the continued growth of the special seed. The Authority will accept areas sown with Special Seed upon attainment of a reasonably thick stand of grass with at least 90 percent coverage, free from sizable thin or bare spots. Areas not meeting this requirement shall be reseeded and shall comply with Subsections 618.03 through 618.09.

618.12 Basis of Payment

The first paragraph is deleted and replaced with the following:

The Authority will pay for the accepted quantity of Special Seed at the Contract price per unit, which price shall be full compensation for furnishing and spreading seed, limestone fertilizer, and inoculants. The price shall also include any reseeding, watering, and maintenance necessary to meet the requirements of Section 618.10, Maintenance and Acceptance.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
618.143 Special Seeding	Unit

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

619.1201 Mulch – Plan Quantity
619.1202 Temporary Mulch

Pay Unit

Unit
Lump Sum

SPECIAL PROVISION

SPECIAL PROVISION

SECTION 620

GEOTEXTILES

(HDPE Geomembrane)

620.01 Description

The following sentence is added:

This work shall include installation of HDPE geomembrane as shown on the Plans or as approved by the Resident.

620.02 Materials

The following paragraph is added:

HDPE geomembrane shall be Poly-Flex 40 mil High Density Polyethylene (HDPE) as manufactured by Poly-Flex, Inc., 2000 W. Marshall Drive, Grand Prairie, TX 75051, (972) 647-4374, Fax (972) 988-8331, or an approved equal.

620.03 Placement

The following paragraphs are added:

HDPE geomembrane shall be placed within the limits shown on the Plans. A surface slope shall be provided in the underlying leveling sand away from structures and toward the sides of the embankments.

HDPE geomembrane deployment shall proceed only when ambient temperatures are between 32°F to 104°F. Geomembrane shall not be placed during precipitation or moisture of any type (e.g., fog, rain, dew), or in the presence of excessive winds, as determined by the Resident or Geotechnical Consultant. Observation of temperature, humidity, precipitation and wind should be noted to ensure that the weather conditions are acceptable prior to HDPE geomembrane placement.

620.05 Seams

The following paragraphs are added:

Approved seaming processes are hot shoe fusion and extrusion welding. On side slopes, seams shall be oriented in the general direction of maximum slope, (i.e., oriented down, not across the slope). In corners and odd-shaped geometric locations, the number of field seams shall be minimized. Seams shall be aligned with the least possible number of wrinkles and “fishmouths”. If a fishmouth or wrinkle is found, it shall be relieved and cap-stripped.

Geomembrane panels must have a finished minimum overlap of four inches for hot shoe fusion welding and three inches for extrusion welding.

Cleaning solvents may not be used unless the product is approved by the liner manufacturer.

Field test seams may be conducted on the liner in accordance with the manufacturer’s recommendations to verify that seaming conditions are satisfactory.

620.09 Method of Measurement

The words, “and HDPE Geomembrane” shall be added after the word “geotextiles” in the first and second sentence of the first paragraph.

620.10 Basis of Payment

The words, “and HDPE Geomembrane” shall be added after the word “geotextiles” in the first and second sentence of the first paragraph.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
620.70 HDPE Geomembrane	Square Yard

SPECIAL PROVISION

SECTION 621

LANDSCAPING

(Tree and Shrub Planting)

621.0023 Setting Plants

The following sentences are added:

The Resident will reject any plants not installed correctly and the Contractor shall re-install plant stock as determined by the Resident at no additional cost to the Authority.

List of Plantings at Toll Administration Buildings (Southbound and Northbound).

ITEM NO.	DESCRIPTIONS	UNIT	SB QTY	NB QTY	TOTAL QUANTITY
621.408	Tauntoni Yew	EA	1	1	2
621.408	Juniperus Chinensis "sergenti" Blue Sargent Juniper	EA	2	2	4
621.513	Hybrid Rhododendron 'PJM' (2.5'-3')	EA	3	3	6
621.553	Cornus Sericca "Kelseyi" Kelsey Dogwood	EA	2	2	4

621.0036 Maintenance Period

The third paragraph is deleted and replaced with the following:

The Maintenance Period shall commence after Physical Work Complete and shall extend for one year after that date unless otherwise directed by the Authority. Necessary replacements shall be made so that at the end of the Maintenance Period all plants shall be in a healthy, vigorous growing condition and free from sizable die-back.

621.0038 Basis of Payment

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
621.408 Evergreens (2.5'-3') Group B	Each
621.513 Hybrid Rhododendron (2.5'-3')	Each
621.553 Deciduous Shrubs (3'-4') Group B	Each

SPECIAL PROVISION
SECTION 625
WATER SERVICE SUPPLY LINES

625.01 Description

This section shall replace SECTION 625 of the State of Maine Department of Transportation Standard Specifications Revision of November 2014 for the purposes of this Contract.

This work shall consist of installing water service supply lines in reasonably close conformity with the lines and grades shown on the plans or established. The installation shall include the assembly of all components and materials shown on the plans or as directed.

The work in this Section shall also include the following:

- Furnishing and installation of pipe, tubing, valves, service boxes, fittings, water meter pit, insulation and any required accessories for a complete water service supply.
- Connections to existing water systems.
- Resetting service boxes and covers to finish grade.
- Disinfection and testing.

625.02 General

This work shall be done with as little interruption of water service as possible. Ample notification shall be given to the users of the water before any disruption of water service.

The municipal water department shall be notified prior to starting construction of any portion of the water service supply line.

The closing of valves necessary for making connections with existing municipal system will be done in coordination with the local Water Department employees, assisted by the Contractor. Sufficient notice shall be given the Water Department of planned connection. No allowance will be made for any delay in closing of valves. A 48-hour notice shall be given to residents or businesses affected by the shut-down and shall be done by the Contractor in coordination with the Water Department. The Water Department may require the work to be done at night during the low-water use time period.

625.03 Materials

Water Service Supply Lines

Water service supply lines less than 3 inches shall be high density polyethylene plastic tubing, copper tubing size (CTS) and conform to AWWA standard C901-02 (PE 3608 Pressure Class 200), ASTM D3350, ASTM D2737 and be clearly marked. The product shall be rated for a minimum 200 working PSI and the standard dimension ratio (SDR) shall not exceed 9 for tubing size.

Tubing shall be approved for potable water service by the National Sanitation Foundation (NSF) and bear the NSF seal. Stainless steel inserts shall be used at all connections.

Curb Stops

Curb stops shall be ball valve type construction with compression type fittings on both ends. Curb stops shall open left (counter-clockwise) and shall conform to AWWA/ANSI C800, manufactured by Ford, Hayes, Mueller or an approved equivalent.

Curb stops shall be sized to receive the service tubing without the use of enlargement/reduction fittings.

Fittings

All fittings shall be compression type, designed for use with high density polyethylene plastic tubing (CTS).

Service Boxes, Covers and Rods

Service boxes shall be Erie style, cast iron improved extension type with arch pattern base. Covers shall be held in place with bronze bolts and the word WATER shall be cast into the top surface of the cover. Service box shafts shall have a minimum inside diameter of 2-1/2 inches. Service boxes shall be adjustable in length from five to six feet and have 1/2-inch diameter stainless steel rod 36-inches in length with brass cotter pins. Service boxes shall be as manufactured by Mueller Co., or an approved equivalent.

Bedding

Bedding material for water service supply lines shall be screened sand consisting of clean, inert, hard, durable grains of quartz or other hard, durable rock, free from loam, clay, surface coatings, frozen or deleterious materials and in conformance with the following gradation:

<u>Sieve (ASTM D422)</u>	<u>Percent Passing by Weight</u>
No. 4	100
No. 8	80 - 95
No. 16	55 - 85
No. 50	0 - 35
No. 200	0 - 5

Bedding material for water service supply lines shall be compacted to a minimum of 92% of the laboratory derived Maximum Density Values at optimum moisture content as determined by ASTM D1557, Method C.

Insulation

Water service line insulation shall be 2-inch thick polystyrene plastic insulation in conformance with Section 653 of the Standard Specifications, installed at the locations shown on

the plans or as directed.

Water Meter Pit

Water meter pits (materials and installation) shall conform to Section 604.

Water Meter Pit Frame and Cover

Water Meter Pit Frame and Covers shall conform to Section 604 and as shown on the Details except that the word "Water" shall be cast into the top of the cover.

625.04 Installation

Service Pipe

All work associated with the Northbound Administration Building water service connection to the water main along Payne Road shall be accessed from Route 703.

Care shall be exercised in placing and laying of services to prevent kinks or sharp bends and to prevent contact with sharp stones or ledge which would damage to the pipe. At least 6 inches of sand shall be placed adjacent to, under, and above the pipe, and no stone larger than 2 inches shall be placed over the pipe until the depth of backfill above the pipe is in excess of 1 foot.

Curb Stop and Curb Boxes

Curb stop and curb boxes shall be of a size equal to the size of the service pipe and shall be installed in the locations shown on the Drawings or as ordered by the Engineer. The boxes shall be set in a vertical position and flush with the proposed finish grade.

Separation from Structures

Whenever possible, water pipes shall maintain a minimum distance of three (3) feet from underground adjacent unheated structures, such as manholes, catch basins, retaining walls, bridge abutments, parking garages, etc.

When spacing described above is not possible, Contractor shall provide insulation for the water pipe for a minimum of three (3) feet beyond the limits of the adjacent structure.

625.05 Testing

Hydrostatic pressure and leakage test shall be conducted in accordance with AWWA Standard C600 Standards. Domestic water service lines without attached fire service supply shall meet the latest edition of AWWA C600 series leakage requirements for the type of pipe being installed. Testing shall be conducted by a certified independent water testing company.

625.06 Disinfection

Before being placed in service, all new water pipe shall be chlorinated in accordance with ANSI/AWWA C651 Standard for Disinfecting Water Mains.

The location of the chlorination and sampling points will be determined by the Engineer in the field. Taps for chlorination and sampling shall be installed by the Contractor. The Contractor shall uncover and backfill the taps as required.

The pipe section being disinfected shall be flushed to remove discolored water and sediment from the pipe. A 25 mg/l chlorine solution in approved dosages shall be inserted through a tap at one end while water is being withdrawn at the other end of the pipe section. The chlorine concentration in the water in the pipe shall be maintained at a minimum 25 mg/l available chlorine during filling. To assure that this concentration is maintained, the chlorine residual shall be measured at regular intervals in accordance with procedures described in Standard Methods and AWWA M12, Simplified Procedure for Water Examination, Section K.

During the application of the chlorine, valves shall be manipulated to prevent the treatment dosage from flowing back into the pipe supplying the water. Chlorine application shall not cease until the entire pipe section is filled with chlorine solution. The chlorinated water shall be retained in the pipe for at least a twenty-four hour period. The treated water shall contain a chlorine residual throughout the length of the pipe section as indicated in AWWA C651.

Following the chlorination period, all treated water shall be flushed from the pipe section and replaced with water from the distribution system. Prior to disposal of treated water, the Contractor shall check with local authorities to determine if the discharge will cause damage to the receiving body or sewer and, if required, the Contractor shall neutralize the chlorinated water in accordance with Appendix B, AWWA C650. Bacteriological sampling and analysis of the replacement water shall then be made by the Contractor in full accordance with AWWA Specification C651. A minimum of three samples shall be taken by the Contractor at locations directed by the Engineer along the length of water pipe being chlorinated and sent to a state-approved private laboratory for analyses. The Contractor shall re-chlorinate if the samples show presence of coliform, and the pipe section shall not be placed in service until all the repeat samples show no presence of coliform.

Furnish two (2) copies of a Certificate of Disinfection Report to the Engineer.

The Contractor shall pay all costs for all testing, flushing, chlorinating; laboratory analyses, sampling, water supply, and municipal charges.

625.07 Method of Measurement

Water service supply lines will be measured by the linear foot installed, to the nearest foot.

Water Meter Pits will be measured by the each for the number of units furnished and installed.

625.08 Basis of Payment

The accepted quantities of water service supply lines will be paid for at the contract unit price, complete in place.

Excavation, backfill, bedding, compaction, sheeting and shoring, insulation, dewatering,

restoration of existing service connections, curb stops, curb boxes, fittings, stainless steel inserts, insulation, pressure testing, disinfection, flushing, maintaining water service, connections to existing water mains and services, restoration of property, loam and seed, as-built drawings and any other work necessary or required for a complete operational water supply service shall be considered included in the work of the contract items.

The accepted quantity of water meter pits will be paid for at the contract unit price. Meter setters, valves, fittings, pipe supports, seals, frame and covers, joint sealant and ballast shall be considered included in the work of the contract items.

Payment will be made under the following:

<u>Pay Item</u>		<u>Pay Unit</u>
625.106	Water Service Supply Line (< 3 in)	Linear Foot
625.107	Water Meter Pit	Each

SPECIAL PROVISIONSECTION 626FOUNDATIONS, CONDUIT, AND JUNCTION BOXES
FOR HIGHWAY SIGNING, LIGHTING AND SIGNALS

(Quazite Junction Box)
(Non-Metallic Conduit)

626.02 General

The following paragraphs are added:

Junction boxes for the electrical and communication conduit associated with the toll equipment and intelligent transportations systems shall be polymer concrete as manufactured by QUAZITE® a division of Hubbell Power Systems or an approved equal. The boxes shall be 36” x 24” and 21” deep or 48” x 36” and 48” deep. The words ELECTRIC, TRAFFIC or COMMUNICATION shall be stamped on the cover as noted in the Plans or directed by the Resident. The boxes shall have an 22,000 lb. load rating.

Junction boxes for the electrical associated with highway lighting shall be polymer concrete as manufactured by QUAZITE® a division of Hubbell Power Systems or an approved equal. The boxes shall be 18” x 11” and 18” deep. New boxes shall have the word LIGHTING stamped on the cover as noted in the Plans or directed by the Resident. The boxes shall have an 15,000 lb. load rating. All existing Junction Boxes in useable condition shall be removed and stacked as directed by the Resident Engineer.

626.04 Method of Measurement

The following sentence is added:

Quazite junction box shall be measured by each unit in place and accepted existing or new.

626.05 Basis of Payment

The following sentence shall be added to the third paragraph:

Payment of non-metallic conduit shall also include furnishing, installation, routing, termination, splices and connection of the wire per the plans and specifications. All wiring items associated with the non-metallic conduit item for highway lighting and traffic signal shall be incidental.

The words, “polymer concrete” shall be added after the words, “precast concrete” in the second sentence of the second paragraph.

Payment will be made under:

Pay Item

Pay Unit

626.121	Quazite Junction Box (36x24)
626.122	Quazite Junction Box (18x11)
626.123	Quazite Junction Box (48x36)

Each
Each
Each

SPECIAL PROVISION

SECTION 626

FOUNDATIONS, CONDUIT, AND JUNCTION BOXES
FOR HIGHWAY SIGNING, LIGHTING AND SIGNALS

(Adjust Existing Junction Box to Grade)

626.02 General

The following paragraph is added:

The work will include adjusting all junction box located within the fill areas.

If the adjustment to grade is greater than twelve inches, an additional similar sized junction box will be used as an extension of the existing junction box. Existing conduit shall be extended as necessary to accommodate the adjustment to grade of the existing junction boxes, and split conduit may be required.

626.04 Method of Measurement

The following sentence is added:

Adjust Existing Junction Box to Grade shall be measured by each unit in place and accepted.

626.05 Basis of Payment

Payment for Adjust Existing Junction Box to Grade will be made by each unit in place and accepted and shall include any conduit extensions. Payment for additional junction boxes will be made per item 626.121 or 626.122, as determined by the resident engineer.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
626.131 Adjust Existing Junction Box to Grade	Each

SPECIAL PROVISIONSECTION 626FOUNDATIONS, CONDUIT, AND JUNCTION BOXES
FOR HIGHWAY SIGNING, LIGHTING AND SIGNALS

(Horizontal Directional Drilled Conduit)

626.01 Description

Horizontal Directional Drilling (HDD) method shall be used for installation of non-metallic conduit for highway lighting, toll systems and traffic signals when specified on the project plans or approved by the Resident. It shall include furnishing of all materials, site preparation, equipment setup, pilot bore, conduit pulling through the drilled bore, installation of pull wire and fittings, site restoration, and incidental work necessary to satisfactorily install conduit at the required locations and depths.

626.02 Materials

Conduit for Horizontal Directional Drilling shall meet requirements of Section 715.03 for non-metallic conduit. Non-metallic conduit to be installed under roadways shall be Schedule 80 or greater. Non-metallic conduit to be installed in other locations shall be Schedule 80 or greater. Conduit sections shall be joined by methods suitable for installation by HDD. Joined conduit sections must have adequate strength and flexibility to withstand the installation stresses and overburden pressures without compromising the structural stability of the conduit wall. Conduit must be able to meet the bend radius required for the proposed installation. Conduit sections shall be joined in a manner resulting in the inner surfaces being flush and even. PVC End Bells shall be utilized on all conduit ends.

626.03 Construction

Prior to commencing HDD work, the Contractor shall submit a drilling work plan to the Resident for approval addressing the following, at minimum:

- Profile of the proposed bore plotted at a scale appropriate for the crossing and acceptable to the Resident;
- HDD site layout including entry and exit points;
- Drilling fluid management plan, including drilling fluid types and specifications, cleaning and recycling equipment to be used, estimated flow rates, procedures for minimizing drilling fluid escape, and the method and location for final disposal of waste drilling fluids. Material safety data sheets shall be provided for all drilling fluid additives that will be used;
- Conduit storage and handling details;
- Summary of assembly and installation procedures to be used;
- Material safety data sheets of any other potentially hazardous substances to be used;
- Response plans for possible problems that may be encountered;
- Documentation and certification of the ability of the proposed conduit to withstand

installation stresses and pressures.

The HDD drill rig and auxiliary pieces of equipment shall be appropriate for the diameter and length of conduit being installed. The power system shall provide sufficient pressure to power the drilling operations with a hydraulic system free from leakage. The directional drilling machine shall be anchored as necessary to stabilize it against excessive dislocation.

In order to minimize friction and prevent collapse of the bore hole, a soil stabilizing agent (drilling fluid) may be introduced into the annular bore space from the front end of the drill head to create a slurry. The drilling fluids shall be selected or designed for the site's specific soil and ground water conditions. The drilling fluid mixing system shall be self-contained and closed with sufficient size to mix and deliver drilling fluid to the drill head. The mixing system shall continually agitate the drilling fluid during drilling operations. The fluids delivery system shall be capable of pumping drilling fluid with sufficient volume and pressure from the mixing tank through the drill rods to the drill head.

Alignment of the bore shall be accomplished by proper orientation of the drill head as it is pushed through the ground by the drill rig. Orientation and tracking of the drill head shall be determined by using an acceptable tracking system from a transmitter located within the drill head. The HDD guidance system shall be capable of locating and tracking the drill head continuously and accurately both horizontally and vertically during the pilot bore. All equipment shall be properly calibrated before commencing the directional drilling operation. The alignment of the conduit shall remain at least 10 feet below the mainline traffic lanes and ramps at all times.

Borehole diameter relative to the conduit diameter shall be minimized to limit potential damage from soil displacement, settlement, and heaving. When necessary, the pilot borehole may be enlarged by back reaming to accommodate conduit larger than the pilot borehole size. Back reaming may be accomplished ahead of or at the same time as pulling the conduit through the pilot borehole. The back-reamer shall be sized to create a large enough borehole to allow cuttings to transfer from the face of excavation to the surface with minimum soil displacement.

Escaping slurry or drilling fluids shall be confined at the ground surface during pull back or drilling. All drilling fluids shall be disposed of or recycled in a manner acceptable to the Maine Department of Environmental Protection. Upon completion of the HDD operation, the work site shall be cleaned of all excess slurry or spoils. Any damage caused by heaving, settlement, separation of pavement, escaping drilling fluid, or other damage from the directional drilling operation shall be repaired by the Contractor to the satisfaction of the Resident.

At the completion of the HDD conduit installation, the Contractor shall provide to the Resident marked up plans noting location, depth, and material type of all conduit installed by the Horizontal Directional Drilling method.

626.04 Method of Measurement

Horizontal Directional Drilled Conduit will be measured by the number of linear feet of conduit in place and accepted by the Resident.

626.05 Basis of Payment

Payment will be made for the total number of linear feet of Horizontal Directional Drilled Conduit and accepted at the contract price per linear foot. Payment shall include the cost of furnishing and installing the conduit; site preparation and restoration of drilling entry and exit points; removal of excavated material and drilling spoils; removal and disposal of drilling fluids

and excess slurry; pull wire, fittings, grounding and bonding; test cleaning of conduit interior; and all other materials, labor, equipment, and incidentals necessary to complete the work. All wiring, as indicated on the plans, within the Horizontal Directional Drilled Conduit for highway lighting and traffic signal shall be incidental to this item. All wiring, as indicated on the plans, within the Horizontal Directional Drilled Conduit for toll power and communication shall be paid for at the unit price for the specific 655 wire/cable item.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
626.223	Horizontal Directional Drilled Conduit	Linear Foot

SPECIAL PROVISION

SECTION 626

FOUNDATIONS, CONDUIT, AND JUNCTION BOXES FOR
HIGHWAY SIGNING, LIGHTING, AND SIGNAL

(Overhead Guide Sign Foundation STA 1062+50)

626.01 Description

The following paragraph is added:

Contractor shall construct a pile supported foundation at the STA 1062+50 Overhead Sign location, as shown on the plans.

626.04 Method of Measurement

The following paragraph is added:

Overhead Sign Foundation at Station 1062+50, complete in place, as called for on the plans, will be measured for payment by the lump sum in place and accepted.

626.05 Basis of Payment

Payment shall include all labor, material, excavation, equipment, and incidentals required to complete the foundation installation in accordance with the plans and these specifications.

The foundation piles, pile tips, pile splices, and mobilization shall not be within the Overhead Guide Sign Foundation STA 1062+50 lump sum pay limit but will be paid for and meet the specifications of pay items 501.50, 501.501, 501.90, 501.91, and 501.92.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
626.701	Overhead Guide Sign Foundation STA 1062+50	Lump Sum

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 inch 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°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:

<u>Pay Item</u>		<u>Pay Unit</u>
627.73	Temporary 6 Inch Pavement Marking Tape	Linear Foot
627.731	Temporary 6 Inch Black Pavement Marking Tape	Linear Foot

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.

The following sentence is added:

This work shall consist of furnishing and placing 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 waterbase 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.

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.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
627.712 White or Yellow Pavement Marking Line	Linear Foot

SPECIAL PROVISION

SECTION 627

PAVEMENT MARKINGS

(Temporary Raised Pavement Markers)

627.01 Description

The following sentence is added:

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

627.02 Materials

The second paragraph is deleted and replaced with the following:

The temporary raised pavement markers shall be white or yellow one way markers (Type Tom W-1, Y-1, Grade WZ) as distributed by Davidson Plastics Co. (DAPCO), Kent, WA, or an approved equal. Colors shall conform to 2009 MUTCD requirements.

627.04 General

The following sentences are added:

Temporary raised pavement markers shall be used to delineate travel lanes (BWLL) after placement of the surface course (HMA 12.5 mm).

Temporary raised pavement marker that lose 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.

The spacing and number of temporary pavement markers installed as edge lines shall be the same as shown for the BWLL on the Plans for Temporary Pavement Marking.

627.09 Method of Measurement

The following sentence is added:

Temporary Raised Pavement Markers will be measured by each unit, complete in place, maintained and accepted.

627.10 Basis of Payment

The following paragraphs are added:

The accepted quantity of Temporary Raised Pavement Markers white and/or yellow will be paid for at the Contract price each. This price shall include all labor and materials to furnish, install, maintain, and remove the markers.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
627.812	Temporary Raised Pavement Markers	Each

SPECIAL PROVISION

SECTION 627

PAVEMENT MARKINGS

(Pavement Marking Tape)

(Pavement Marking Tape – Dotted White Lane Line, 6-inch Width)

(Pavement Marking Tape – Dotted White Lane Line, 12-inch Width)

627.01 Description

The following sentence is added:

This work shall consist of furnishing and placing reflective pavement marking tape in conformity with the Plans, as specified herein and as directed by the Resident.

The pavement marking tape shall be installed at all locations.

627.02 Materials

The following sentence is added:

For the Broken White Lane Line (BWLL), Pavement Marking Tape shall be 3M Stamark™ High Performance Tape Series 380AW – High Performance pavement marking tape, color- white, six (6) inch width, as manufactured by 3M of St. Paul, Minnesota.

For the Dotted White Lane Line (DWLL), Pavement Marking Tape shall be 3M Stamark™ High Performance Tape Series 380I ES – High Performance pavement marking tape, color- white, six (6) inch wide and twelve (12) inch wide, as manufactured by 3M of St. Paul, Minnesota.

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627.04 General

The following paragraphs are added:

The tape shall be used as a supplemental broken white lane line. The tape shall be installed between the painted Broken White Lane Line (BWLL) spaced eighty (80) foot center to center as shown on the Plans. The length of the tape shall be three (3) feet.

The tape shall also be used to mark a Dotted White Lane Line (DWLL) and shall be installed on parallel deceleration and acceleration lanes at locations as noted in the Plans. On deceleration lanes, the tape shall be installed from the beginning of the full width deceleration lane and shall extend to the theoretical gore markings. On acceleration lanes, the DWLL shall extend from the theoretical gore markings to a point one-half of the total length of the acceleration lane

(including the lane taper length). Layout data is noted on the Plans. Dotted White Lane Line tape shall be three (3) foot in length and shall be spaced nine (9) feet apart. Spacing from the Solid White Lane Line (SWLL) or the Theoretical Gore Markings shall be nine (9) feet.

627.05 Preparation of Surface

The following paragraph is added:

The Contractor shall mill a groove in the pavement for each tape length to be placed (“in-and-out” pattern). Continuous grooving for installation of the tape shall not be allowed. The groove length shall be the required tape length plus 12 inches on both ends. Tape length spacing shall be as shown on the plans. The groove width for inlaid tape pavement marking shall be the pavement marking width plus 1 inch, with a tolerance of $\pm \frac{1}{4}$ inch. The groove shall have a uniform depth of 150 Mils (± 20 Mils). Groove position shall be a minimum of 2 inches from the edge of the pavement marking to the longitudinal pavement joint. The bottom of the groove shall have a smooth, flat finished surface. The use of gang stacked Diamond cutting blades is required for asphalt pavement surfaces. The spacers between blade cuts shall be such that there will be less than a 10 mil rise in the finished groove between the blades.

Grooves shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants. The Contractor shall prevent traffic from traversing the grooves, and re-clean grooves, as necessary, prior to application of the primer and pavement marking tape. Depth plates shall be provided by the contractor to assure that desired groove depth is achieved.

Reference is made to 3M Information Folder 5.18 Grooving Applications, May 2011, “Application Guidelines for Pavement Marking in Grooved Pavement Surfaces.”

627.09 Method of Measurements

The following paragraph is added:

The quantity of Pavement Marking Tape measured for payment will be the linear feet of tape in place and accepted. The measurement will not include the gaps.

627.10 Basis of Payment

The following paragraphs are added:

The accepted quantity of pavement marking tape will be paid for at the Contract unit price per linear foot which price shall include all material, pavement grooving, equipment, labor and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
627.94	Pavement Marking Tape	Linear Foot
627.941	Pavement Marking Tape – Dotted White Lane Line, 6-inch Width	Linear Foot
627.942	Pavement Marking Tape – Dotted White Lane Line, 12-inch Width	Linear Foot

SPECIAL PROVISION

SECTION 627

PAVEMENT MARKINGS

(Recessed Pavement Marking Tape)

627.01 Description

The following sentence is added:

This work shall consist of furnishing and placing recessed, reflective pavement marking tape in conformity with the Plans, as specified herein and as directed by the Resident.

627.02 Materials

The following sentence is added:

Pavement Marking Tape for lane designation words, arrows, and stop bars shall be pre-cut by the manufacturer, and shall be 3M Stamark Extended Season Tape Series 380IES– High Performance pavement marking tape, color - white, as manufactured by 3M of St. Paul, Minnesota.

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627.05 Preparation of Surface

The following paragraph is added:

The Contractor shall mill a groove in the pavement for each tape length or area to be placed (“in- and-out” pattern). Continuous grooving for installation of the tape shall not be allowed. The groove length shall be the required tape length plus 12 inches on each end. Tape length spacing shall be as shown on the plans. The groove width for inlaid tape pavement marking shall be the pavement marking width plus 1 inch, with a tolerance of $\pm \frac{1}{4}$ inch. The groove width for inlaid tape pavement areas shall be the pavement marking width plus 3 inches, with a tolerance of ± 1 inch. The groove shall have a uniform depth of 150 Mils (± 20 Mils). Groove position shall be a minimum of 2 inches from the edge of the pavement marking to the longitudinal pavement joint.

The bottom of the groove shall have a smooth, flat finished surface. The use of gang stacked Diamond cutting blades is required for asphalt pavement surfaces. The spacers between blade cuts shall be such that there will be less than a 10 mil rise in the finished groove between the blades.

Grooves shall be clean, dry and free of laitance, oil, dirt, grease, paint or other foreign contaminants. The Contractor shall prevent traffic from traversing the grooves, and re-clean grooves, as necessary, prior to application of the primer and pavement marking tape. Depth plates shall be provided by the contractor to assure that desired groove depth is achieved.

Reference is made to 3M Information Folder 5.18 Grooving Applications, May 2011, “Application Guidelines for Pavement Marking in Grooved Pavement Surfaces.”

627.09 Method of Measurements

The following paragraph is added:

The accepted quantity of Pavement Markings – Recessed Tape – Words, Arrows, Stop Bars will be measured for payment by the square foot in place and accepted. The square foot areas of the Words and Arrows will be the areas posted in the Pavement Marking section of the MaineDOT Standard Details.

627.10 Basis of Payment

The following paragraphs are added:

The accepted quantity of Pavement Markings – Recessed Tape - Words, Arrows, Stop Bars will be paid for at the Contract unit price per square foot which price shall include all material, pavement grooving, equipment, labor and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
627.944 Pavement Markings – Recessed Tape – Words, Arrows, Stop Bars	Square Foot

SPECIAL PROVISION

SECTION 631

EQUIPMENT RENTAL

631.02 General

The following sentences are added:

Jackhammer - To be included under category of air tool.

Bucket truck - Approved one man, able to reach 30 feet high bucket truck with 10 feet lateral extension.

Scissor Lift - Hydraulic scissors lift with a minimum capacity of three workers.

Electrician - Licensed by State of Maine.

Electrician's Apprentice - Enrolled in an accredited program.

631.08 Basis of Payment

The following paragraphs are added:

Such related costs such as use of hand tools, meal and room expenses, benefits, insurance, retirement, travel time, overtime, overhead and profit will not be measured separately for payment, but shall be incidental to the unit price for the bid item.

Note: For extra materials required for miscellaneous work the General Contractor shall be allowed 15 percent overhead and profit on the cost of materials and rental equipment (not covered by miscellaneous unit items). Rates for Subcontractor owned equipment required to perform miscellaneous work, not otherwise provided for in the Contract, shall be negotiated.

The General Contractor will be allowed 10 percent overhead and profit on the subcontractor's cost of materials, and subcontractors rented equipment (not covered by miscellaneous unit items). The General Contractor shall include his markup on the Subcontractor's labor in the pay items.

The labor hour bid items shall include labor and labor burdens, benefits, supervision, transportation, travel time and allowances, overnights, small tools and equipment, subcontractor overhead and profit, and General Contractor overhead and profit. Time will be measured from the start of work to the stoppage of work at the project site; less the time taken for lunch. No deduction of time will be taken for the standard morning "coffee break".

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
631.50	Jackhammer (Air Tool Including Operator)	Hour
631.51	Bucket Truck	Hour
631.52	Scissor Lift	Hour
631.53	Electrician	Hour
631.54	Electrician's Apprentice	Hour
631.55	Plumber	Hour

SPECIAL PROVISIONSECTION 633PROPANE GAS UTILITY

(Propane Service)

633.01 Description

This work shall include furnishing and installing two 1000 gallon above ground propane tanks at each Toll Administration Building, manifold piping between the propane tanks including a primary regulator, HDPE propane service line from the tanks to the generator, Corrugated Stainless Steel tubing from the tanks to the toll booth cabinet unit heater secondary regulator, and 16" x 16" x 8" PVC Junction Boxes in Islands A and B front booth bumpers.

633.02 Materials

The aboveground 1000 Gallon Propane Tanks shall be furnished new not refurbished, with a manufacture date within 24 months of installation.

The aboveground propane tanks shall meet the following requirements:

- Designed and constructed in accordance with the ASME Section III, Division 1 Code.
- Registered with the National Board of Boiler & Pressure Vessels Inspectors
- Complies with NFPA 58
- TGIC polyester powder paint
- Painted Sky White
- Tanks fully fitted with RegO valves and Rochester liquid level gauges
- Container pressure rated at 250 psi @ 400 deg F
- Vacuum Purged
- Stainless steel data plate
- Steel Dome
- #54 liquid level outage valve orifice

The Generator Propane Service Line shall be ½" High Density Polyethylene distribution pipe meeting the requirements of ASTM D 2513.

The toll booth cabinet unit heater propane service line shall be ½" (size 18 EHD) Corrugated Stainless Steel tubing to be manufactured by Gastite® (or approved equal) corrugated stainless steel tubing complying with ANSI LC 1 "Fuel Gas Piping Systems Using CSST" and listed with CSA®, ICC and IAPMO. Manufacturing materials to be ASTM A240 type 300 corrugated stainless steel tubing with a minimum wall thickness of 0.010", jacketing of UV resistant polyethylene meeting the requirements of ASTM E84 for flame spread and smoke density. All mechanical tube fittings are SAE CA360 brass incorporating double wall flare sealing and Jacket-Lock™ jacket capturing for steel tubing protection.

Backfilling shall consist of placing suitable material in all spaces excavated and not occupied by the utility lines up to the loam elevation. Backfill shall be granular borrow placed at

or near optimum moisture content and shall not contain stones larger than three inches, frozen lumps, chunks of clay, organic matter or other objectionable material.

Sand borrow bedding material shall meet the requirements of Subsection 703.01.

633.03 Construction

The Contractor shall coordinate the construction of the Propane Service with the Authority’s propane supplier, through the Resident. Backfill of the propane gas piping shall be in accordance with Section 206, Structural Excavation.

Warning tapes shall be a metallic/detectable type made of solid yellow film with continuously printed black-letter caption: "CAUTION—PROPANE GAS BURIED BELOW". The warning tape shall be metallic warning tape manufactured for marking and identifying underground utilities, six inches wide and a minimum of four mils thickness, continuously inscribed with a description of the utility.

633.04 Method of Measurement

Propane Service shall be measured by the Lump Sum complete and accepted.

633.05 Basis of Payment

Propane Service shall be paid for at the Contract unit price per lump sum, which shall be full compensation for furnishing and installing propane tanks, piping, regulators, shut off valves and all excavation, backfill, compaction, coordination, materials, equipment and incidental items necessary to complete the work to the satisfaction of the Resident.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
633.031 Propane Service - Southbound	Lump Sum
633.032 Propane Service – Northbound	Lump Sum

SPECIAL PROVISIONSECTION 633GAS UTILITY

(Propane Tank Supports)

633.01 Description

This work shall consist of furnishing and placing Portland Cement concrete for the propane tank supports in accordance with these Specifications and in conformity with the lines, grades, and dimensions shown on the Plans.

633.02 Materials

Materials shall meet the following requirements:

Concrete shall be Class "A" cement concrete (f'c-4000 psi).

Gravel shall meet the requirement for Section 703.06b.

Pea stone shall conform to ASTM C33 Grading 7 (Pea stone).

633.03 Propane Tank Supports

The Contractor shall coordinate the location and spacing of the supports for the tanks with the propane gas supplier prior to any excavation. The Contractor has the option of using precast or cast-in-place supports. The supports shall be constructed / placed on a six inch layer of pea stone. After the supports have been set to line and grade the cavity shall be backfilled with aggregate subbase material. The aggregate material shall be firmly compacted in layers not more than eight inches, loose measure. Backfilling of the support's material shall conform to Subsection 206.03.

633.04 Method of Measurement

Propane Tank Supports satisfactorily placed and accepted shall be measured by each unit.

633.05 Basis of Payment

The accepted quantity of Propane Tank Supports will be paid for at the Contract unit price each for the number of units installed. Payment shall be full compensation for excavation, construction or placement of support, pea stone and gravel, backfilling and all equipment, labor and incidentals necessary to complete the work.

Payment will be made under:

Pay Item

Pay Unit

633.21 Propane Tank Supports

Each

SPECIAL PROVISION

SECTION 633

GAS UTILITY

(Propane Tank Pad)

633.01 Description

This work shall consist of excavating and placing pea stone for the construction of a propane tank pad in accordance with these Specifications and in reasonably close conformity with the lines, grades and typical sections shown on the Plans or established.

633.02 Materials

Materials shall meet the following requirements:

Pea stone shall conform to ASTM C33 Grading 7 (Pea stone)
Weed Control Fabric 722.03

633.03 General

The Contractor shall excavate area for the pad to the dimensions shown on the Plans or as directed by the Resident. Weed control fabric shall be placed on the bottom and sides of the excavated area and shall be overlapped as recommended by the manufacturer. A layer of pea stone shall then be placed on the fabric to the required depth as shown on the Plans.

633.04 Method of Measurement

The quantity of Propane Tank Pad will be measured by the number of square yards of surface covered, complete and accepted.

633.05 Basis of Payment

The Propane Tank Pad will be paid for at the Contract unit price per square yard, complete and accepted. Payment shall be full compensation for all excavation, pea stone, weed control fabric, tools, equipment, labor and all incidentals necessary to complete the work.

The weed control fabric will not be measured separately for payment but shall be incidental to this pay item.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
633.31 Propane Tank Pad	Square Yard

SPECIAL PROVISIONSECTION 634HIGHWAY LIGHTING

(Replacement LED Fixture)
 (Remove and Reset Light Standard)
 (Remove and Stack Light Standard)
 (Conventional Light Standard with LED Fixture)

634.01 Description

The following paragraph is added:

This work shall consist of removing existing light standards, luminaires, and any breakaway devices and resetting with all associated appurtenances and wiring system on to new concrete foundations with new LED luminaires at locations as shown on the Plans... This work shall also include installing new light standards with LED fixtures with all new associated appurtenances and wiring system at locations shown on the plans.

The work also includes removing and stacking temporary light standards as shown on the Plans. All removed existing luminaires, wooden poles, offset brackets, and wiring shall be carefully transported and stacked at the MTA's Sign Shop at Mile 58 NB.

All new highway lights will have photoelectric sensors for each individual light. All new light standards will be 35 feet tall with 2 foot riser and a 12 foot offset arm for toll plaza, ramps and SR 703, and 8' offset arms for Turnpike Mainline. All highway lights shall be installed so the LED fixture is centered over the shoulder lane line (right or left) for maintenance purposes.

Replacement LED light fixtures with 12 foot offset arms will be installed on the wooden traffic signal strain poles and wired into the signal cabinet.

634.021 Materials

The following paragraphs are added:

Underground junction boxes shall be quazite precast concrete (Item 626.122). Provide manufacturer's listed cover for each junction box with logo stating "LIGHTING". All junction boxes are to be furnished as detailed on the Drawings.

Splices in junction boxes shall be made with ILSCO USPA-350-SS-DB Safetysub Watertight Direct Bury Splice Wire Range 350MCM-10-STR connectors for the appropriate wire count only. Splices in hand holes shall be Ideal SLK Disconnect Fuse Kit 30-S2212.

LED fixtures shall be one of the following:

- Model # ATB2-80BLEDE10-MVOLT-R3-PCSS, as manufactured from American Electric Lighting/Acuity Brands Lighting.

- Model # VP-L/96NB-280/4K/T3/UNV/PCR-TL/SF2/GYS from Beacon Lighting/Hubbell.
- Model # RVM-270W/160LED4K-LE3-UNV-PH8-GY3 from Signify Lighting.

634.04 Cable Installation

The reset light standards shall be wired with new wiring.

All existing light standards to receive new LED light fixtures shall also receive new wiring, including all splices, new fuse kits and disconnects, from the new LED fixture back to and including in the junction box.

634.051 Removing Light Standards

The first paragraph is deleted and replaced with the following:

Before removing light standards, the luminaires shall be removed from the light standard and stacked.

The second paragraph is deleted and replaced with the following:

Care shall be exercised in removing, transporting and stacking the light standards and luminaires. The Contractor will be required to replace, at his own expense, all equipment damaged or destroyed by his operation.

The Contractor will not be allowed to remove the existing light standards until all new foundations, wiring, conduits and junction boxes have been installed. Breakaway devices shall be required on all light standards. If breakaway devices do not exist on the existing light standard, new breakaway devices shall be supplied and installed. The Contractor will be allowed one (1) working day to remove and reset the light standards, including replacing luminaires and testing. At a minimum, existing light levels shall be maintained while relocated light standards are being installed and made fully operational and shall be incidental to highway lighting pay items.

634.06 Luminaires

In the second paragraph “12” is replaced with “10” and “THHN” replaced with “XHHW” to read:

“Number 10 wires AWG copper stranded XHHW...”.

634.092 Method of Measurement

The following sentence is added:

Replacement LED Fixture, Remove and Reset Light Standard, Remove and Stack Light Standard, and Conventional Light Standard with LED Fixture will be measured by the single unit each, complete in place and accepted.

634.093 Basis of Payment

In the second sentence of the first paragraph, the words, “LED fixture, pole wiring” shall be added after the words, “bracket arm”.

The following paragraphs are added:

Payment for furnishing and installing Replacement LED Fixtures will be made for the accepted quantity at the Contract unit price each, which shall include new LED fixture, ballast, lamp, offset arm, wiring and incidentals necessary to complete the work.

The accepted quantity of Remove and Reset Light Standard will be paid at the Contract unit price each for the number of units that are removed and reset. Payment shall be full compensation for the removal and resetting of the light standard, removing and delivering removed luminaries to the Authority, transporting and installing the replacement light pole, resetting the breakaway device or installing a new fuse kits, new breakaway device, new pole wiring to the new LED fixture and all incidentals necessary to complete the work.

Payment for Remove and Stack Light Standard will be made for the accepted quantity at the Contract unit price each, which shall include removing the light standard and transporting it to MTA’s Sign Shop at Mile 58 NB, as well as removing and disposing of all foundations as per plan and specifications.

Payment for furnishing and installing Conventional Light Standard with LED Fixture will be made for the accepted quantity at the Contract unit price each, which shall include installing the new light standard, breakaway device, bracket arm, LED fixture, ballast, lamp and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
634.175	Replacement LED Fixture	Each
634.208	Remove and Reset Light Standard	Each
634.2083	Remove and Stack Light Standard	Each
634.231	Conventional Light Standard with LED Fixture	Each

SPECIAL PROVISION

SECTION 639

ENGINEERING FACILITIES

(Field Office, Type A – Provided by MTA)

639.01 Description

This subsection is deleted and replaced with the following:

This work shall consist of providing utility services (Power and High-Speed Internet), equipping and maintaining access for the MTA owned Type A field office. The field office furnished by the Authority is currently set up in the entrance of the CMP Substation adjacent to Payne Road and the Route 703 Ramp H. The Contractor shall remove all temporary utility connections after completion of the contract.

639.02 Materials

This subsection is deleted and not replaced.

639.03 General

This subsection is deleted and replaced with the following:

The office trailer equipment, furnishings, and utility services shall be provided prior to the start of work, and shall remain until work is completed and accepted, unless earlier removal is authorized.

A fire extinguisher shall be provided for electrical and chemical fires and effective on all solvents used in the building.

Furnishings shall be supplied for a Type A trailer as outlined in subsection 639.04.

639.04 Field Offices

The first thirteen paragraphs are deleted from this subsection and not replaced.

639.08 Heat

This subsection is deleted and replaced with the following:

The Contractor is responsible for the electrical costs associated with providing heat.

639.09 Telephone

This subsection is deleted and not replaced.

639.10 Method of Measurement

This subsection is deleted and replaced with the following:

Field Office, Type A (Provided by MTA) will be measured by the lump sum for each building equipped and maintained satisfactorily.

639.11 Basis of Payment

This subsection is deleted and replaced with the following:

The accepted quantity of field office will be paid for at the contract unit price each which payment shall be full compensation for equipping, maintaining, furnishing utility services, installing and maintaining toilet facilities.

Payment will be made in three parts; the first payment of 1/2 to be made after the Contractor has provided utility services, toilet facilities, and has provided all required furnishings for the field office, the second payment of 1/4 shall be made when one-half of the anticipated work has been completed, and the final payment of the remaining 1/4 shall be made upon completion of the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
639.181 Field Office, Type A (Provided by MTA)	Each

SPECIAL PROVISIONSECTION 639ENGINEERING FACILITIES

(Geotechnical Instrumentation Protection and Removal)

639.01 Description

This work consists of temporarily protecting and then later removing specified geotechnical instrumentation installed within the preloaded embankments previously built under Contract 2019.13. The locations of the geotechnical instrumentation to be protected and removed are shown in the Plans.

CONSTRUCTION REQUIREMENTS

The following Subsections are added:

639.051 Protection of Instrumentation

The Contractor shall protect all existing instrumentation from damage during construction operations until such time as the Resident directs the instruments to be removed. The protection shall also include maintenance of existing protective barriers and flagging. The Contractor shall provide access to all active instruments by the Engineer for the purposes of data readings.

If the Contractor damages any instruments, protective barriers, or flagging, they shall be repaired, replaced, or reimbursed at the discretion of the Resident. The time of instrumentation removal will vary across the project site, but it will generally follow removal of the surcharge materials for a section of embankment. However, no instrument shall be removed until specifically directed by the Resident.

639.052 Removal of Settlement Platforms

When directed, the Contractor shall remove settlement platforms at locations shown in the Plans. Care shall be taken during the removal of the surcharge materials to maintain the integrity of the settlement platforms. After removal of the surcharge, the Contractor shall provide the Engineer three working days to obtain final settlement platform elevation readings.

After the final elevations have been read, the Contractor shall carefully excavate around the settlement platforms down to three feet below the design subgrade. The steel and PVC pipes shall be removed so they are flush with the bottom of the excavation. The Contractor shall backfill the annular space between the steel and PVC pipes remaining in place, with a uniformly graded sand to within 12 inches of the top. The top 12 inches of the steel pipes and annular space between the steel and PVC pipes shall be sealed with a closed cell, exterior grade, expandable foam.

The excavations shall be backfilled with aggregate subbase coarse gravel (703.06 - Type D) in layers not exceeding eight inches. Each layer shall be compacted to a minimum 95 percent maximum dry density obtained from AASHTO T180.

639.053 Removal of Piezometers

When directed, the Contractor shall remove piezometers at locations shown in the Plans. Care shall be taken during the removal of the surcharge materials to maintain the integrity of the piezometers. After removal of the surcharge, the Contractor shall provide the Engineer three working days to obtain final piezometer readings.

After the final piezometer readings have been taken, the Contractor shall carefully excavate around the piezometers down to three feet below the proposed subgrade in pavement areas and two feet below the finished ground surface in unpaved areas. The conduits and wires shall be removed so they are flush with the bottom of the excavation. The Contractor shall backfill the annular space between conduit remaining in place with a uniformly graded sand to within 12 inches of the top. The top 12 inches of the conduit and annular space around the conduit shall be sealed with a closed cell, exterior grade, expandable foam.

In pavement and armored slope area the excavations shall be backfilled with aggregate subbase coarse gravel (703.06 - Type D) in layers not exceeding 8 inches. Each layer shall be compacted to a minimum 95 percent maximum dry density obtained from AASHTO T180.

639.054 Removal of Inclinerometers

When directed, the Contractor shall remove inclinometers at locations shown in the Plans. Care shall be taken during the removal of the surcharge materials to maintain the integrity of the inclinometers. After removal of the surcharge, the Contractor shall provide the Engineer three working days to obtain final inclinometer readings.

After the final inclinometer readings have been taken, the Contractor shall carefully excavate around the inclinometers down to two feet below the finished ground surface. The casings shall be removed so they are flush with the bottom of the excavation. The Contractor shall backfill the annular space between conduit remaining in place with a uniformly graded sand to the within 12 inches of the top. The top 12 inches of the annular space around the casing shall be sealed with a closed cell, exterior grade, expandable foam. The interior of the inclinometer casing shall be tremied with Portland cement grout by insertion of tremie tube to the bottom casing until grout overflows at the surface. The tremie tube shall then be slowly raised while continuing to pump at a reduced rate to maintain the grout level at the top of the casing.

In armored slope areas, the excavations shall be backfilled with aggregate subbase coarse gravel (703.06 - Type D) in layers not exceeding 8 inches. Each layer shall be compacted to a minimum 95 percent maximum dry density obtained from AASHTO T180. In loam/seed areas or in areas beyond the toe of slope, excavations shall be backfilled with the materials excavated.

639.10 Method of Measurement

The following sentence is added:

The Geotechnical Instrumentation Protection and Removal shall be measured by the lump sum.

639.11 Basis of Payment

The following paragraphs are added:

The Geotechnical Instrumentation Protection and Removal will be paid for at the Contract price per lump sum which shall be full compensation for all labor, materials and equipment necessary to satisfactorily complete the work as shown on the Plans, described in this Section or as directed by the Engineer.

Payment shall be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
639.261 Geotechnical Instrumentation Protection and Removal	Lump Sum

SPECIAL PROVISION

SECTION 643

TRAFFIC SIGNALS

(Lane Use Signal)

643.01 Description

This work shall consist of supply and installation of lane use signals (Non-Flashing). All equipment, installation of equipment and other incidental work shall conform to the latest applicable provisions of: NEC, MUTCD, NESC, NEMA, and the ITE Standards for traffic control equipment. All work shall be done to the satisfaction of the Resident. The meaning of specific terms shall be as defined in MUTCD, NESC, and the ITE Standards for traffic control equipment.

643.02 Materials

The lane use signal heads shall be Signal-Tech DOT2424RG-175 or approved equal. See Appendix J for technical product details.

643.03 Installation

The new lane use signal housing and LED signal shall be installed and wired over the center of the new lane. Pelco (or equal) mounting brackets shall be used and will be incidental to the installation of the new lane use signal. The contractor shall provide a one year warranty on all material and workmanship related to the installation of the new lane use signal.

643.04 Method of Measurement

Lane use signals will be measured by each unit, installed and accepted.

643.05 Basis of Payment

Lane Use Signals will be paid for at the Contract unit price each which payment shall be full compensation for the furnishing and installation of new lane use signals, and all other materials, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
643.712	Lane Use Signal	Each

SPECIAL PROVISIONSECTION 643TRAFFIC SIGNALS643.01 Description

This work shall consist of the installation of a new traffic signal at Maine Turnpike Exit 45 SB on/off ramps. Work shall include the installation of MTA provided equipment, to include traffic control cabinet, video detection system, and pre-emption system. The work will also include the installation of contractor provided equipment, to include wood strain poles, guy cables, messenger cables, tether cables, signal heads, signal wiring, video detection wiring, pre-emption wiring, and cabinet foundation. The work shall include backfill, and all necessary fittings, cables, and components as required to make a fully functional traffic signal, video detection system and pre-emption system.

Traffic signal terms shall be in accordance with those defined in the NEC, MUTCD, NESC, NEMA, IMSA and the ITE Standards for traffic control equipment.

643.02 Materials

A list of the materials required to install the system is included on the signal plan sheet, but the Authority will give no guarantee as to the completeness of this list, the contractor is responsible for submitting for approval all material to be included in the installation of the signal. Unless otherwise specified, all equipment and components shall be new and free of defects.

Electrical materials shall meet the standards herein, local and utility codes, and the National Electrical Code, where applicable.

Drawings, manufacturer's specifications and applicable catalog cuts for all materials and components shall be submitted in accordance with Section 105.7 of the Standard Specification within 21 days after award of the Contract. An additional set of final approved documents, to total 6 sets, shall be provided to the Resident.

643.0211 Traffic Signal Heads

New housings shall be constructed of die cast aluminum or polycarbonate with a smooth outer surface. All housings shall be equipped with a Quick Change Kit as manufactured by GGI Road and Traffic. Housings shall be adaptable for pedestal, bracket, or span wire vertical or horizontal mounting. The assembled housing shall be dust proof and moisture proof. Each housing shall be equipped with a hinged door of die cast aluminum or polycarbonate to hold the lens and parts of the optical units. The doors shall be designed to ensure uniform pressure around the doorframe when closed. Doors shall be fastened by two hinged wing nut assemblies or other approved fasteners. Unless otherwise indicated on the plans, lenses shall be furnished with approved tunnel visors (not less than 10 inches). If either longer visors than those specified above or louvers are deemed necessary, they shall be furnished and installed. If required, louvers shall be attached with machine screws, nuts and washers. The use of "self-tapping" machine screws will not be allowed. All traffic signals shall be furnished with a 5 inch backplate with a factory applied 2" diamond grade retroreflective border. Backplates shall be louvered aluminum coated

flat black, be fastened with stainless steel hex head slotted screws and a 3/16 inch by 3/4 inch stainless steel fender washer. Signal housings shall be manufactured by the Econolite Group, Inc. or an approved equal.

The assembled housings shall be made up of individual sections fastened together with bolts; the assembly of sectional units shall present a smooth unbroken contour of pleasing appearance. Each end of the housing assembly shall have an opening for a 1-1/2 inch pipe nipple. The area around this opening shall be reinforced and serrated so that lock nuts will seat firmly. The use of "Tri-Studs" to join the signal sections together will not be permitted.

One cap shall be supplied with each new assembled housing to act as a cover over the hole in the top to prevent water from entering.

Housing adapters for pedestal mounting shall be constructed of cast iron. They shall be adjustable with serrated surfaces to permit the housing to be locked in the desired horizontal position. The adapters shall be secured to the bottom of the housing by means of a close nipple, shall slip fit at least 7 inches over a standard traffic signal post of 4 inches in diameter and shall be secured to the post by a minimum of four set screws. Adapters shall contain raceways from the housing to the post to protect the wires from the elements.

Span wire hardware shall consist of hangers with a cast nipple. "Tri-Stud" hangers will not be permitted.

Light Emitting Diode (LED) lamps shall have a regulated power supply designed to electrically protect the diodes. The lamp shall be watertight and sealed to eliminate contaminants. The lamp shall be capable of operating at ambient air temperatures of -40° F to 140° F. LED's shall be a 120 Volt AC LED module as manufactured by Trastar or an approved equal. All LED lamps shall have a date code not to exceed 6 months prior to the start of construction.

Each LED module shall be wired with two leads which shall terminate at the terminal block in each signal head. Separate leads shall be used to wire the block to the base. Leads shall be 18 AWG stranded wire with spade type copper terminal ends. All colors shall be bright and clearly defined and cover the insulation the entire length of the lead. The color of these leads shall be as follows:

- (a) From the receptacle behind the red or "Don't Walk" lens: one red wire and one white wire with an optional red tracer;
- (b) From the receptacle behind the yellow lens: one yellow wire and one white wire with an optional yellow tracer;
- (c) From the receptacle behind the green or "Walk" lens: one green wire and one white wire with an optional green tracer;
- (d) From the receptacle behind the green arrow: one blue wire and one white wire with an optional blue tracer.

LED lamp life shall be a minimum of 100,000 hours of continuous operation. Power consumption for 12" indications including power supply shall not exceed 10 W.

LED modules shall conform to the standards set forth by the Institute of Transportation Engineers and shall be of the color indicated, circular in shape, with a visible diameter of approximately 12 inches.

643.03 Traffic Signal Poles, Mast Arms, and Pedestals

Section 720 of the Standard Specifications shall apply unless otherwise noted.

Steel Structures. Section 720.04 of the Standard Specifications shall apply.

Concrete foundation shall be concrete Class A meeting the requirements of Section 502 of the Standard Specifications - Structural Concrete. Reinforcing steel shall meet the requirements of Section 503 of the Standard Specifications – Reinforcing Steel. The foundations shall be as shown on the plans.

Anchor bolts. Section 720.07 of the Standard Specifications shall apply.

Mast-arm structure and foundation (when required) design calculations and shop drawings shall be submitted for documentation in accordance with Section 105.7 of the Standard Specifications.

Wood Utility Poles. Section 720.10 of the Standard Specifications shall apply.

Messenger, tether and guy cable shall be a minimum seven strand, 5/16 inch diameter wire with a breaking strength of 8,000 pounds, double galvanized in accordance with AASHTO M 111.

Aluminum Structures. Sections 720.01 and 720.02 of the Standard Specifications shall apply.

643.04 Traffic Signal Controllers and Cabinets

The MTA will provide the signal cabinet for contractor installation.

643.05 Fire Pre-emption

The MTA will provide the pre-emption equipment for contractor installation.

The contractor will provide all mounting hardware and wiring for the pre-emption equipment.

Optical detector locations shall be verified by the Authority to assure optimum reception. Optical detector cable shall run unspliced from the optical detector head to the controller cabinet.

Each optical detector lead-in cable shall be marked with plastic tape. The fire preemption shall correspond to the following chart associating the fire preemption call with its corresponding phase:

PREEMPTION PHASE CODE

Preempt 3	Phases 1 & 6
Preempt 4	Phases 2 & 5

Preempt 5

Phases 3 & 8

Preempt 6

Phases 4 & 7

The system will be tested at the completion of the project and any components found to be non-functioning shall be replaced by the contractor at no cost to the Authority. All preemption testing will be performed in the presence of a representative of the Authority.

643.06 Video Detection

The MTA will provide the video detection equipment for contractor installation. The contractor will be responsible for providing all wiring required for the installation of the video detection system. Upon installation of the video detection system by the contractor, the Authority will program the system for operation.

643.07 Contacts

All contacts used in connection with interval indications shall be of pure coin silver or equivalent and shall be capable of breaking and carrying 15 A at 125 V alternating current. The contacts shall be readily accessible and capable of being replaced in the timer without the use of any tools other than pliers and screwdriver.

643.08 Radio and Television Interference

Electrical equipment shall be prevented from interfering with radio and television reception.

643.09 Cable and Wire

Cable shall be plastic covered cable meeting the applicable requirements of the International Municipal Signal Association (IMSA) 19-1 specifications. The conductor color coding shall not be by means of printed code. All wiring shall be new. Reuse of existing cable will not be allowed. Actual color coding shall be used. Wiring will not be paid for separately but will be incidental to the respective signal item. The minimum size wire for the circuits shall be as follows:

Minimum A.W.G.

(a) Service to Cabinet	2 Stranded
(b) Cabinet to Splice Boot	12 Stranded
(c) Cabinet to Luminaire	10 Stranded
(c) Pole or Pedestal to Receptacles	14 Stranded
(d) Equipment Grounding Conductor	8 Stranded

Each lead-in cable shall be marked with plastic tape corresponding to the following color code to identify which phase it pertains to at the splice(s) in both the pull box(es) and in the cabinet.

PHASE COLOR CODE

Phase 1	1 Blue
Phase 2	1 Green
Phase 3	1 Yellow
Phase 4	1 Red
Phase 5	2 Blue
Phase 6	2 Green
Phase 7	2 Yellow
Phase 8	2 Red

Traffic signal conduit, pull boxes, frames, and covers shall conform to Section 626 of the Standard Specifications. Conduit for all lines shall be 3 inch in diameter unless noted on the plans. Unless otherwise noted, all conduits shall be schedule 80 PVC.

643.10 Painting

Prior to erection and assembly, if not manufactured of polycarbonate material, the entire traffic or pedestrian signal housing and visors shall be painted with an approved zinc-rich primer and a finish enamel coat as noted below. All paint shall conform to Section 708 of the Standard Specifications.

- | | |
|------------------------|--|
| (a) Controller Cabinet | N/A – Provide by MTA |
| (b) Housings | Yellow (3) |
| (c) Visors | Inside: Black (2); Outside: Yellow (3) |

Federal No.

- | | |
|-----------------------------|--------|
| (1) Green Enamel = | H8-577 |
| (2) Black Enamel = | 17038 |
| (3) Federal Yellow Enamel = | 13538 |

After the signals have been completely installed, two coats of enamel shall be applied to all unpainted or scratched surfaces after the surface has been lightly sanded to remove gloss.

643.11 Construction Requirements

All traffic signal and electrical installations shall comply with the requirements specified herein, local and utility codes, MUTCD, and the National Electrical Code (NEC). All employees of the signal subcontractor shall have an OSHA 10 Hour Certification. The signal subcontractor

shall have at least one representative onsite at all times with an IMSA Traffic Signal Level 2 Field certification.

A preconstruction meeting with the Contractor, signal Subcontractor, Engineer and Authority representative shall be arranged not less than 3 days prior to the start of signal installation, to resolve any problems.

The signal Subcontractor shall notify the Maine Turnpike Authority ITS / Toll Manager no less than 3 days prior to final inspection of signal installation. This final inspection is required prior to signal activation.

Each signal head mounted on a mast arm shall be installed with a 1/8 inch diameter aircraft cable, looped around the mast arm and mast arm bracket, as a safety device to prevent the signal head from falling. Cable ends shall be fastened by two opposing "U" clamps. When suspended by this cable, the top of the signal head shall be no more than 6 inches below the bottom of the mast arm.

All conduit lines necessary shall be constructed for the proper operation of the signals and shall conform to Section 626 of the Standard Specifications.

All conduits terminating in the cabinet shall be sealed with duct sealant.

Concrete foundations with anchor bolts to secure the traffic signal structures, flasher or controller cabinets, and meter pedestals, shall be installed at the locations specified on the plans. The concrete foundation for the controller cabinet shall be raised a minimum height of 3 inches up to a maximum height of 18 inches above the finished surface as directed by the Resident. Chamfer strips shall be used on all signal controller cabinet foundations. Forms shall be inspected before concrete is placed. The use of a precast foundation for the controller cabinet will be permitted with approval from the MTA.

Poles shall not be mounted on the leveling nuts until the concrete has cured for at least 7 days or attained a minimum of at least 80 percent of its design compressive strength.

Provide protection for wiring from rodents and other elements as approved by the Engineer and/or as shown on the Plans.

Prior to placing the controller cabinet on its foundation, silicone sealant shall be applied to the area of contact.

The Contractor shall use bolt pattern templates when setting mast-arm anchor bolts, signal pedestal bolts and controller cabinet mounting bolts. The templates shall remain in place for a minimum of 24 hours.

Wood poles shall be placed in the ground to a depth of 20% of their overall length, with a maximum deviation from the vertical of 1/4 inch in 5 feet.

Poles shall be back-guyed using a 10-inch expanding anchor with a 3/4 inch by 96-inch anchor rod. Thimble eyes of anchor rods shall extend 12 inches above finish ground. Cable used for back-guying shall be attached to the anchor rod by a short bail automatic type grip and to the

guy hook on the pole by a preformed type grip. The pole shall be drilled 14 inches from top and a 5/8 inch oval eyebolt installed with one square flat washer and square nut on the messenger side and one square washer, square nut and guy hook on the opposite side. Any guy wire, messenger wire or span wire installations done on Utility Company poles shall follow Utility Company requirements.

643.111 Backfill for foundations

Unless otherwise ordered, backfill for foundations shall be material conforming to the requirements of Section 203.26 of the Standard Specifications – Gravel Borrow.

643.112 Service and Meter Box

Electrical Service for the new signal will be provided by the Authority. The contractor shall run the needed conduit and wiring from the signal cabinet to the new toll building on the SB on ramp at Exit 45 SB Toll.

643.113 Signal Cable and Wire Installation

The Contractor shall furnish and install sufficient cable and wire to operate the system properly and at least 4 spare conductors in each cable run shall be provided. Pulling a separate cable to achieve the required number of spares will not be allowed.

Each approach to the intersection shall have a dedicated cable run from the controller cabinet.

No more than one cable shall be permitted in a conduit except to eliminate splices in pull boxes. When more than one cable is permitted the area of combined cables shall not exceed 30 percent of the inside area of the conduit.

Messenger cable shall run unspliced between poles and shall be installed with a 5 percent sag in the wire when measured from the point of attachment to the middle of span. The cable shall be attached to the pole eyebolt by a preformed type grip on one end and an automatic type grip on the opposite end. Messenger cable shall be grounded to the back-guy cable.

Signal bases, housings and controllers shall be furnished and installed as required. All structures and housings shall be plumb after erection.

Miscellaneous electrical equipment. All additional electrical fittings, service conduit, switches, fuses, traffic signal bulbs, and such other hardware as is necessary to properly and securely install the equipment shall be furnished. All electrical fittings shall be weatherproof.

Wiring and connections. All connections shall be spliced, soldered, compounded, and taped. The use of wire nuts will not be permitted. A minimum of 18 inches of wire will extend outside of the mast arm handhole or splice boot. The following color code shall be used:

- | | |
|-----------------|----------------|
| (a) Red Wire | Red, Artery |
| (b) Orange Wire | Yellow, Artery |

(c) Green Wire	Green. Artery
(d) Red with tracer	Red, Side Street
(e) Orange with tracer	Yellow, Side Street
(f) Green with tracer	Green, Side Street
(g) White	Neutral for all signals
(h) Blue	All steady burning arrows
(i) Blue with tracer	Intermittent arrows
(j) Remaining	Push buttons and spares

Note: The white wire shall be used for all neutral connections and shall be connected to the service ground.

No street lighting splices will be permitted in the mast-arm shaft. Splices for street lighting and lightning arrestors shall be located inside the nearest streetlight pull box.

Ground connections. All installations and equipment shall be bonded and grounded to the service ground rod in accordance with the requirements of the electric power company.

Each signal cable run shall be installed with one green plastic covered copper ground wire to which all equipment shall be bonded in accordance with standard practice. Each base and post, cabinet, and any other component that would be considered a part of the signal system shall be bonded to the ground wire. This ground wire shall be “daisy chained” through each device to be bonded. This ground wire shall be connected to the ground rod at the controller cabinet.

643.114 Installation of signals and equipment

The signals and equipment shall be installed by competent workmen or the manufacturer’s representative.

Prior to placing the signals in operation, the signal housing shall be hooded with approved non-transparent material or turned to clearly indicate that the signals are not in operation.

Signs mounted on the signals not applicable to construction conditions shall be covered as specified in Section 645 of the Standard Specifications.

All material including poles, foundations, fittings and cable shall be supplied and installed to make a complete operative installation.

Signs mounted on span wire shall be mounted with Pelco “Span Wire Sign Hangar Assemblies,” or approved equal.

643.12 Operation

The Contractor shall commence the operation of the signal system only when permitted by the Engineer. Unless otherwise noted, signals shall be placed in flash a minimum of 1 week before

the planned start of operation. New signals shall be made operational between the hours of 10:00 AM and 2:00 PM unless approved by the Engineer. The contractor shall have a factory representative present at the commencement of signal operation.

Operating sequences shall be as shown on the plans or as ordered.

Operating sequences shall be verified by testing.

In cooperation with the Fire Department, the Contractor shall make trial runs to ascertain proper timing of the fire pre-emption system. The minimum time shall be approved by the Chief of the Fire Department or the Chief's representative.

The Contractor shall provide a qualified technician to thoroughly review and confirm that the system is satisfactory and operational as designed. Prior to placing the signals in operation, the Contractor shall have a review with the Authority's Toll / ITS Manager and local officials (including Fire Department technician) to review and comment upon the system.

643.13 Warranty

Upon completion of the project, the Contractor shall forward to the Authority all warranties to the purchaser that the equipment which has been installed hereunder shall be free from defects in materials, workmanship and title, and shall be of the kind and quality designated or described in the Contract. The foregoing warranty supersedes all other warranties whether written, oral, or implied. If it appears within 24 months from the date of Acceptance of the work that the equipment installed hereunder does not meet the warranties specified above, the Contractor shall promptly correct any defect or nonconformance with the specifications. This warranty does not relieve the Contractor of the requirement of Section 106 of the Standard Specifications.

643.14 Method of Measurement

The traffic signal installation will be measured as a lump sum unit. The installation of the video detection system will be incidental to the Traffic Signal Item.

Wood Poles will be measured by each pole installed and guyed and accepted.

643.15 Basis of Payment

The accepted quantity of traffic signal will be paid for at the Contract lump sum price complete in place.

When an item of conduit appears in the Contract, conduit for traffic signals will be paid for under Section 626 of the Standard Specification. When no item for conduit appears in the Contract, any conduit required will be incidental.

All miscellaneous electrical equipment required shall be subsidiary.

Video detection system will incidental to the Traffic Signal item and that items contract lump sum price; which payment will be full compensation for installation and furnishing all materials and all appurtenances and incidentals required for a complete functioning video detection system.

The accepted quantity of wood strain poles will be paid for at the contract unit price for each pole. Payment shall be full compensation for furnishing, installing the poles, guys and span wire and all other materials, equipment and labor necessary to install wood strain poles.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
643.80	Traffic Signal at: Exit 45 I-95 SB On/Off Ramps	Lump Sum
643.931	Wood Poles with Guys and Span Wire	Each

SPECIAL PROVISION

SECTION 645

HIGHWAY SIGNING

645.06 Installation of Type I Signs

a. Sign Supports

The following paragraph is added:

Support posts for Regulatory, Warning, Confirmation, and Route Marker Assembly Signs, Type I that are less than 16 sf in area and not on the Maine Turnpike mainline shall be 6 inch by 6 inch wood posts.

645.09 Basis of Payment

The following paragraph is added:

Furnishing and installing posts for Regulatory, Warning, Confirmation, and Route Marker Assembly Signs, Type I that are less than 16 sf in area and not on the Maine Turnpike mainline including earth excavation and backfilling, furnishing and placing assembly hardware, backfilling material, loam, seed, and other incidentals will not be paid for directly but will be considered incidental to the cost of the signs they support.

SPECIAL PROVISIONSECTION 645HIGHWAY SIGNING

(Barrier Reflector)

645.01 Description

This Section is deleted and replaced with the following:

This work consists of furnishing and installing new barrier reflectors on the top portion of the precast concrete median barrier in accordance with these specifications and as shown on the plans, details, or as established; including all labor material, equipment and incidentals necessary to complete the work, in conjunction with the rest of the project.

645.02 Materials

The reflectors shall be designed to be affixed to the top of the precast concrete median barrier by non-mechanical means, and when covered with reflective sheeting provides a directional visual cue to the location of the barrier wall and roadway. The design of the reflector shall provide twelve (12) square inches of surface area for application of retro-reflective sheeting of a specified grade during manufacture.

The T-shaped reflector shall consist of a flat rigid upper panel, to which is affixed retro-reflective sheeting, and a rigid base plate. Connecting these two components shall be a clear, UV-stabilized, flexible polyurethane hinge at least 0.5” in height. The polyurethane hinge shall be both mechanically and chemically attached to both the base plate and top panel. All materials shall be new.

The reflector units shall be constructed of a UV-stabilized, high-impact rigid thermo-plastic alloy conforming to the following material specifications:

Property	ASTM Test	Results
Tensile Strength @ Yield (min psi)	D638	6,400
Impact Strength @ 73F (Ft#/in) notched izod	D256	2.9
Impact Strength @ -4F (Ft#/in) notched izod	D256	2.3
Flexural Strength @ 73F (psi)	D790	12,000
Flexural Modulus @ 73F (psi)	D790	400,000

The “hinge” portion shall be constructed of a UV-stabilized, flexible thermo-plastic polyurethane conforming to the following material specifications:

Property	ASTM Test	Results
Specific Gravity (min.)	D 792	1.19
Hardness (min.)	D 2240	80 A
Tensile Strength @ yield, (min PSI)	D 412	4,600
Ultimate Elongation (min)	D 412	330
Compression Set (22 hrs @ 70° C)	D 396	65
Tear Strength (min PLI)	D 624, Die C	600
Taber Abrasion (CS17 Wheel)	100 cycles	3 mg

The polyurethane “hinge” of the reflector shall have the following minimum dimensions in relation to rigid top panel and base sections:

- Wall thickness of the rigid top panel and base sections shall be min. 0.090”;
- Wall thickness of the polyurethane hinge section shall be min. 0.090”;
- Total surface area of the connection of the hinge to the upper top panel shall be minimum of 0.500”;
- Total surface area of the connection of the hinge to the lower base plate shall be a minimum of 0.400”.
- The polyurethane hinge shall protrude vertically into the top panel.
- The polyurethane hinge shall also protrude down into the base plate.
- The un-encapsulated section of the poly-urethane hinge shall be no less than 0.100” thick and 0.130” tall.

The reflectors shall be constructed of UV-stabilized polymers white in color. The color shall be solid throughout and stabilized to resist UV degradation. The polyurethane “hinge” shall be natural/clear in color.

All reflectors shall have retro-reflective sheeting applied to both sides of the top panel. Reflective sheeting shall be yellow, and shall conform to the material requirements of Section 719.01 – Reflective Sheeting, for high intensity reflective sheeting. The sheeting shall be factory-applied to the reflector by the manufacturer.

645.03 Construction Requirements

The Contractor shall note that it is the Authority’s intention for barrier reflector installation to occur concurrently with the linear installation of the precast concrete median barrier, however, the contractor may perform this work on their timing, with Resident approval. All maintenance of traffic is incidental.

There will be no separate payment for the furnishing and installation of the new barrier reflectors, but shall be considered incidental to the lump sum Pay Item 526.35 – Precast Concrete Median Barrier.

Final location for the installation of the barrier reflectors shall be in accordance with Table 1 – Spacing of Reflectors as shown on the Plans, and as approved by the Resident.

The Contractor shall operate in a manner which prevents damage to the barrier reflectors

during installation. The Contractor shall be responsible for replacement and reinstallation of barrier reflectors damaged during the Contractor's operations. No additional payment shall be made for replacement and reinstallation of barrier reflectors damaged as a result of the Contractor's operations.

645.04 Method of Measurement

The quantity of Barrier Reflectors shall not be measured for payment, but shall be considered incidental to Pay Item 526.35 – Precast Concrete Median Barrier.

645.05 Basis of Payment

No separate payment will be made. Payment shall be considered incidental to the related pay items for Median Barrier, Bridge Endpost Median Barrier Transition, and Guardrail Median Barrier Transition.

SPECIAL PROVISION

SECTION 645

HIGHWAY SIGNING

(Protection of Signs with Type XI Sheeting)

645.04 Fabrication of Type I Guide Signs

The following paragraphs are added after the second paragraph in part b. Reflective Sheeting:

The Contractor and Sign Fabricator shall exercise all due caution to avoid any creases, bends, tears, punctures, or other damage to any Type XI sign sheeting, perceptible or not. Sign sheeting shall be protected at all times following application to the extruded aluminum surface. Any defect which becomes perceptible either under direct, indirect or no light conditions shall be cause for rejection of the sign panel.

Following the application of the sign legend and borders, the sign panel shall be protected from all hazards that may cause a defect to the sign sheeting (either background, legend or borders) in accordance with the manufacturer's recommendations. Fabricated signs shall not be stacked during storage, transport, or erection such that concentrated pressure is placed on one area of the sign face that is not uniform across the full sign face.

645.08 Method of Measurement

The fifth (5th) paragraph is deleted and replaced by the following paragraph:

The area of roadside guide signs, regulatory, warning, confirmation and route marker assembly signs of the respective types, will be measured by the area in square feet, computed to the nearest hundredth of a square foot (0.01 SF), as determined by the overall height multiplied by the overall width. Any defect in the surface area of the sign that becomes perceptible under direct, indirect, or no light conditions shall be cause for rejection of the whole sign panel.

SPECIAL PROVISION

SECTION 645

HIGHWAY SIGNING

(Remove and Reset Sign)
(Remove and Dispose Sign)

645.02 General

The following paragraph is added:

Existing signs noted to be removed and reset shall be maintained until the new location is ready for the reset. The contractor will be required to provide temporary signing for all signs that are not reset within the same day as removal. Similarly, all new signs that replace existing signs shall be set within the same day as the existing sign is removed or temporary signing shall be provided. The contractor shall submit a plan for all temporary signing, including location and support, for MTA approval.

645.07 Demounting and Reinstalling Existing Signs and Poles

The following paragraphs are added:

At locations noted on the Plans, existing ground-mounted signs are designated to be removed and reset. This work shall consist of removing the sign panels, removing and resetting or disposing of the existing wood post and resetting the sign panels on a new wood post if required in the appropriate specified location. The Resident will determine if a new wood post is required.

All other signs shown to be removed and disposed shall consist of demounting and removing the existing sign panels and disposal by the Contractor. Foundations shall be disposed of by the contractor.

Any existing signs not shown on the Plans are to remain in their existing condition unless directed otherwise by the Resident.

645.08 Method of Measurement

The following sentences are added:

Removing and Resetting existing ground-mounted signs shall be measured as complete units each, removed, reset and accepted.

Removing and disposing existing signs shall be measured as complete units each removed and disposed.

645.09 Basis of Payment

The following paragraphs are added:

The accepted signs Removed and Reset will be paid for at the Contract unit price each as specified. Such price will include removing and resetting sign panels, removing and resetting or disposing existing wood post and resetting the sign panels on the existing or new wood post and new hardware as required to complete the sign installation. Any signs or supports damaged by the Contractor shall be replaced by him with new signs or supports conforming to the applicable Specifications at no additional cost to the Authority.

The accepted signs Removed and Disposed shall be paid for at the Contract unit price each as specified. Such price shall include demounting, removing, and disposing the sign panels, removing, disassembling, and stacking the sign supports, breakaways at the location specified, and precast foundations that are not reused and in good condition. Payment shall also include disposing of other foundations. Ground restoration shall be paid for under the appropriate contract pay items.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
645.109	Remove and Reset Sign	Each
645.1099	Remove and Dispose Sign	Each

SPECIAL PROVISION

SECTION 645

HIGHWAY SIGNING

(Remove and Stack Canopy Mounted Sign)

645.01 Description

The following paragraph is added:

Existing canopy mounted signs are defined as signs fabricated from sheet aluminum as identified in the Plans. Each sign is mounted on framing supports on top of the toll plaza canopy with an attached luminaire. There are four static signs to be stacked at the MTA’s Sign Shop at Mile 58 NB.

645.08 Method of Measurement

The following sentence is added:

Remove and Stack Canopy Mounted Signs shall be measured as complete units each removed and stacked.

645.09 Basis of Payment

The following paragraphs are added:

The accepted Remove and Stack Canopy Mounted Signs shall be paid for at the Contract unit price each as specified. Such price shall include removing sign panels, luminaires, and hardware framing supports and delivering to the MTA’s Sign Shop at Mile 58 NB. This includes all hardware, labor and equipment necessary to complete this task.

Any signs, luminaires, or supports damaged by the Contractor shall be replaced with new signs, luminaires, or supports conforming to the applicable Specifications at no additional cost to the Authority.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
645.107	Remove and Stack Canopy Mounted Sign	Each

SPECIAL PROVISIONSECTION 645HIGHWAY SIGNING

(Canopy Mounted Dynamic Message Sign)

645.01 Description

This work shall consist of the installation of a canopy mounted dynamic message sign (DMS) located above the center lane of the new Exit 45 Southbound and Northbound toll plazas. All needed electrical and communication wiring will be included as part of the installation. The contractor shall coordinate with the MTA Toll system and ITS manager for sign installation.

All needed electrical and communication wiring will be included as part of the installation. Each sign is mounted on framing supports and mounted on brackets to the top of the toll plaza canopy.

The contractor shall provide power wiring and two (2) direct burial type, Category 5e shielded cables and needed conduit. One will be routed from the canopy mounted DMS to the toll booth counter for the center lanes NB and SB toll plazas and the other will be routed from the canopy mounted DMS to the lane controller in the booth. A ten (10) foot slack loop of cable for routing of the cable within the booth shall be provided.

645.02 Materials

The DMS to be installed at the new Exit 45 SB and NB toll plazas will be the following:

Daktronics model GS6-36x120-26.4-RGB-SF, or approved equal. The Sign shall also include a DM-100 hand controller or approved equal.

645.04 Method of Measurement

Canopy Mounted Dynamic Message Sign shall be measured by the lump sum for provision and installations accepted by the MTA.

645.05 Basis of Payment

Canopy Mounted Dynamic Message Sign shall be full compensation for the installation of the new DMS on the toll canopy over the center toll lane at the new Exit 45 SB and NB toll plazas, and for all other materials, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
645.1092 Canopy Mounted Dynamic Message Sign	Each

SPECIAL PROVISION

SECTION 645

HIGHWAY SIGNING

(Overhead Guide Sign)
(Overhead Guide Sign on Existing Structure)

645.01 Description

The following paragraph is added:

This work shall also include providing and mounting a new sign panel on an existing overhead sign structure.

645.02 General

The following paragraph is added:

Prior to fabrication, the Contractor shall submit drawings of the proposed method of attachment of new sign panels to existing sign structures.

645.023 Support Structures

b. Bridge, Cantilever, and Butterfly Type Sign Supports

The first paragraph is deleted and replaced with the following:

The Contractor shall be responsible for the design of the support structure. The foundation has been designed and detailed within the Plans.

645.024 Bridge, Cantilever, and Butterfly Type Sign Support Structure Foundations

This Section is deleted in its entirety. See Section 626 for Overhead Sign Foundation requirements.

645.08 Method of Measurement

The following sentence is added:

Overhead Guide Sign on Existing Structure will be measured by the lump sum complete in place and accepted.

645.09 Basis of Payment

The third paragraph is deleted and the following paragraphs are added:

Overhead Guide Signs will be paid for at the contract lump sum price. Such price will be full compensation for signs, support structures, and all incidentals necessary to complete the work.

Overhead Guide Sign on Existing Structure will be paid for at the contract lump sum price. Such price will be full compensation for signs, all attachment brackets, supports, and all incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
645.123	Overhead Guide Sign: (Sta. 1062+50)	Lump Sum
645.124	Overhead Guide Sign on Existing Structure	Lump Sum

SPECIAL PROVISION

SECTION 645

HIGHWAY SIGNING

(Canopy Mounted Sign)
(Canopy Mounted Sign – Supplied by Authority)

645.01 Description

The following paragraphs are added:

This work shall consist of furnishing and installing new Canopy mounted signs fabricated from sheet aluminum with aluminum angle windbars as identified in the Plans. Each sign is mounted on framing supports and brackets to the top of the toll plaza canopy with an attached luminaire.

This work shall consist of picking up, transporting and installing Canopy mounted signs – Supplied by Authority fabricated from sheet aluminum as identified in the Plans and Supplied by Authority. Aluminum angle windbars shall be installed on the Canopy mounted signs prior to mounting on framing supports and brackets to the top of the toll plaza canopy with an attached luminaire.

645.021 Materials

The following paragraph is added:

LED Fixture shall be:

- Model # SVLED2-PNL-PK1-MVOLT-40K-AMT-GYSDP-AO from Holophane.

645.08 Method of Measurement

The following sentences are added:

Canopy Mounted Signs will be measured by each complete unit of the kind specified and installed.

Canopy Mounted Signs – Supplied by Authority will be measured by each complete unit of the kind specified and installed.

645.09 Basis of Payment

The following paragraphs are added:

The accepted quantity of Canopy Mounted Sign shall be paid for at the Contract unit price each as specified. Such price shall include all hardware, labor and equipment necessary to

complete this task. The item also includes all necessary aluminum angle windbars, electrical wiring, conduit, tenon, and luminaire.

The accepted quantity of Canopy Mounted Sign – Supplied by Authority shall be paid for at the Contract unit price each as specified. Such price shall include all hardware, labor and equipment necessary to complete this task. This item also includes transport of sheet aluminum sign from the MTA Sign Shop, Mile 59, all necessary aluminum angle windbars, electrical wiring, conduit, tenon and luminaire.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
645.14	Canopy Mounted Sign	Each
645.141	Canopy Mounted Sign – Supplied by Authority	Each

SPECIAL PROVISIONSECTION 645HIGHWAY SIGNING

(Remove and Reset Mainline Sign)

645.01 Description

The following paragraphs are added:

This work shall consist of removing and resetting the existing highway guide signs as shown on the Plans. The work includes a combination of the following: removal, resetting, modifying, furnishing, and disposal of concrete foundations, steel posts, wood posts, and breakaway foundations. Existing materials from the existing sign installation may be reused to reset the existing sign or another sign.

This work shall consist of removing and resetting the existing overhead guide signs as shown on the Plans. The work includes unbolting and removing the existing sign from sign structure and reattaching the existing sign to the sign structure. Existing materials from removing the existing sign may be reused to reset the existing sign.

The signs' message shall remain visible to turnpike drivers at all times unless other provisions have been approved.

645.02 General

The following sentences are added:

New concrete foundations shall conform to the requirements of Section 626 and shall be in conformance with the Maine Department of Transportation Standard Details in conjunction with the information shown on the Plans.

Breakaway devices shall be B525 or B650 as manufactured by Transpo Industries, Inc. (www.transpo.com).

645.05 Signs

The following paragraphs are added:

The removal and resetting of the mainline signs shall be completed in accordance with the details as shown on the Plans. The Contractor shall keep all signs visible to turnpike drivers except for the period of time necessary to actually complete the relocation. The sign panel shall not be removed and relocated until after the proposed sign support system (foundation and posts) have been installed in the final location. One (1) working day is allowed for the sign relocation.

The Contractor may elect to utilize all new materials or reuse materials from other sign locations that have previously been reset. The cutting of structural steel post shall be accomplished

by mechanical means. The use of burning to cut shall not be allowed. One single connection will be allowed to extend a post to the required length. A full penetration weld or a bolted splice shall be required for the connection. The Contractor shall submit his proposed connection method to the Resident for approval. Any damaged area shall be repaired with two coats of zinc-rich chromium paint. Material removed from an existing sign location and not reused at a proposed sign location shall become the property of the Contractor.

All signs posts on breakaway foundations shall be installed in accordance with the Specifications for breakaway devices. Multipost signs shall be constructed with the required splice as in accordance with the Plans.

645.08 Method of Measurement

The following sentence is added:

Remove and Reset Overhead Mainline Sign shall be measured for payment as one lump sum for each sign number as shown on the Plans.

Remove and Reset Mainline Sign shall be measured for payment as one lump sum for each sign number as shown on the Plans.

645.09 Basis of Payment

The payment for Remove and Reset Mainline Sign and Remove and Reset Overhead Mainline Sign shall be at the Contract lump sum price for each sign number. This payment shall be full compensation for furnishing all new materials, removing, modifying resetting existing material and signs, and all labor and equipment necessary to complete the installation in accordance with the details as shown on the Plans. This may include furnishing and installing new materials such as structural steel, concrete foundations, and single and multipole breakaway devices. Compensation for the excavation and backfill for the concrete foundation, as well as removal of the concrete foundation, shall be included in this item.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
645.501	Remove and Reset Mainline Sign No. 1	Lump Sum
645.502	Remove and Reset Mainline Sign No. 2	Lump Sum
645.503	Remove and Reset Mainline Sign No. 3	Lump Sum
645.504	Remove and Reset Mainline Sign No. 4	Lump Sum
645.505	Remove and Reset Mainline Sign No. 5	Lump Sum

SPECIAL PROVISION

SECTION 645

HIGHWAY SIGNING

(Temporary Remove and Reset Mainline Sign)

645.01 Description

The following paragraphs are added:

This work shall consist of removing and temporarily resetting the existing highway guide signs multiple times as shown on the Maintenance of Traffic Plans. The work includes a combination of the following: removal, resetting, modifying, furnishing, and disposal of concrete foundations, steel posts, wood posts, and breakaway foundations. Existing materials from the existing sign installation may be reused to reset the existing sign or the contractor may provide a temporary sign support system which meets the standard detail vertical and horizontal offset limits from the edge of roadway and is able to withstand wind loading.

645.05 Signs

The following paragraphs are added:

The temporary removal and resetting of the mainline signs shall be completed in accordance with the details as shown on the Plans. The Contractor shall keep all signs visible to drivers except for the period of time necessary to actually complete the relocation. The sign panel shall not be removed and relocated until after the proposed sign support system (foundation and posts) have been installed in the final location. One (1) working day is allowed for the sign relocation.

The Contractor shall submit their proposed sign support method to the Resident for approval. Material removed from the existing sign location and upon completion of temporary use shall become the property of the Contractor.

Breakaway devices will not be required at temporary location when installed behind positive protection barrier.

645.08 Method of Measurement

The following sentence is added:

Temporary Remove and Reset Mainline Sign shall be measured for payment as one lump sum for each sign as shown on the Plans.

645.09 Basis of Payment

The payment for Temporary Remove and Reset Mainline Sign shall be at the Contract lump sum price for each sign number. This payment shall be full compensation for furnishing all

new materials, removing, modifying resetting existing material and signs multiple times as shown on the plans, and all labor and equipment necessary to complete the installation in accordance with the details as shown on the Plans. This may include furnishing and installing temporary materials such as structural steel, multiple wood posts, and concrete foundations. Compensation for the excavation and backfill for the concrete foundation, as well as removal of the concrete foundation, and temporary sign support systems relocated as many times as shown on the Maintenance of Traffic Plans shall be included in this item.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
645.5011 Temporary Remove and Reset Mainline Sign	Lump Sum

SPECIAL PROVISIONSECTION 648FLAGPOLE AND SPOTLIGHT648.01 Description

This work shall consist of furnishing and installation of a 30 foot aluminum flagpole, ground mounted spotlight and concrete foundation in accordance with these Specifications, and in reasonably close conformity with the lines and grades shown on the Plans or as approved by the Resident.

648.02 Materials

Flagpole shall be by American Flagpole, Concord Industries Inc. or EMC, a division of Eder Manufacturing Corp. Flagpole shall be a six inch diameter, seamless cone tapered aluminum 6063-T6 alloy, 30 foot height (exposed) with a mechanical Class I clear anodized finish for two flags. All fittings, such as ball finial, double revolving truck, two halyard and four snap hooks, tow cleats, and pole mounting assembly shall be as manufactured by or recommended by the flagpole manufacturer.

Concrete shall be Class "AAA" cement concrete (4500 PSI).

Reinforcing steel shall meet the requirements of Section 503.

Lighting shall meet the requirements of Part II Division 800.

Flag Spotlights shall be an outdoor, wet location rated inground, LED spot optic uplight with powder coated finish and below grade enclosure. The light shall have IP68 rated wire connectors 5000K CCT (+/- 500) with a 5 year warranty. The Light shall be a Hydrel catalog number M9820ALEDWHT53K MVOLTNSPFLC34BIHLLPDNA or approved equal. The spotlights shall be activated by a building mounted exterior photocell. The spotlights shall be concrete incased on either side of the flagpole as detailed in the plans and the power for the spotlight will come from the toll building power panel.

648.03 General

When flagpole and spotlights are to be stored on-site for an extended period before installation, the pole and lights shall be stored in a dry place, off the ground.

648.04 Method of Measurement

The flagpole and spotlight will be measured by each unit. Conduit, wiring all electrical incidentals are included under Pay Item 800.01 Administration Building.

648.05 Basis of Payment

The accepted quantity of flagpole and spot light will be paid for at the Contract unit price each which payment shall be full compensation for furnishing and installing flagpole, spot lights and all accessories, foundation including anchor bolts, reinforcing steel, rubbing, penetration

sealer, excavation, backfill, compaction, tools, equipment, labor and all incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
648.00 Flagpole and Spotlight	Each

SPECIAL PROVISIONSECTION 652MAINTENANCE 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 December 31, 2019.

Cummings Road Traffic Control Requirements

Two lanes of traffic (one lane in each direction) shall be maintained at all times with the exception of the hours between 7:00 p.m. and 7:00 a.m. Sunday through Thursday nights. During this overnight period, traffic may be reduced to a single lane of alternating one-way traffic. In addition, for operations associated with the construction of the Southbound Toll Plaza access road, traffic may be reduced to a single lane of alternating one-way traffic between 9:00 a.m. and 3:00 p.m. Monday through Friday. Two lanes of traffic shall be maintained at all times between Thanksgiving and Christmas.

Maine Turnpike Mainline Reconstruction

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.

Construction vehicles are prohibited from merging with mainline traffic between 7:00 a.m. and 9:00 a.m. and between 4:00 p.m. and 6:00 p.m.

Maine Turnpike Traffic Control Requirements (I-95 and Route 703)

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 shown in the plans. Minimum widths on the Mainline and Route 703 shall be 12 ft lanes and 2 ft shoulders unless otherwise noted. Minimum ramp widths of 16 ft (12 ft lanes and 2 ft shoulders) must be maintained at all times unless otherwise noted.

A single weekend closure of the southbound On Ramp and Off Ramp, with an off-site detour for the purpose of reconstructing the Ramp A/B ramp crossings to grade early in the contract to allow for anticipated settlement, is permitted as defined in Subsection 107.4.6 Prosecution of Work (Interim Completion Date A). All gravels, pavement, temporary pavement markings, traffic control devices and temporary barrier or guardrail must be installed prior to reopening the ramps. A weekend refers to Friday 9:00 p.m. to the following Monday at 6:00 a.m.

A second weekend closure of the southbound On Ramp and Off Ramp, with an off-site detour for the purpose of reconstructing the southbound Off Ramp (Ramp B) ramp crossing to grade early in the contract to allow for anticipated settlement and connecting the proposed southbound On Ramp (Ramp A) realignment to the existing southbound On Ramp, is permitted as defined in Subsection 107.4.6 Prosecution of Work (Interim Completion Date A). All gravels, pavement, temporary pavement markings, traffic control devices and temporary barrier or guardrail must be installed prior to reopening the ramps. A weekend refers to Friday 9:00 p.m. to the following Monday at 6:00 a.m.

A third weekend closure of the entire interchange, with an off-site detour for the purpose of connecting the new interchange ramps immediately prior to switching fare collection to the new toll plaza facilities, are permitted as defined in Subsection 107.4.6 Prosecution of Work (Interim Completion Date C). All gravels, pavement, temporary pavement markings, traffic control devices and temporary barrier or guardrail must be installed prior to opening the ramps. A weekend refers to Friday 9:00 p.m. to the following Monday 6:00 a.m.

A fourth weekend closure of the entire interchange, with an off-site detour for the purpose of the phase 1 demolition of the existing toll plaza, is permitted as defined in Subsection 107.4.6 Prosecution of Work (Interim Completion Date D). All gravels, pavement, temporary pavement markings, traffic control devices and temporary barrier or guardrail must be installed prior to opening the ramps. A weekend refers to Friday 9:00 p.m. to the following Monday 6:00 a.m.

The northbound on ramp and southbound on ramps may only be closed at the same time, as noted in the plans and/or as noted above. Ramp closures will not be permitted on holiday weekends or any weekend between Thanksgiving and New Year's Day. Overnight ramp closures will be allowed from 9:00 p.m. to 5:00 a.m. the following morning for the purposes of establishing maintenance of traffic phases and any work that cannot be performed due to proximity of the work to the active ramp travel lanes associated with limited ramp widths. The Contractor shall notify the Resident/Authority two weeks prior to all closures. A temporary detour shall be established and maintained at all times in accordance with the detour plan shown in the Plans.

Construction vehicles will not be allowed to cross active ramps. Access to, and egress from, the project site shall be with the direction of travel without crossing traffic.

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.

Portable light towers will be required to illuminate the night construction work area.

Mainline Northbound Exit 44 to Exit 46 Project Start to May 15, 2021 September 19, 2021 to May 14, 2022 September 18, 2022 to May 13, 2023						
		Erection and Removal of Bridge Girders	Equipment Moves	Temporary Lane Closures	Temporary Double 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
Time of Day:	10:00 p.m. to 6:00 a.m. following day	Allowed (10 pm – 5 am)	Allowed	Allowed	Allowed	Allowed
Days of Week:	Friday night through Saturday morning					
Time of Day:	9:00 p.m. to 9:00 a.m. following day		Allowed	Allowed		Allowed
Time of Day:	10:00 p.m. to 6:00 a.m. following day		Allowed	Allowed	Allowed	Allowed

Mainline Northbound Exit 44 to Exit 46 May 16, 2021 to September 18, 2021 May 15, 2022 to September 17, 2022 May 14, 2023 to Contract Completion						
		Erection and Removal of Bridge Girders	Equipment Moves	Temporary Lane Closures	Temporary Double 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
Time of Day:	10:00 p.m. to 6:00 a.m. following day	Allowed (10 pm – 5 am)	Allowed	Allowed	Allowed	Allowed
Days of Week:	Friday night through Saturday morning					
Time of Day:	10:00 p.m. to 8:00 a.m. following day		Allowed	Allowed		Allowed
Time of Day:	11:00 p.m. to 6:00 a.m. following day		Allowed	Allowed	Allowed	Allowed

Mainline Southbound Exit 44 to Exit 46 May 16, 2021 to September 18, 2021 May 15, 2022 to September 17, 2022 May 14, 2023 to Contract Completion						
		Erection and Removal of Bridge Girders	Equipment Moves	Temporary Lane Closures	Temporary Double 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
Time of Day:	10:00 p.m. to 6:00 a.m. following day	Allowed (10 pm – 5 am)	Allowed	Allowed	Allowed	Allowed
Days of Week:	Friday night through Saturday morning					
Time of Day:	10:00 p.m. to 9:00 a.m. following day		Allowed	Allowed		Allowed
Time of Day:	11:00 p.m. to 6:00 a.m. following day		Allowed	Allowed	Allowed	Allowed

Mainline Southbound Exit 44 to Exit 46 Project Start to May 15, 2021 September 19, 2021 to May 14, 2022 September 18, 2022 to May 13, 2023						
		Erection and Removal of Bridge Girders	Equipment Moves	Temporary Lane Closures	Temporary Double 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
Time of Day:	9:00 p.m. to 6:00 a.m. following day	Allowed (10 pm – 5 am)	Allowed	Allowed	Allowed	Allowed
Days of Week:	Friday night through Saturday morning					
Time of Day:	8:00 p.m. to 9:00 a.m. following day		Allowed	Allowed		Allowed
Time of Day:	10:00 p.m. to 6:00 a.m. following day		Allowed	Allowed	Allowed	Allowed

Route 703 Westbound (Entering Ramps)					
		Erection and Removal of Overhead Structures/Signs	Equipment Moves	Temporary Lane Closures	Temporary Shoulder Closures
Days of Week:	Sunday night through Friday morning				
Time of Day:	6:00 p.m. to 2:00 p.m. following day		Allowed	Allowed	Allowed
Time of Day:	10:00 p.m. to 5:00 a.m. following day	Allowed	Allowed	Allowed	Allowed
Days of Week:	Friday night through Saturday morning				
Time of Day:	8:00 p.m. to 2:00 p.m. following day		Allowed	Allowed	Allowed

Route 703 Eastbound (Exiting Ramps)					
		Erection and Removal of Overhead Structures/Signs	Equipment Moves	Temporary Lane Closures	Temporary Shoulder Closures
Days of Week:	Sunday night through Friday morning				
Time of Day:	6:00 p.m. to 6:00 a.m. following day		Allowed	Allowed	Allowed
Time of Day:	10:00 p.m. to 5:00 a.m. following day	Allowed	Allowed	Allowed	Allowed
Days of Week:	Monday through Friday				
Time of Day:	10:00 a.m. to 2:00 p.m.		Allowed	Allowed	Allowed
Days of Week:	Friday night through Saturday morning				
Time of Day:	8:00 p.m. to 2:00 p.m. following day		Allowed	Allowed	Allowed

SPECIAL PROVISIONSECTION 652MAINTENANCE OF TRAFFIC

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 Transportation's 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 an 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 hand held 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 $\frac{1}{2}$ or $\frac{5}{8}$ 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 night time 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 night time 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 weather proof, 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 threshold. **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.

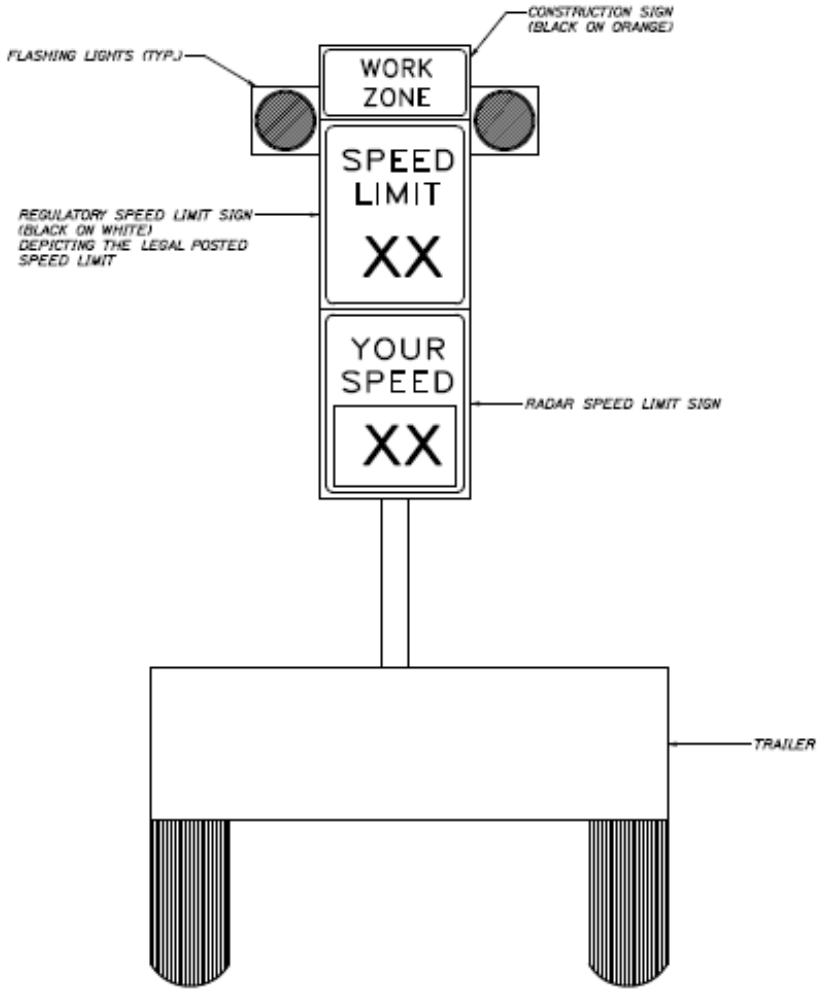
Upon delivery of the Automated Trailer Mounted Speed Limit Sign and before acceptance by the Authority, the Contractor shall have a representative of the manufacturer review the condition and notify the Resident in writing, of all deficiencies noted.

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.

Date: 2/13/2018

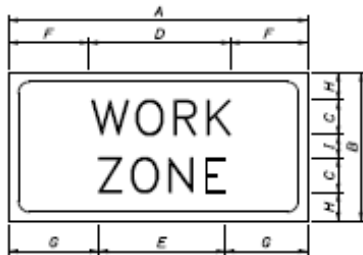
Filename: Trailer Mounted Speed Limit.dgn



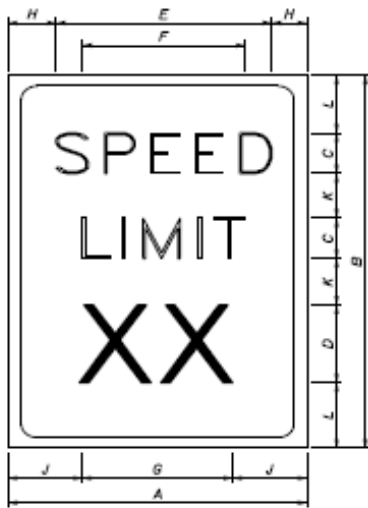
HNTB
FEBRUARY 2018

AUTOMATED TRAILER MOUNTED
SPEED LIMIT SIGN

Date: 2/13/2018



SIGN #1
 1.25" BORDER, 0.75" INDENT,
 BLACK ON ORANGE, BB GRADE PLYWOOD SIGN



SIGN #2
 1.25" BORDER, 0.75" INDENT,
 BLACK ON WHITE, BB GRADE PLYWOOD SIGN

DIMENSIONS (INCHES) / LETTER FONTS												
	A	B	C	D	E	F	G	H	I	J	K	L
*1	48	20	5D	10 1/8	16 1/8	14 1/8	15 1/8	4	2	N/A	N/A	N/A
*2	48	60	8E	16E	30 1/4	29 1/4	29 1/2	4 1/2	9 1/2	9 1/4	8	6



Filename: Trailer Mounted Speed Limit.dgn



HNTB
 FEBRUARY 2018

TRAILER MOUNTED CONSTRUCTION ZONE
 SPEED LIMIT SIGN

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 night time 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 deceleration 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 snow banks.

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 work station. 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 work stations, 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, Inslope 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 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 $\frac{1}{4}$ 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.

Portable-changeable message signs shall be measured for payment by each or by the calendar day for each calendar day that a portable-changeable message sign is used on the project.

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 Contractor's 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.

<u>Amount of Penalty Damages per Violation</u>		
<u>1st</u>	<u>2nd</u>	<u>3rd & Subsequent</u>
\$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.

The accepted quantity of Portable Changeable Message Signs will be paid for at the Contract unit price per calendar day. 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:

<u>Pay Item</u>	<u>Pay Unit</u>
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
652.4101	Portable-Changeable Message Sign	Calendar Day
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 PROVISIONSECTION 652MAINTENANCE OF TRAFFIC

(Temporary Toll Plaza Lane Closures)

The following minimum requirements shall be maintained:

Plaza lanes shall remain available for opening at all times except when the Contractor is performing work in, adjacent to or directly over the plaza lanes. A plaza lane closure is required when danger to the traveling public or turnpike employees may exist. The potential of any material falling onto the roadway shall be considered a potential danger. This shall include, but not necessarily be limited to, demolition debris, water, tools, equipment and material.

A plaza lane closure will be required whenever men or equipment will be present in a plaza lane. The Authority may also require adjacent lanes to be closed to protect the traveling public or turnpike employees. Temporary plaza lane closures will only be allowed at the times outlined in Table A. These hours may be adjusted based on the traffic volume each day by the Resident. Plaza lane closures not completely removed by the ending time specified will be subject to a lane rental fee of \$500.00 per 10 minutes for every 10 minute increment beyond the specified ending time. Temporary plaza lane closures will not be allowed during periods of inclement weather as determined by the Authority. Temporary plaza lane closures may not be allowed on days or times when complete stoppages of traffic for other Authority projects are scheduled. The Authority reserves the right to order removal of approved plaza lane closures.

Requests for temporary traffic lane closures shall be submitted to the Resident for approval. The Resident is required to receive approval from the Maine Turnpike Authority's Director of Fare Collection for all plaza lane closures. The request shall be submitted to the Plaza Supervisor by the Resident at least one (1) working days prior to the day of the requested plaza lane closure. 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.

Some activities, which require plaza lane closures, will be considered favorably for night work. The Contractor shall submit a request in writing to the Resident. The approval of the request will be at the Resident's discretion and will not be unreasonably withheld.

Wide load and E-ZPass lanes may be closed individually from Monday at 8:00 p.m. to Friday at 6:00 a.m. The wide load and E-ZPass lane closures must be scheduled two (2) week in advance, and occur outside of the various Holiday restrictions.

Intermediate single lanes may be closed from Sunday at 8:00 p.m. to Friday at 3:00 p.m. The Intermediate single lanes closures must be scheduled one (1) day in advance, and occur outside of the various Holiday restrictions.

Intermediate multiple lanes may be closed from Sunday at 8:00 p.m. to Friday at 3:00 p.m. The Intermediate multiple lanes closures must be scheduled two (2) days in advance, and occur outside of the various Holiday restrictions.

Table A. Minimum Toll Lane Requirements (open to traffic)
when Temporary Lane Closures are in place

Month	Day/Time	E-Z Pass	Cash
September to May	Any day 8 p.m. to 6 a.m.	1	1
	Any day 6 a.m. to 8 p.m.	1	2
June to August	Any day 8 p.m. to 6 a.m.	1	1
	Friday to Sunday 6 a.m. to 8 p.m.	2	2
	Monday to Thursday 6 a.m. to 8 p.m.	1	2

Work Directly Over Traffic

The Contractor shall not perform any of the following canopy extension work directly over lanes carrying traffic or within 15 feet of the centerline of an open plaza lane (20 feet of the centerline of the wide load lanes):

1. Canopy demolition
2. Welding, burning or grinding
3. Unbolting and removing structural steel
4. Erecting and bolting structural steel
5. Installing and welding metal decking
6. Removing or erecting sign panels
7. Spray painting structural steel

Before the roadway is reopened, all materials shall be secured so they will not endanger traffic passing underneath or alongside.

Traffic Control and Plaza Safety

Appendix G identifies the various plaza traffic control scenarios required to accomplish the work and provide a safe working environment for turnpike employees and safe passage for turnpike patrons. The Contractor shall plan his work accordingly.

SPECIAL PROVISION

SECTION 655

ELECTRICAL WORK

655.01 Description

All work shall be governed by the Standard Specifications except for that work which applies to those sections of the Standard Specifications which are amended by the following modifications, additions and deletions.

Specifically, for the electrical work (in addition to standards specified in individual work sections), the following standards are imposed, as applicable to the work in each instance:

- NEC, National Electrical Code (NFPA No. 70)
- NFPA No. 101, Life Safety Code
- ANSI C 2, National Electrical Safety Code
- ANSI C 73, Dimensions of Attachment Plugs and Receptacles
- NECA standards for installation
- NEMA standards for materials and products
- UL, Underwriters Laboratories

The Contractor will warranty the material supplied by them and their workmanship for a minimum of one (1) year.

655.02 General Provisions

RELATED DOCUMENTS

General provisions of this Contract, including General Provisions and Special Provisions, apply to work of this section.

SUMMARY

This Section specifies several categories of provisions for electrical work, including:

1. Certain adaptive expansions of requirements specified in the Special Provisions.
2. General performance requirements within the electrical systems as a whole.
3. General work to be performed as electrical work, because of its close association.

SUMMARY OF ELECTRICAL WORK

General Outline: The facilities and systems of the electrical work can be described (but not by way of limitation) as follows:

1. Modification of existing electrical service and service/distribution equipment.
2. Installation of electrical control and power distribution systems, including the electrical connections to new equipment.
3. Installation of a replacement stand-by generator including a replacement transfer switch and connections to new equipment.
4. Installation of toll revenue collection systems hardware.
5. Installation of temporary and interim provisions.

Permits and Fees: This work shall include the procurement of and payment for any and all permits and fees required for the performance of the electrical work including those that may be required from local utilities for services.

COORDINATION OF ELECTRICAL WORK

Refer to Part II, Special Provisions for general coordination requirements applicable to the entire work. It is recognized that the Contract documents are often diagrammatic in showing certain physical relationships, which shall be established within the electrical work, and in its interface with other work including utilities and mechanical work, and that such establishment is the exclusive responsibility of the Contractor.

Arrange electrical work in a neat, well organized manner with conduit and similar services running parallel with primary lines of the building construction, and with a minimum of 7'0" overhead clearance where physical limitations permit.

Locate operating and control equipment properly and in accordance with the NEC, to provide easy access, and arrange entire electrical work with adequate access for operation and maintenance.

Coordination of Options and Substitutions: Where the Contract documents permit the selection from several product options, and where it becomes necessary to authorize a substitution, the Contractor shall not proceed with purchases until coordination of all interface requirements has been checked and satisfactorily established. Substitutions are subject to approval by the Authority or designated representative per the requirements of the Contract documents.

SUBMITTALS FOR ELECTRICAL WORK

For electrical work, submittals are required for each category of items listed below.

- Shop Drawings, Product Data, Certifications, Test Reports, Warranties, Guarantees, Installation Drawings, and Plaza Work Checklist in Appendix I.

- Installation Drawings shall be modified and submitted to reflect any changes during installation of electrical equipment.

The Contractor, prior to forwarding shop drawings and product data to the Resident, shall check all conditions, make all corrections and sign and date each set. No shop drawings will be reviewed by the Resident without the signature of the Contractor, which shall signify that he has checked the submittals.

PRODUCTS, ELECTRICAL WORK

Refer to Divisions 600 and 700 of the Standard Specifications for general requirements on products, materials and equipment. The following provisions expand or modify the requirements as applicable to electrical work:

Compatibility: Provide products, which are compatible with other products of the electrical work and with other work requiring interface with the electrical work, including electrical connections and control devices. For exposed electrical work, coordinate colors and finishes with other work.

FLOOR AND WALL PENETRATIONS

Where electrical materials penetrate walls or floors that are a part of a fire separation or assembly, the opening shall be effectively sealed to maintain separation integrity. Openings shall be closed using General Electric RTV850 Silicone RTV Foam, or approved equal to form a fire rated, water-tight seal, and installation with automatic mixing only. The penetration seal materials shall pass ASTM E 814 (UL 1479) Standard Method of Fire Tests for Through Penetration Fire Stops up to the required fire resistance.

Where conduits penetrate a wall, floor or ceiling that is part of a weatherproof barrier, a non-shrink weatherproof type grout and or Sika 1A caulking shall be used, in accordance with manufacturer's installation instructions.

All work, materials, labor to fireproof or waterproof conduit penetrations shall be incidental to the various pay items

EXCAVATING FOR ELECTRICAL WORK

The work of this article is defined to include whatever excavating and back-filling is necessary to install the electrical work. Coordinate the work with other excavating and back-filling in the same area, including de-watering; flood protection provisions, and other temporary facilities. Coordinate the work with other work in the same area, including other underground services (existing and new), paving, and concrete work. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of installations, excavating and back-filling.

General Standards: Except as otherwise required, comply with the applicable provisions of Divisions 600 and 700 of the Standard Specifications for information related to electrical-work excavating and back-filling. Refer instances of uncertain applicability to the Resident for resolution before proceeding.

ELECTRICAL WORK CLOSEOUT

Construction Equipment: After completion of performance testing and the Authority's performance testing, remove Contractor's tools, test facilities, construction equipment and similar devices and materials used in execution of the work but not incorporated in the work.

ELECTRICAL SYSTEM TEST

The Contractor shall submit certification of the adequacy of each power and/or communications circuit for the following sub-systems, where applicable:

- Lane Controller (LC) System
- Automatic Vehicle Identification (AVI) Readers
- Automatic Vehicle Identification (AVI) Antennas
- Digital Video Audit System (DVAS)
- Traffic Control Pedestal (TCP)
- Vehicle Capture and Recognition System (VCARS)
- Canopy Override Switch (COS)
- Manual Lane Terminal (MLT)
- Receipt Printer (RP)
- Stand-by Generator

Verification of the electrical system should be done by turning on/off assigned circuit breakers prior to attachment of equipment to validate panel schedule and that proper voltage is present at termination.

COMMUNICATIONS SYSTEMS

Provide outlets, wireways, device plates, etc., in conformance with the applicable sections of this specification, as may be required.

Wireways shall be in accordance with "Wireways" part of the Technical Specifications and NEC and the following special conditions:

- Minimum size shall be 1 inch unless otherwise noted.
- No more than two standard factory 90-degree bends per 100 feet or three 90 degree 24 inch radius bends and as to adhere to minimum manufacturers bend radius's on data cables.

655.03 Electrical Wireways

RELATED DOCUMENTS

General provisions of the Contract, including General Provisions and Special provisions, apply to work of this section.

SUMMARY

The requirements of this section apply to electrical wireway work specified elsewhere in these Specifications.

The types of electrical wireways required for the project may include the following:

- Electrical metallic tubing.
- Intermediate metal conduit.
- Liquid tight metallic flexible conduit.
- Galvanized rigid metal conduit.
- Nonmetallic conduit. (PVC)
- Surface Plastic NEMA 4R wireways.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in manufacture of electrical wireways of types and capacities required, whose products have been in satisfactory use in similar service for not less than three years.

Contractor: A firm with at least three years of successful installation experience on projects with electrical wiring installation work similar to that required for the project. Under this definition, Contractor can also be a subcontractor to the General Contractor for the Project.

NEMA Compliance: Comply with applicable portions of National Electrical Manufacturers Association standards pertaining to nonmetallic duct and fittings for underground installation.

UL Labels: Provide electrical wireways, which have been listed and labeled by Underwriters Laboratories.

NEC Compliance: Comply with National Electrical Code (NFPA No. 70) as applicable to construction and installation of electrical wireways.

PRODUCT DELIVERY, STORAGE AND HANDLING

Provide color-coded end-cap thread protectors on exposed threads of threaded metal conduit. Handle conduit and tubing carefully to prevent bending and end-damage and to avoid scoring finish. Store pipe and tubing inside and protect from weather. When necessary to store outdoors, elevate well above grade and enclose with durable, watertight wrapping.

MATERIALS AND COMPONENTS

For each electrical wireway system required, provide a complete assembly of conduit or tubing with fittings including, but not necessarily limited to, connectors, nipples, couplings, elbows,

expansion fittings, supports, and other components and accessories as needed to form a complete system of type required.

Metal Conduit, Tubing and Fittings: Provide metal conduit, tubing and fittings of type, grade, size and weight (wall thickness) required for each service. Where type and grade are not indicated, provide proper selection determined to fulfill wiring requirements, and comply with National Electrical Code for electrical wireways.

Rigid Steel Conduit: FS WW-C-581 and ANSI C80.1.

Intermediate Steel Conduit: FS WW-C-581 and ANSI C80.1.

EMT- Electrical Metallic Tubing: FS WW-C-563A, ANSI C80.3 and UL 797. Installation shall comply with NEC Article 348. Provide high quality, hot dip galvanized, electrical metallic tubing conduit and fittings of type, size and weight (wall thickness) required for each application. EMT shall only be used in enclosed areas that are not subject to possible collision or interference. Where type and grade are not indicated, provide proper selection determined to fulfill wiring requirements, and comply with National Electrical Code. Rain-tight compression type connectors shall be used in all cases. Set-screw type conduit connections or fittings shall not be used.

Galvanized Rigid Metal Conduit Fittings: FS W-F-408, Type and Classes as required.

Liquid-tight Flexible Metal Conduit: Provide liquid-tight flexible metal conduit comprised of single strip, continuous, flexible interlocked, double-wrapped steel, galvanized inside and outside; forming smooth internal wiring channel; with liquid-tight jacket of flexible polyvinyl chloride (PVC).

Liquid-tight Flexible Metal Conduit Fittings: FS W-F-406, Type as required.

Nonmetallic Conduit and Fittings (PVC): Provide nonmetallic conduit and fittings of type, size and weight (wall thickness) required for each service. Where type and grade are not indicated, provide proper selection determined to fulfill wiring requirements, and comply with National Electrical Code for electrical wireways, and with type selected in accordance with applicable standards.

Surface Mounted Plastic NEMA 4R Wireways: Provide wireways for surface mounting as required. Wireways shall be of rectangular cross section of size as required by the National Electrical Code (NFPA No. 70) for conductor fill. Wireways shall be of a design to accommodate wiring devices required.

Conduit and Tubing and Wireway Accessories: Provide conduit, tubing and wireway accessories including straps, hangers, angles expansion and deflection fittings as recommended by conduit, tubing and wireway manufacturers.

Mounting strut materials and hardware: Provide corrosion-resistant hot-dip galvanized strut members and stainless steel hardware for all equipment and cabinet mounting applications.

INSTALLATION

Install conduit and tubing products as required, in accordance with manufacturer's written instructions, applicable requirements of NEC and National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve intended function.

Complete the installation of electrical wireways before starting installation of cables within wireways.

Where conduit is installed in earth, it shall be Polyvinyl Chloride (PVC) conduit as specified in the Plans.

PVC conduit shall be used in concrete slabs on grade and where noted in the Plans. Metallic conduit is not permitted in the concrete slabs or in substitution of any PVC conduit locations specified on the Plans without specific authorization by the Authority.

Wherever possible, install horizontal wireway runs above water and steam piping.

Install surface Plastic NEMA 4R wireways and accessories as required on elevations. Carefully coordinate with interior finishes and furnishings.

End bell fittings shall be installed on all conduit ends.

At any point where a conduit crosses an expansion joint, or where movement between adjacent sections of conduit can be expected, bronze or alloy expansion fittings shall be installed equal to Type AX as made by the O.Z. Electrical Manufacturing Co., Inc., or equivalent by Hope or Spring City unless such locations are within conduit specified as non-metallic. Such locations shall be handled with a non-metallic equivalent or as specified in Plans.

The Contractor shall submit a proposed method of attaching all ancillary components to the toll canopy/mast arm to the Resident for approval. The proposed attachment method shall not require drilling, welding or other attachment methods that will damage the toll canopy/mast arm or its coating. Any areas of galvanized coating that are damaged by the Contractor during installation of ancillary components shall be repaired in accordance with ASTM A780.

655.04 Wires and Connectors

RELATED DOCUMENTS

The general provisions of the Contract, including General Provisions and Special Provisions, apply to the work specified in this section.

SUMMARY

The requirements of this section apply to the wire work specified elsewhere in these Specifications.

The applications for wire and connectors required on the project may include the following:

- Power distribution circuitry.
- Lighting circuitry.
- Appliance and equipment circuitry.

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in the manufacture of electrical products of the types and ratings required, whose products have been in satisfactory use in similar service for not less than 3 years.

Contractor: A firm with at least three years of successful installation experience on projects with electrical wiring installation work similar to that required for the project. Under this definition, Contractor can also be a subcontractor to the General Contractor for the Project.

NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical cable, wire and connectors.

UL Labels: Provide electrical cable, wire and connectors, which have been listed and labeled by Underwriters Laboratories.

NEMA/ICEA Compliance: Comply with National Electrical Manufacturers Association/Insulated Power Cable Authorities Association Standards publications pertaining to materials, construction and testing wire cable, where applicable.

PRODUCT DELIVERY, STORAGE AND HANDLING

Provide factory-wrapped water-proof flexible barrier material for covering wire and cable on wood reels, where applicable; and weather resistant fiberboard containers for factory-packaging of cable, wire and connectors, to protect against physical damage in transit. Do not install damaged cable, wire or connectors; remove from project site.

Store wire and connectors in factory-installed coverings in a clean, dry indoor space which provides protection against the weather.

MANUFACTURERS

Provide products produced by one of the following or approved equal (for each type of cable, wire and connectors):

Cable and Wire:

- Anaconda Wire and Cable Co.
- Belden Corp.

- General Cable Corp.
- Phelps Dodge Cable and Wire Co.
- Wire and Cable Dept., General Electric Co.
- Rome Cable Corp.

Connectors:

- AMP Inc.
- Burndy Corp.
- Minnesota Mining and Mfg. Co.
- OZ/Gedney Co.
- Thomas & Betts Co.

WIRE AND CONNECTORS

Except as otherwise required, provide wire and connectors of manufacturer's standard materials, as required by published product information; designed and constructed as recommended by the manufacturer, and as required for the installation.

Wire:

Provide factory-fabricated wire of the size, rating, material and type as required for each service. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements and with NEC standards. Select from only the following types, materials, conductor configurations, insulations, and coverings for 120/208 Volt circuits:

UL Type: THWN. (Sizes #16 AWG wire up to #12 AWG wire)

UL Type: XHHW-2. (Sizes #10 AWG wire up to #2 AWG wire)

UL Type: XHHW-2. (Size 500 MCM)

Material: Copper.

Conductors: (AWG wire 24 to AWG wire 18).

Note: All low voltage signal conductors (including CAT5e and CAT6 data cables) shall be stranded. Conductors for underground, below grade, or in conduit to lane devices shall be shielded and Outdoor (CMX) rated not to be gel filled. Interior building communications cables may be plenum rated for interior wall or cable tray applications.

Concentric-lay-stranded (standard flexibility) (AWG wire 16 and larger).

Interconnection for data communication shall be performed with cables that shall be submitted for approval. The general cable types are designated on the Plans/ Specifications. Minimum bend radius should meet the requirements of the manufacturer and the requirements of the system.

Wire shall be color-coded as noted in the wiring schedules provided in the Plans.

Lead-in cables to extend loop detectors shall be IMSA Type 50-2. Loop lead-in cables shall be manufactured with a size of #14 AWG.

Klik-Its (Power & Tel Enterprise Part #C8820) or approved equivalent shall be used at all loop wire splice locations. All splices must be twisted, soldered and shrink-wrap waterproofed before enclosure is placed.

Home run cables preferably should not be shielded. The use of shielded cable is acceptable provided neither end is grounded.

All cable labeling shall be coordinated with the requirements of the Authority's Toll System Integrator (SI).

INSTALLATION

Install electrical wire and connectors as required, in accordance with the manufacturer's written instructions, the applicable requirements of NEC and the National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve the intended functions.

Coordinate cable and wire installation work with electrical wireway and equipment installation work, as necessary for proper interface.

All wire and cable shall be in first class condition when they are installed. Lo-leak lubricants manufactured for the purpose of a pulling lubricant may be used when necessary.

All wires shall be continuous from outlet and there shall be no unnecessary slack in the conductors.

FIELD QUALITY CONTROL

Prior to energizing, check wire for continuity of circuitry and for short circuits with ohmmeter type testing equipment. Correct malfunction when detected.

Subsequent to wire hook-ups, energize circuitry and demonstrate functioning in accordance with requirements.

655.05 Electrical Boxes and Fittings

RELATED DOCUMENTS

The general provisions of the Contract, including General Provisions and Special Provisions, apply to the work specified in this section.

SUMMARY

The types of electrical boxes and fittings required for the project may include the following:

- NEMA 4X Cabinet for AVI Readers
- Outlet boxes
- Junction boxes
- Pull boxes
- Floor boxes
- Conduit bodies
- Bushings
- Locknuts

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in the manufacture of electrical units of types and sizes required, whose products have been in satisfactory use in similar service for not less than three years.

Contractor: A firm with at least three years of successful installation experience on projects with electrical installation work similar to that required for the project. Under this definition, Contractor can also be a subcontractor to the General Contractor for the Project.

NEC Compliance: Comply with National Electrical Code (NFPA 70) as applicable to construction and installation of electrical boxes and fittings.

U.L. Labels: Provide boxes and fittings, which have been listed and labeled by Underwriters Laboratories.

NEMA Compliance: Comply with National Electrical Manufacturers Association standards as applicable to nonmetallic fittings for underground installation.

NECA Standard: Comply with applicable portions of the National Electrical Contractors Association's "Standard of Installation".

MANUFACTURERS

Provide products produced by one of the following or approved equal (for each type of box and fitting):

Control Cabinet:

- Hammond Manufacturing (provided by SI and installed by the Contractor)

Interior Outlet Boxes:

- Appleton Electric Co.
- Arrow Conduit and Fittings Corp.
- National Electric Products Co.
- OZ/Gedney Co.
- Steel City, Midland-Ross Corp.

Junction and Pull Boxes:

- Arrow-Hart, Inc.
- General Electric Co.
- OZ/Gedney Co.
- Square D Co.
- Unitil

Conduit Bodies:

- Appleton Electric Co.
- Crouse-Hinds Co.
- Killark Electric Mfg. Co.
- Pyle-National Co.

Bushings, Knockout Closures and Locknuts:

- Allen-Stevens Conduit Fittings Corp.
- Allied Metal Stamping, Inc.
- Appleton Electric Co.
- Carr Co.
- Raco, Inc.
- Steel City, Midland-Ross Corp.
- Thomas and Betts Co., Inc.

FABRICATED MATERIALS

Interior Outlet Boxes: Provide galvanized steel interior outlet wiring boxes, of the type, shape and size, including depth of box, to suit each respective location and installation; constructed with stamped knockouts in back and sides, and with threaded holes with screws for securing box covers or wiring devices.

Interior Outlet Box Accessories: Provide outlet box accessories as required for each installation, including mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, compatible with outlet boxes being used and meeting requirements of individual wiring situations. Choice of accessories is Installer's option. All covers for outlet boxes to be stainless steel.

Junction and Pull Boxes: Provide galvanized sheet steel or concrete junction and pull boxes as called for in the Plans with screw-on covers; of the type shape and size, to suit each respective location and installation; with welded seams and equipped with stainless steel nuts, bolts, screws and washers.

Conduit Bodies: Provide galvanized cast-metal conduit bodies, of the type, shape and size, to suit each respective location and installation, constructed with threaded conduit ends, removable cover, and corrosion-resistant screws.

Bushings, Knockout Closures and Locknuts: Provide corrosion-resistant punched-steel box knockout closures, conduit locknuts and malleable iron conduit bushings of the type and size to suit each respective use and installation.

Mounting strut materials and hardware: Provide corrosion-resistant hot dipped galvanized members and stainless steel hardware for all equipment mounting applications. Where strut material is exposed to the weather, and less than 10 feet off the ground, struts shall be stainless steel. When any galvanized strut member or hardware is cut or the galvanizing is compromised, the affected area shall be wire brushed and cleaned to bare metal and the area shall be given two coats of cold galvanizing (following application instructions).

INSTALLATION OF BOXES AND FITTINGS

Install all equipment cabinets in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure the boxes and fittings serve the intended purposes

Install electrical boxes and fittings in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that the boxes and fittings serve the intended purposes:

Provide weatherproof outlets for interior and exterior locations exposed to weather or moisture.

Provide knockout closures to cap unused knockout holes where blanks have been removed.

Locate boxes and conduit bodies to ensure accessibility of electrical wiring.

All boxes shall be rigidly secured in position unless otherwise directed

Where standard boxes are not suitable, provide boxes of special design to suit space and function.

The Contractor shall submit a proposed method of attaching all ancillary components to the toll canopy/mast arm to the Resident for approval. The proposed attachment method shall not require drilling, welding or other attachment methods that will damage the toll canopy/mast arm or its coating. Any areas of galvanized coating that are damaged by the Contractor during installation of ancillary components shall be repaired in accordance with ASTM A780.

655.06 Wiring Devices

RELATED DOCUMENTS

The general provisions of the Contract, including General Provisions and Special Provisions, apply to the work specified in this section.

SUMMARY

Wiring devices are defined as single discrete units of electrical distribution systems, which are intended to carry but not utilize electric energy.

The types of electrical wiring devices required for this project include the following:

- Receptacles
- Switches
- Wall plates
- Plugs
- Connectors
- Breakers

QUALITY ASSURANCE

Manufacturers: Firms regularly engaged in manufacture of wiring devices, of types and ratings required, whose products have been in satisfactory use in similar service for not less than three years.

Contractor: A firm with at least three years of successful installation experience on projects with electrical installation work similar to that required for the project.

NEC Compliance: Comply with National Electrical Code (NFPA No. 70) as applicable to construction and installation of electrical wiring devices.

UL Labels: Provide electrical wiring devices, which have been tested, listed and labeled by Underwriters Laboratories.

NEMA Compliance: Comply with National Electrical Manufacturers Association standards for general- and specific-purpose wiring devices.

MANUFACTURERS

Provide products produced by one of the following:

- Arrow-Hart, Inc.
- Bell Electric Co.
- Bryant Electric Co.
- Crouse-Hinds Co.
- Cutler-Hammer, Inc.
- General Electric Co.
- Gould, Inc.
- Harvey Hubbell Inc.
- Pass and Seymour, Inc.
- Slater Electric, Inc.
- Square D Co.
- Hunt Electronics
- Lutron
- Intermatic
- Paragon
- Unitil

FABRICATED DEVICES

Provide factory-fabricated wiring devices, in type and electrical rating for the service required.

Receptacles: Comply with NEMA Stds. Pub. No. WD1 and as follows:

General-Duty Duplex: Provide duplex general-duty type, spec. grade, receptacles, 2-pole, 3-wire grounding, with green hexagonal equipment ground screw, ground terminals and poles internally connected to mounting yoke, 15-ampere, 125-volts, with metal plaster ears, screw terminal connectors, NEMA configuration 5-15R unless otherwise required.

Heavy-Duty Duplex: Provide duplex type, spec. grade, receptacles, 2-pole, 3-wire grounding, with green hexagonal equipment ground screw, 20-ampere, 125-volts, with metal plaster ears, screw terminal connectors, NEMA configuration L5-20R unless otherwise required.

Switches: Comply with NEMA Stds. Pub. No. WD1 and as follows:

Provide general-duty flush toggle switches, 20-ampere, 120/277 VAC, with mounting yoke insulated from mechanism, equipped with plaster ears, and side-wired screw terminals as follows:

Single pole switches

Double pole switches

Three Way switches

Four Way switches

Breakers: Breakers shall be compatible with existing panel circuits. All breakers necessary will be incidental to the Contract pay items.

WIRING DEVICE ACCESSORIES

Wall Plates: Provide single switch and duplex outlet wall plates for wiring devices, with ganging and cutouts as required, provide with metal screws for securing plates to devices, screw heads colored to match finish of plate, and wall plates possessing the following additional construction features:

Material and Finish: 0.04 inch thick, satin finished stainless steel.

INSTALLATION OF WIRING DEVICES

Install wiring devices where required, in accordance with manufacturer's written instructions, applicable requirements of NEC and National Electrical Contractors Association's "Standard of Installation", and in accordance with recognized industry practices to ensure that products serve intended function.

Delay installation of devices until wiring is completed.

Install receptacles and switches only in electrical boxes that are clean and free from excess building materials, debris, etc.

PROTECTION OF WALL PLATES AND RECEPTACLES

Upon installation of wall plates and receptacles, Contractor shall use caution regarding the use of convenience outlets. At time of completion, replace those items which have been damaged, including those burned and scored by faulty plugs.

TESTING

Test wiring devices to ensure electrical continuity of grounding connections, and after energizing circuitry, to demonstrate compliance with requirements.

655.07 Grounding

SUMMARY

Furnish labor and material to provide grounding facilities for the entire electrical installation as required by all inspecting and jurisdictional authorities as herein specified. The following are included, but not limited to, as items requiring grounding:

- Electrical service neutral conductor.
- Neutral conductor of all transformer secondaries.
- Conduits, boxes and other conductor enclosures. Neutral or identified conductor of interior wiring system.
- Distribution panels, power and lighting panel boards.
- Non-current - carrying parts of fixed equipment, such as transformers, motors, starters, control cabinets, disconnects, lighting fixtures, stand-by generator, etc.
- Metallic cabinets and auxiliary systems cabinets.

EQUIPMENT

Furnish and install all boxes and/or access plates required for installation and inspection of grounding connections to cold water piping system or other made electrodes.

Provide brass identifying tags on all ground clamps.

INSTALLATION

Ground connections made to metallic cold water piping system at such locations as will be readily available for inspection. Provide jumper connections around all meters and shut off devices.

Where cold water piping is not available for ground connections, use other available or made electrodes as described in NEC Section 250.

Conduit Grounding: All grounding bushings within all enclosures, including equipment enclosures, shall be wired together and connected internally to the enclosure grounding lug or grounding bus with bare copper conductor. Grounding conductors sized in accordance with NEC shall be used with all grounding bushings.

Equipment Grounding: All electrical equipment shall be grounded. Most other equipment will be furnished with grounding pads or grounding lugs. All ground connections shall be cleaned immediately prior to connection. The Contractor shall provide all grounding material required but not furnished with the equipment.

No grounding conductor shall be smaller than 12 AWG wire unless it is a part of an acceptable cable assembly.

SPECIAL PROVISIONSECTION 655ELECTRICAL

(Installation of Cash Lane Controller Cabinet)

Related Documents

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

Description

The purpose of this section is to provide information related to the work required to prepare the location for the proposed lane controller (LC) cabinet to be installed by the Contractor. This section provides information on how the work by the Contractor will take the LC into consideration. All work shall be coordinated with the Resident and SI.

Submittals

Five days prior to the removal of the LC cabinet, the Contractor will be required to submit three copies of a neat line sketch of the proposed lane controller cabinet location detailing existing and proposed conduit/wireway runs (calling out conduit/wireway sizes and the specific cables/wires in each conduit/wireway) to the LC, AVI, Sensor loops, TCP, DVAS, MLT, RP, Proximity Reader and COS (As shown in the Plans). Included with this sketch will be the Plaza Work checklist from Appendix I that the Contractor must complete, indicating what cables will be routed into the new LC, how much slack is present in each of these cables, and any extra work that is required. The Resident/SI will have three working days to review the submittal. Work done for this submittal will be incidental to mobilization. After this submittal the exact location of the LC installation will be confirmed by the Resident and the SI. Also to be confirmed by the Resident and the SI will be the number, size and location of the conduits entering the LC cabinet, conduit/wireway layouts in pit and entering the pit, canopy and booth, islands, under slabs, etc.

Installation

The Contractor shall install all conduit/wireway and power, and data wires, associated with the proposed LC within the LC cabinet so as to be able to connect existing and proposed peripherals to the new LC at the time of installation by the SI.

The Contractor will be required to:

- a. terminate clean and dirty power into the LC cabinet or provide alternate termination as directed by the Resident and the SI. Power termination requirements to be confirmed in the field;

- b. pull data/power from lane equipment into the LC cabinet with a 36 inch service loop for all data lines (including 120 volt data);
- c. label each wire coming into the LC cabinet with numbered tags as directed by the Resident and the SI at the start of the project. Tags shall be neat, legible, waterproof, and approved by the SI/ Resident.

Measurement and payment for preparation work associated with the Lane Controller cabinet as shown on the Plan drawings and described herein will be per each item. Installation of the LC cabinet, installation of receptacles, completion of all conduits and wiring associated with the cabinet shall be incidental.

All new conduit/wireway installed will be paid under its appropriate pay item.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
655.012 Installation of Cash Lane Controller Cabinet	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(DVAS Mount Installation)

Description

The Contractor shall mount a Pelco EM2200 hook to the underside of the toll canopy/mast arm to accept a Costar CHG3000S enclosure for the DVAS camera. The Pelco hook shall be supplied by the SI. The Contractor will be responsible for mounting the hook. The mounting hardware shall be mounted directly to the toll canopy and mast arms. Final location shall be approved by the Authority. Any additional hardware required will be incidental to the pay item.

Basis of Payment

Measurement and payment for work the DVAS mount installation as shown on the Plan drawings and described herein will be per each item.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.02	DVAS Mount Installation	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Installation of Sensor Loops)

Description

The Contractor shall sawcut concrete pavement slab as directed by the Resident and according to Plans and detailed manufacturer’s instructions provided prior to installation. Given the proprietary nature of the loop installation requirements, the manufacturer’s instructions will only be provided to the awarded Contractor. Loop installation will involve multiple sawcuts within the limits indicated on the Plans and per manufacturer provided templates. Templates for loop cutting outlines shall be provided by the SI. No loop installation activities shall be done without the SI representative on-site. The SI will install the sensor loops, provide the required materials for sealing the loops, and terminate the loop sensor wiring using Klik-Its provided by the Contractor (see Special Provision Section 655 Electrical Work Subsection 655.04 Wire and Connectors). The Contractor shall be responsible for obtaining and operating required sawcutting equipment. The Contractor shall be responsible for cleaning the saw cut substrate in preparation of the SI installing the loop sensors.

All dust must be contained so that no silica reaches Authority employees or patrons. This may be accomplished by using wet saws, advanced air filter systems or by building an enclosure around the work area. The Contractor shall provide the Resident a 5-day notice prior to any sawcutting activities.

Basis of Payment

Payment to be made as lump sum for all work associated with sawcutting for installation of Sensor loops shown on Plan drawings; including but not limited to, furnishing Klik-Its wire connectors for each individual lane sensor. Sawcutting of concrete, removal and disposal of slurry from wet system sawcutting and substrate cleaning will be incidental to the item.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.041	Installation of Sensor Loops – Southbound	Lump Sum
655.042	Installation of Sensor Loops – Northbound	Lump Sum

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Installation of AVI Antennas)

Description

The Contractor shall pick up AVI antennas and mounting equipment at TransCore’s warehouse located at 190 Riverside Street, Suite 38 in Portland as coordinated by the Resident. The Contractor shall install antennas and mounts in accordance with the manufacturer’s instructions. Antenna wires (LMR 600 Cable) shall be installed, looped, and terminated by the Contractor. If the vendor requires additional work during testing the Contractor must be present to assist.

Basis of Payment

Measurement and payment for work associated with the installation of AVI antennas as shown on the Plan drawings and described herein will be per each item. The Contractor will not pay for the purchase of antennas or the AVI equipment vendor’s presence to tune and test the equipment.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
655.05 Installation of AVI Antennas	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Traffic Control Pedestal (TCP) Preparation Work)

Description

Measurement and payment for preparation work for the TCP as shown on the Plan drawings and described herein will be per each item. Note the procurement and installation of the TCP will be by the SI. Preparation work shall include drilling and installing threaded rods with adhesive and protection of associated wiring for the TCP in advance of installation of the TCP by the SI. The Contractor shall provide the following items or approved equals for the TCP anchorage system:

- 4 each - 1/2" x 6-1/2" Hilti HAS 304SS threaded rods, nuts (double nut), flat and lock washers.
- 4 each - Hilti HVU adhesive capsules.
- 4 each – 1/2" SS nuts and fender washers for shimming and leveling the pedestal base.

Steps involved for installation of threaded rods are as follows:

1. Using the Pedestal Base or Pedestal Base template provided by the System Integrator, layout and drill four 9/16" holes for the 1/2" threaded rods.
2. Using a compressor and wire brush blow gun, clean out the anchor holes.
3. Use the shop vacuum to clean up all of the concrete dust and metal shavings.
4. For all concrete island installations, install the four 1/2 inch Hilti HAS 304SS threaded rods (using HVU adhesive capsules according to the manufacturer's instructions).

Final location of TCP and alignment of threaded rod pattern layout shall be confirmed by the Resident and the SI prior to threaded rod installation.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
655.07 Traffic Control Pedestal Preparation Work	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(AWG Wire)

Description

This task shall include the providing and installation of the AWG wire, as described herein for clean and dirty power wiring, for grounding wires (where applicable) and other locations called for in the Plans and Specifications. All wire installed in conduit must be burial grade, suitable for wet locations.

Basis of Payment

Measurement and payment for the installation of the AWG wire as described herein will be per foot, to the nearest 10 foot interval per run. It shall include the furnishing, installation, routing, termination, splices and connection of the wire per the wiring schedule.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.101	#6 AWG Wire	Linear Foot
655.102	#2 AWG Wire	Linear Foot
655.12	#12 AWG Wire	Linear Foot
655.125	500 MCM Wire	Linear Foot
655.13	#14 AWG Wire	Linear Foot

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(4pr/24 (Category 5e) Cable)

Description

This task shall include the providing and installation of the Category 5e cable shown on the Plan drawings and described herein.

Cable: 4 pair, 24 AWG, Category 5e, twisted pair cable. Conductor material shall be bare copper, inner jacket material shall be PVC, cable shall be insulated, shielded and non-gel filled. Must be direct burial type suited for harsh conditions 4pr/24 category 5e cable, as approved.

Basis of Payment

Measurement and payment for the installation of the 4pr/24 category 5e cable will be by linear foot to the nearest 10 ft. interval. It shall include the furnishing, installation and routing of the cable per the wiring schedule.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.141	4pr/24 (Category 5e) Cable	Linear Foot

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(LMR 600 Cable)

Description

This task shall include the providing and installation of the LMR 600 cable shown on the Plan drawings and described herein. The Contractor shall terminate the LMR 600 Cable with the RF Male-RFN-1006-9L2 and RF Female-RFN-1029-2L2 or equivalent. The male terminal end is at the antenna and the female terminal end is at the AVI Reader. The Contractor shall solder the end of the terminal end pins instead of crimping.

Cable: LMR 600 cable, as approved.

Basis of Payment

Measurement and payment for the installation of the LMR 600 cable will be by linear foot to the nearest 10 ft. interval. It shall include the furnishing, installation, routing of the cable per the wiring schedule and terminating.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
655.151 LMR 600 Cable	Linear Foot

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Fiber Optic Cable)

Description

This task shall include the providing and installation of 62.5/125 micron multimode fiber optic cable as shown on the Plan drawings and described herein. The following Specifications for the selection and installation of fiber-optic cable and associated hardware are intended to ensure a reliable and consistent fiber optic media infrastructure for the MTA. All fiber optic cable termination and the fiber optic patch panels will be provided by the Contractor. Fiber optic patch panels shall be Corning Pretium or approved equal. All fiber termination and testing shall be completed by a technician certified to perform this work.

Cable: 6-Fiber multi-mode Fi, 100 mbs, 62.5/125 Microns, Outdoor Riser Rater, ST (Male) Connection, as approved

Specifications: Fiber installed must meet or exceed the following Specifications:

- Multimode fiber installed cable shall be 62.5/125micron core/cladding, armored, rodent deterrent, enhanced grade, multimode, and graded index glass fiber. All materials in the cable shall be dielectric.
- Installed fiber must meet or exceed the following performance Specifications:

Wavelength (nm)	Max. Attn.(dB/Km)	Min. Bandwidth (Mhz*Km)
850	3.5	200
1,300	1.5	500

- Plenum rated cable shall be used for all interior installations. Plenum rated cable shall be:
 - Tight buffered 900 um
 - Mechanical strippable Teflon (for plenum applications)
 - EIA/TIA -598 color coding for fiber optic cable
 - Aramid yarn strength member
 - Capable of supporting a short-term tensile load of 310 lb. without stretching.
 - Capable of bend radii as small as 20 x outside cable diameter (under installation load) and 10 x outside cable diameter (long term load)
 - Capable of a minimum crush resistance of 160 lb./in.

- Optical Cable Corporation D-Series – Rodent Deterrent Riser Rated Distribution Cable shall be used for exterior installations. Cable from other manufacturers will be considered. All cable installed must be approved by the Authority prior to installation.

All cable is to be fully supported throughout its entire run.

At no time shall more than 310 pounds of tension be placed on any fiber cable while it is being pulled through tray or conduit. It is preferred that all fiber cable be pulled with hand power only. If power winches or mechanical advantage devices are used to pull cable, a tensionometer must be used to ensure that maximum tension is not exceeded. Alternatively, a "mechanical fuse" rated at 300 pounds may be included in the linkage. Torsion shall be avoided by the use of a swivel at the cable end. While under tension, a minimum bend radius of 20 times the outside cable diameter will be maintained through the use of pulleys and sheaves where required. After pulling, no bend may have a radius, at rest, of less than 10 times the outside cable diameter.

Each cable is to be permanently labeled at each end with a unique cable number. In addition, labels shall be affixed to the cable at every transition of a vault, hand hole, riser closet, or major pull box.

Each fiber optic strand shall be labeled with a unique identifier at the ST coupler.

Fiber ends are to be terminated in ST-type connectors. No splices will be permitted. The cable shall be continuous run from building to building and LC to server room fiber switch location.

At each end of the cable, sufficient slack (15 - 30') shall be left to facilitate reasonable future relocation of the fiber switch or LC. Slack shall be mounted on walls or upper ladder racks.

Testing: Contractor shall test all long reels with an OTDR for length and transmission anomalies while on the reel prior to installation. It is suggested that each individual fiber in a cable regardless of length be tested with an OTDR for length and transmission anomalies while on the reel before installation.

All multimode fiber strands shall be tested end-to-end for bi-directional attenuation, 850 nm/1300 nm for multimode. Tests should be conducted in compliance with EIA/TIA-526-14 or OFSTP 14, Method B, according to the manufacturer's instructions for the test set being utilized.

Tests must ensure that the measured link loss for each strand does not exceed the "worst case" allowable loss defined as the sum of the connector loss (based on the number of mated connector pairs at the EIA/TIA-568 B maximum allowable loss of 0.75 dB per mated pair) and the optical loss (based on the performance standard above, 2.1.1 and 2.2.1).

After termination, each fiber shall be tested with an ODTR for length, transmission anomalies, and end-to-end attenuation. Results are to be recorded and supplied to MTA in the form of hard-copy printouts or photographs of screen traces.

After termination each terminated fiber is to be tested for end-to-end loss with a power meter/light source. As above, results are to be recorded and supplied to MTA.

The Contractor shall review all end faces of field terminated connectors with a fiber inspection scope following the final polish. Connector end faces with hackles, scratches, cracks, chips and or surface pitting shall be rejected and repolished or replaced if repolishing will not remove the end face surface defects. The recommended minimum viewing magnifications for connector ends are 100X for multimode fiber.

Basis of Payment

Measurement and payment for the installation of the Fiber Optic cable will be by linear foot to the nearest 10 ft. interval. It shall include the furnishing, installation, termination, testing and routing of the cable per the wiring schedule, as well as installation of fiber optic patch panels.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.16	6 Strand Multi-Modal Fiber Optic Cable	Linear Foot

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(IVIS Homerun Loop Cable (IMSA 50-2 #14))

Description

This task shall include the providing and installation of the IVIS homerun loop cable (IMSA 50-2 #14) shown on the Plan drawings and described herein.

Cable: IMSA 50-2 #14 cable loop detector wire shall be as follows:

- Conductors: Solid or stranded tin copper
- Insulation: Polyethylene
- Conductor Configuration: Twisted pair
- Shield: Aluminum/Mylar tape
- Outer Jacket: Low-density polyethylene

Cable shall have two conductors, #14 AWG, 19 strand. Cable must be direct burial grade suitable for installation in the tunnel, beneath the roadway, within the barrier and any other locations shown on the Plan or described within the design documents. All loop sensor homerun cables shall have tape with length markings.

Basis of Payment

Measurement and payment for the installation of the IMSA 50-2 #14 cable will be by linear foot to the nearest 10 ft. interval. It shall include the furnishing, installation and routing of the cable per the wiring schedule.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
655.17 IVIS Homerun Loop Cable (IMSA 50-2 #14)	Linear Foot

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(PVC Conduit)

Description

This task shall include providing and the installation of PVC Conduit as shown on the Plan drawings and described herein. All conduit shall be installed per NEC specification. Connections to specialized fittings are to be compatible with adjoining conduit.

Joints shall be made in accordance with ASTM D 2855. Solvent cement shall meet the requirements of ASTM D 2564 with particular attention to matching the viscosity to the conduit size.

Joint adhesives shall be in accordance with ASTM D2517.

All conduit runs shall be watertight. Slope conduit to drain into junction boxes.

All empty conduits shall have a labeled pull string. Pull strings shall have length markings and should be used for long conduits over 50 feet or for all underground installations. Clean, plug and seal conduit ends after installation.

Basis of Payment

Measurement and payment for installing PVC Conduit as shown on the Plan drawings and described herein will be per linear foot of each type of underground or exposed conduit actually furnished, installed, and accepted at the Contract price per linear foot. It shall include the furnishing, installing, supporting and connection of the conduit and all various hardware necessary for the installation. This price shall include the cost of hand digging, trenching, or plowing; furnishing and installing the conduit; furnishing special backfilling materials, pull string, fittings, groundings and bonding; test cleaning interiors of conduits and all materials, labor, equipment and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.200	1- 1/2" Schedule 40 PVC Conduit	Linear Foot
655.201	3" Schedule 40 PVC Conduit	Linear Foot
655.2021	1" Schedule 80 PVC Conduit	Linear Foot
655.203	1-1/2" Schedule 80 PVC Conduit	Linear Foot
655.2031	2" Schedule 80 PVC Conduit	Linear Foot
655.204	3" Schedule 80 PVC Conduit	Linear Foot
655.205	4" Schedule 80 PVC Conduit	Linear Foot
655.2052	5" Schedule 80 PVC Conduit	Linear Foot

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Galvanized Rigid Metal Conduit (RMC))

Description

This task shall include providing and the installation of Galvanized RMC as shown on the Plan drawings and described herein. All fittings shall be threaded, or approved compression type (approved by the engineer and compatible with the conduit), so as to be waterproof. Conduit shall be installed and grounded per NEC regulations. All supports shall be hot dipped galvanized or stainless steel (approved by the engineer and compatible with the conduit).

Basis of Payment

Measurement and payment for furnishing and installing the Galvanized RMC as shown on the plan drawings, where necessary, and described herein will be per linear foot actually furnished, installed, and accepted at the Contract price per linear foot. This price shall include the cost of furnishing and installing the conduit; pull string, fittings, groundings and bonding; test cleaning interiors of conduits and all materials, labor, equipment and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.206	1” Galvanized Rigid Metal Conduit	Linear Foot
655.207	1-1/2” Galvanized Rigid Metal Conduit	Linear Foot
655.2071	2” Galvanized Rigid Metal Conduit	Linear Foot
655.208	3” Galvanized Rigid Metal Conduit	Linear Foot

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Liquid Tight Metallic Flexible Conduit)

Description

This task shall include providing and the installation of Liquid Tight Metallic Flexible Conduit as shown on the Plan drawings and described herein. All conduit shall be watertight with flexible PVC coating over galvanized steel flex tubing. Conduit shall be installed and grounded per NEC regulations. All supports for shall be hot dipped galvanized or stainless steel. Connections shall be specialized fittings to be compatible with adjoining conduit and watertight.

Basis of Payment

Measurement and payment for installing the Liquid Tight Metallic Flexible Conduit as shown on the Plan drawings and described herein will be per linear foot actually furnished, installed, and accepted at the Contract price per linear foot. This price shall include the cost of furnishing and installing the conduit; pull string, fittings, groundings and bonding; test cleaning interiors of conduits and all materials, labor, equipment and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.209	1/2" Liquid Tight Metallic Flexible Conduit	Linear Foot
655.2101	1-1/2" Liquid Tight Metallic Flexible Conduit	Linear Foot
655.2102	2" Liquid Tight Metallic Flexible Conduit	Linear Foot

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Electrical Metal Tubing (EMT) Conduit)

Description

This task shall include the installation of the EMT as shown on the Plan drawings and described herein. All fittings shall be an approved compression type (approved by the engineer and compatible with the conduit). Conduit shall be installed and grounded per NEC regulations. All supports for conduit shall be galvanized steel (with similar or better galvanizing than the tubing). Fittings are to be joined using couplings as recommended by the manufacturer.

Basis of Payment

Measurement and payment for installing the EMT as shown on the Plan drawings and described herein will be per foot actually furnished, installed, and accepted at the Contract price per linear foot. This price shall include the cost of furnishing and installing the conduit; pull string, fittings, groundings and bonding; test cleaning interiors of conduits and all materials, labor, equipment and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.211	1-1/2" Electrical Metallic Tubing Conduit	Linear Foot
655.215	3/4" Electrical Metallic Tubing Conduit	Linear Foot

SPECIAL PROVISIONSECTION 655ELECTRICAL

(Installation of Pull Boxes)

Description

This task shall include providing and installing:

- The type A pull box for interior, dry locations as shown on the Plan drawings and detailed herein, or where used elsewhere.
 - Materials: 4" x 4" x 2" steel; equal to Appleton 4SD1 or better.
- The type C pull box as shown on the Plan drawings and detailed herein. The C pull box shall be installed in booth pits, or building utility pits, or where PVC conduit is used.
 - Materials: 18" x 18" x 6" PVC, NEMA 3R.
- The type D pull box as shown on the Plan drawings and detailed herein, or where used elsewhere.
 - Materials: 12" x 12" x 6" NEMA 4X; Stainless Steel.
- The type E pull box as shown on the Plan drawings and detailed herein. The E pull box shall be installed in booths/buildings in dry locations to pull communications cables, or shown elsewhere on the Plans, or where needed to complete the work.
 - Materials: 6" x 6" x 6" steel, indoor rated; equal to Hoffman A-606CH or better.
- The type F pull box as shown on the Plan drawings and detailed herein. The F pull box shall be installed in booth pits, or building utility pits, or where this size is to be used in a wet location or exterior location.
 - Materials: 4" x 4" x 4" plastic, medium duty; equal to or better than Appleton JIC-2
- The type G pull box as shown on the Plan drawings and detailed herein. The G pull box shall be installed in as cast-in-place for booth bumper for access to LP gas going through the bumper.
 - Materials: 8" x 8" x 6" Polymer Concrete, ANSI Tier 5; Hubbell

If equipment is to be installed at a later date insure adequate slack in the junction box for termination and additional 4 inch for possible re-termination. For pass through junction boxes no slack is required. For specific equipment the following guidelines apply:

- Sensor Loops: A single slack loop of 12” – 24” for convenience of splicing.
- DVAS: Slack loop to allow for distance to mounting location of camera plus an additional 3 feet.
- LC: 4 feet of slack at LC mounting location.

Basis of Payment

Measurement and payment for installing the pull boxes as shown on the Plan drawings and described herein will be per each item. It shall include the furnishing, installation, mounting of the box, and the drilling of holes into the box for conduits.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.221	Type A Pull Box Inside	Each
655.222	Type C Pull Box Inside	Each
655.223	Type D Pull Box Outdoor	Each
655.224	Type E Pull Box Inside	Each
655.225	Type F Pull Box Outdoor	Each
655.226	Type G Pull Box Outdoor	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Galvanized Steel Junction Box)

Description

This task shall include providing and installing galvanized steel watertight junction boxes measuring 12” x 12” x 6” to provide an access point from toll canopy column to tolling equipment mounted to the toll canopy as shown in the Plan drawings. Junction boxes must be approved by Resident.

Basis of Payment

Measurement and payment for installing the junction boxes as shown on the Plan drawings and described herein will be per each item. It shall include the furnishing, installation, mounting of the box, and the drilling of holes into the box for conduits.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.30	12” x 12” x 6” Galvanized Junction Box	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(36" X 30" X 20" NEMA 4X Cabinet)

Description

Provide and install NEMA 4X stainless steel equipment cabinets as designated on the Plan drawings to house the AVI Readers. The System Integrator will furnish and install the AVI Readers. Cabinets shall provide equipment mounting rails as appropriate and shall provide sufficient space for the enclosed equipment. Doors for the equipment cabinets shall be secured with standard interchangeable cylinder locks that match the existing (BEST) system presently in use by MTA. A closed cell neoprene gasket shall be utilized to prevent water entry at the door. A handle controlled latching system shall be included to simplify access to the cabinets. The door shall be able to be opened and closed without need for separate latching hardware. A 120-Volt single-phase three-wire circuit shall be furnished and installed for clean and dirty power to a quadplex receptacle (Type 5-15R – half clean/half dirty power) that shall be provided within each cabinet as shown on the Plans. The quadplex receptacles shall be orange/brown with stainless steel cover.

AVI Reader cabinets shall be NEMA-4X with minimum dimensions of:

- o Height 36"
- o Width 30"
- o Depth 20"

AVI Reader cabinets shall be fabricated with internal pieces of aluminum angle that is positioned to support the reader and provide 19 inch wide rack mounting with minimum depth of 15 inches. The AVI Reader and associated contiguous RF rack height is 21.05 inches. Mounting shall be configured per RS-310 (EIA rack spacing).

Basis of Payment

Measurement and payment for installing the NEMA 4X Cabinets as shown on the Plan drawings and described herein will be per each item. It shall include the furnishing, installation, mounting of the box, and the drilling of holes into the box for conduits. Installation of receptacles and completion of all conduits and wiring associated with the cabinet shall be incidental.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
655.42 36" x 30" x 20" NEMA 4X Cabinet	Each

SPECIAL PROVISIONSECTION 655ELECTRICAL

(Power and Communications Cabinet)

The following Section is added:

655.01 Description

This task shall consist of installing two new power and communications cabinet provided by the Contractor on a new concrete foundation as shown on the plans or described herein. The cabinets shall be installed at the NB and SB exit lane toll points.

The cabinets shall include four 36-inch x 36-inch x 4-inch concrete work pads, or two 36-inch wide pads that are equal in width to the cabinet, shall be installed in front and back of the cabinet, at each set of doors. The pads shall be placed on a minimum of four inches of compacted granular material. The pad shall be set with at least one percent grade such that any water on the pad shall flow away from the cabinet. The cabinet shall be secured to the concrete foundation provided by the Contractor as shown in the Contract Documents. Where the work pad is installed on a slope, the depth of the pad shall be increased such that there is at least two inches of the concrete pad below grade.

655.02 Materials

The new power and communications cabinet shall be a NEMA 3R - Safetran model 342 LX with extension base or approved equal.

- a. The cabinet shall protect the electronics and interfaces against sustained winds of 90 miles per hour (MPH), with 120 MPH wind gusts, blowing sand and dust, roadside pollutants from vehicle exhausts, blowing rain and snow and heavy ice accumulations experienced in the project area.
- b. The cabinet doors shall be supplied and installed with Corbin 1548-1 locks for access by #2 keys.
- c. The cabinet shall be supplied with captive door restraint bars. The bars shall allow the doors to be kept open at a minimum of two different angles with one at 90 degrees and the other in the fully open position. The door restraint bars shall be supplied and installed such that the doors are held in place during a 40 MPH wind without the restraint bar being bent. The door restraint bars shall be provided to prevent door movement when open in windy conditions.
- d. Door hinges shall be continuous and bolted to the cabinet and door utilizing steel carriage bolts and nylock nuts. The hinges shall be made of a minimum 0.083-inch thick aluminum and shall have a minimum 0.250-inch diameter stainless steel hinge pin. The hinge pin shall be capped at the top and bottom by a weld to prevent removal.
- e. The top and bottom of the latching pushrods shall contain nylon rollers to promote secure door closure.
- f. The door handle shall be stainless steel. The latching handle shall have provisions for padlocking in the closed position.

- g. The power and communication cabinet shall be covered by a one year dated warranty covering material defects for one year from date of acceptance.
- h. The cabinet shall contain a power switch mounted within the cabinet to control power to all duplex outlets. The cabinet shall include a minimum of two duplex outlets (total of four outlets), each rated for 15 amps.
- i. The Contractor shall supply and install a thermostatically controlled electric fan in the cabinet to maintain the temperature within the field cabinet to that required by the equipment for outside temperatures as specified in these Special Provisions. Thermostats shall have the capability of being field adjusted from 50° F to 120° F.
- j. All exposed, high voltage electrical terminals shall be insulated with non-conducting material such as rubber boots or silicon/rubber caulking.
- k. The cabinet shall be electrically bonded to all of its associated metallic toll mast arm support structure grounding systems, as described elsewhere in this document or in the Contract Documents.
- l. All air venting arrangements shall contain air filters. The air filters shall have an average rated efficiency of 30% and an arresstance of 90% when tested in accordance with ASHRAE 52.1-1992 Test Standard. The filter shall be listed and rated Class 2 by the Underwriters Laboratories. Each cabinet shall be supplied with all required air filters. All fans shall be located above the air filters at the top of the cabinet.
- m. All intake and exhaust vents shall meet NEMA 3R requirements with and without powering the air venting arrangements. All exhaust vents shall be furnished with a screen to prevent insects from entering the cabinet.
- n. The cabinet shall have an internal LED light located in the top of the cabinet inside the door. This light shall automatically turn on when the cabinet door is open and shut off when the door is closed. The light shall be hardwire connected to the cabinet's electrical power distribution buss.
- o. The cabinet shall contain a three phase 60 AMP 12 space clean power panel sub panel for toll equipment.
- p. The cabinet shall contain a fiber optic patch panel for toll communication.

655.05 Measurement of Payment

New power and communications cabinet will be measured by each unit.

655.06 Basis of Payment

The accepted quantity of Power and Communications Cabinet will be paid for at the contract unit price each. The unit price shall include the cabinet, a new reinforced concrete foundation, installing the new cabinet on the new foundation, concrete work pads and all incidentals required to complete the work as shown on the plans or described herein.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.421	Exit Toll Power and Communication Cabinet	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(PVC Conduit Condulets)

Description

This task shall include the installation of PVC condulets where called for on the plans, or where called for on installation drawings. Fittings for PVC condulets are to be joined using couplings and approved solvent, as recommended by the manufacturer. Types of condulets include, but are not limited to “LB”, “T”, “LR”, “LL”. All openings shall have rubber gaskets.

Basis of Payment

Measurement and payment for installing the PVC condulets as described herein will be per item. It shall include the furnishing, installation and mounting of the condulet, and all associated hardware.

Pay Items are as follows:

<u>Pay Item</u>	<u>Pay Unit</u>
655.501 1” PVC Conduit Condulets	Each
655.502 1½” PVC Conduit Condulets	Each
655.503 2” PVC Conduit Condulets	Each
655.504 3” PVC Conduit Condulets	Each
655.505 4” PVC Conduit Condulets	Each
655.506 5” PVC Conduit Condulets	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Rigid Metal Conduit Condulets)

Description

This task shall include the installation of Rigid Metal Conduit Condulets where called for on the plans, or where called for on installation drawings. The condulets shall be hot dipped galvanized and waterproof, with threaded couplings or approved compression type couplings (if recommended by the manufacturer and compatible with adjoining conduit). Types of condulets include, but are not limited to “LB”, “T”, “LR”, “LL”. All openings shall have rubber gaskets.

Basis of Payment

Measurement and payment for installing the condulets as described herein will be per item. It shall include the furnishing and installation and of the condulet, and all associated hardware.

Pay Items are as follows:

<u>Pay Item</u>		<u>Pay Unit</u>
655.512	1” Rigid Metal Conduit Condulets	Each
655.513	1½” Rigid Metal Conduit Condulets	Each
655.514	2” Rigid Metal Conduit Condulets	Each
655.515	3” Rigid Metal Conduit Condulets	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Electrical Metal Tubing Condulets)

Description

This task shall include the installation of Electrical Metal Tubing (EMT) condulets where called for on the plans, or where called for on installation drawings. The condulets shall be hot galvanized steel and waterproof, with approved compression type couplings (if recommended by the manufacturer and compatible with adjoining conduit). Types of condulets include, but are not limited to “LB”, “T”, “LR”, “LL”. All openings shall have rubber gaskets.

Basis of Payment

Measurement and payment for installing the condulets as described herein will be per item. It shall include the furnishing, installation and mounting of the condulet, and all associated hardware.

Pay Items are as follows:

<u>Pay Item</u>		<u>Pay Unit</u>
655.57	1½” Electrical Metal Tubing Condulets	Each
655.58	¾” Electrical Metal Tubing Condulets	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Plastic Wireway)

Description

This task shall include providing and the installation of plastic wireway in the booth pit as shown on the Plan drawings and/or described herein. Wireways shall be plastic NEMA 4R and shall be installed per NEC regulations. All supports for wireways shall be hot dipped galvanized or stainless steel.

Basis of Payment

Measurement and payment for installing the Plastic Wireways as shown on the Plan drawings and described herein will be per foot, to the nearest two foot increment above the final installed segment. It shall include the furnishing, installing, supporting and connection of the wireway and all misc. hardware necessary for the installation. It shall also include all end caps, covers, drilling of holes for conduits, fabrications for 90 degree bends, etc.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.63	4-inch x 4-inch Plastic NEMA 4R Wireway	Linear Foot
655.64	6-inch x 6-inch Plastic NEMA4R Wireway	Linear Foot

SPECIAL PROVISIONSECTION 655ELECTRICAL

(Lightning Suppression System)

655.81 Description

This task shall include furnishing and installing the lightning protection system as described in the Plan drawings and described herein. Drawings and general provisions of this Contract, including General Provisions and Special Conditions, apply to work of this Section.

The task also includes obtaining a UL Master Label Certificate for the completed lightning protection as a UL Class I ordinary structure.

655.82 Submittals

1. Product Data: For air terminals and mounting accessories, grounding conductors, grounding electrodes, and ground connection equipment.
2. Shop Drawings: Detail lightning protection system, including air-terminal locations, conductor routing and connections, and bonding and grounding provisions. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal bodies.
3. Qualifications: Qualification data for firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include data on listing or certification by an NRTL or LPI.
4. Inspection: Field inspection reports indicating compliance with UL Master Label Certification.

655.83 Quality Assurance

1. Installer Qualifications: Engage an experienced installer who is an NRTL or who is certified by LPI as a Master Installer/Designer. Installer shall be UL listed as a lightning protection installer.
2. Listing and Labeling: All system components utilized in the installation shall comply with the Standard for Lightning Protection Components, UL 96A.

655.84 Coordination

Coordinate installation of lightning protection with installation of other tolling systems and components, including electrical wiring, supporting structures and materials, metal bodies requiring bonding to lightning protection components, and finishes.

655.85 Products

Subject to compliance with requirements, provide products by one of the following manufacturers or approved equal:

1. Automatic Lightning Protection.
2. ERICO International Corporation.
3. Harger Lightning Protection, Inc.
4. Heary Bros. Lightning Protection Co. Inc.
5. Independent Protection Co.
6. Robbins Lightning Inc.
7. Thompson Lightning Protection, Inc.

Air Terminals shall be NFPA Class I, solid copper, 3/8" diameter, by 24" tall or 10" tall, as indicated on the Contract Drawings. Main roof conductors as down conductors shall be bare copper in sizes as indicated on the Contract Drawings. Grounding electrodes shall be copper-clad steel, 3/4" diameter by 10'-0" long.

Provide a UL 1449 compliant, Type 1 surge suppression device at the new main service panelboard in the Utility Shed. The device shall be as manufactured by *Eaton*, series SP2-240, or approved equal. The surge suppression device shall have a minimum nominal discharge rating of 20kA and shall be listed on the UL Certification Directory for Type 1 surge protection devices.

655.86 Execution

All work shall conform to the requirements contained in the latest edition of UL 96A, Installation Requirements for Lightning Protection Systems, and in the latest edition of NFPA 780 Standard for the Installation of Lightning Protection Systems.

Install conductors with direct paths from air terminals to ground connections. Conductors shall be supported for their entire length without travel through free air. No bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches.

Conductors shall not be directly attached to aluminum or galvanized steel. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.

Main conductors shall be fastened at intervals not exceeding 3 feet.

Down conductors shall be installed within Schedule 80 PVC conduit for physical protection.

Cable Connections: Use UL listed connectors or approved exothermic-welded connections for all conductor splices and grounding connections.

UL Inspection: Provide inspections as required to obtain a UL Master Label Certification for the system.

LPI Certification: Provide an inspection by an inspector certified by LPI to obtain an LPI certification.

655.87 Method of Measurement

Lightning Suppression Systems will be measured by each lightning suppression system shown on the plans.

655.88 Basis of Payment

The accepted quantity of Lightning Suppression System will be paid for at the Contract unit price per each which shall include excavation, air terminals, grounding rods, heavy duty ground test wells with cover, copper wire, associated hardware for a complete operational system, and system certification.

Payment will be made under:

<u>Item</u>	<u>Description</u>	<u>Unit</u>
655.801	Lightning Suppression System – Southbound Entry and Exit	LS
655.802	Lightning Suppression System – Northbound Entry and Exit	LS

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Key Switch)

Description

A key switch similar to existing key switches in use within the toll system shall be installed in line between clean power panel and power lead for each pair of VES cameras and each DVAS camera.

Basis of Payment

Work shall include furnishing all materials and hardware, and labor and equipment to install. All conduit and wires will be paid under separate pay items.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.81	Key Switch	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL

(Receptacle Boxes)

Description

A convenience duplex outlet of NEMA type 5-15R may be required near new cash lane controllers at a location to be determined by the Resident and the SI and in new toll booths. Covers shall be stainless steel.

A Quadplex receptacle is two NEMA type 5-15R may be required near new cash lane controllers at a location to be determined by the Resident and the SI and in new toll booths. Covers shall be stainless steel.

Basis of Payment

Work shall include furnishing all materials and hardware, and labor and equipment to install. All conduit and wires will be paid under separate pay items.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
655.82	Duplex Receptacle	Each
655.84	Quadplex Receptacle	Each

SPECIAL PROVISION

SECTION 655

ELECTRICAL WORK

(LED Canopy Light Fixture)

655.01 Description

This work shall consist of furnishing and installing (2) new LED light fixtures with housing per lane in the new toll plaza canopy in accordance with these Specifications, and as shown on the Plans or as approved by the Resident.

655.011 General

The Contractor shall submit a shop drawing for installing new LED fixtures for approval.

655.02 Materials

Provide products produced by:

- CREE Inc. – BetaLED 304 Series – PKG-304-40-DM-06-E-UL-BZ-350-J-40K

655.03 Method of Measurement

LED light fixtures will be measured by each unit, installed, and accepted.

655.04 Basis of Payment

LED Canopy Light Fixtures will be paid for at the Contract unit price each which payment shall be full compensation for furnishing and installation of the new fixture, and all other materials, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Unit</u>
655.92 LED Canopy Light Fixture	Each

SPECIAL PROVISIONSECTION 655ELECTRICAL WORK

(Stand-By Generator and Transfer Switch)

655.01 Description

Provide and install a new propane-fired, 3-phase, stand-by generator with a new, 3-phase automatic transfer switch.

The engine-generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: 0.0 deg C (32.0 deg F) to 48.89 deg C (120.0 deg F).
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level

The Contractor shall provide base warranty coverage on the material and workmanship of the generator set from the Manufacturer for a minimum of twenty-four (24) months from Substantial Completion.

The basis for this specification is Kohler KG60, 60Hz, Propane. Approved equals may be considered from the following manufacturers:

- Onan
- Caterpillar/Olympian
- Cummins Power Generation

Maintain alignment of mounted components without depending on concrete foundation; and have lifting attachments. Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.

A skid-mounted outdoor sound attenuated enclosure shall be provided with the manufacturers' standard finish over corrosion-resistant pretreatment and compatible primer. A 12 inch extension base shall be provided.

The electrical output power rating for Standby operation shall be not less than 40.0kW, at 80 percent lagging power factor, 120/208, Parallel Wye, Three phase, 4 -wire, 60 hertz. The alternator shall be capable of accepting maximum 311.0 kVA in a single step and be capable of recovering to a minimum of 90% of rated no load voltage. Following the application of the specified kVA load at near zero power factor applied to the generator set.

The Steady-State Voltage Operational Bandwidth shall be 1.0 percent of rated output voltage from no load to full load. The Transient Voltage Performance shall be not more than 20

percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within 5 seconds. On application of a 100% load step the generator set shall recover to stable voltage within 10 seconds.

The Steady-State Frequency Operational Bandwidth shall be 0.5 percent of rated frequency from no load to full load. The Steady-State Frequency Stability shall be when system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

The Transient Frequency Performance shall be not more than 15 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within 5 seconds. On application of a 100% load step the generator set shall recover to stable frequency within 10 seconds.

At full load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for any single harmonic. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.

For a 3-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 8 seconds without damage to generator system components. For a 1-phase, bolted short circuit at system output terminals, system shall regulate both voltage and current to prevent over-voltage conditions on the non-faulted phases.

Start Time: Comply with NFPA 110, Level 1, Type 10, system requirements.

Ambient Condition Performance: Engine generator shall be designed to allow operation at full rated load in an ambient temperature under site conditions, based on highest ambient condition. Ambient temperature shall be as measured at the air inlet to the engine generator for enclosed units, and at the control of the engine generator for machines installed in equipment rooms.

The Fuel shall be Liquefied Petroleum Gas (Propane). The Rated Engine Speed shall be 1800RPM.

The Lube oil pump shall be positive displacement, mechanical, full pressure pump. A Filter and Strainer shall be provided by the engine manufacturer of record to provide adequate filtration for the prime mover to be used. A Crankcase Drain shall be arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

Provide a Coolant Jacket Heater, electric-immersion type, factory installed in the coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment for heater capacity and performance. The jacket heater shall be designed for operation on a single 120 VAC, Single phase, 60Hz power connection, and shall be installed with isolation valves to isolate the heater for replacement of the element without draining the engine cooling system or significant coolant loss. Provided with a 12VDC thermostat, installed at the engine thermostat housing.

The Governor shall be adjustable isochronous, with speed sensing. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide

fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate as appropriate to the state of the engine generator. Fuel rate shall be regulated as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous states.

The Cooling System shall be closed loop, liquid cooled. The generator set manufacturer shall provide prototype test data for the specific hardware proposed demonstrating that the machine will operate at rated standby load in an outdoor ambient condition of 40 deg C. Coolant shall be a solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer. The size of radiator overflow tank shall be adequate to contain expansion of total system coolant from cold start to 110 percent load condition. The Expansion Tank shall be constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock. A self-contained, thermostatic-control valve shall modulate coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer. Provide a flexible radiator duct adapter flange.

A residential-grade Muffler/Silencer shall be provided with performance as required to meet sound requirements of the application, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements. The Air-Intake Filter shall be engine-mounted air cleaner with replaceable dry-filter element and restriction indicator.

The Starting System shall be 12 or 24V, as recommended by the engine manufacturer; electric, with negative ground. The system shall be sized so the components will not be damaged during a full engine-cranking cycle with ambient temperature at maximum. The Cranking Cycle shall be as required by NFPA 110 for level 1 systems. The Battery Cable shall be sized as recommended by engine manufacturer for cable length as required. Include required interconnecting conductors and connection accessories.

The Battery-Charging Alternator shall be factory mounted on engine with solid-state voltage regulation. The battery charging alternator shall have sufficient capacity to recharge the batteries with all parasitic loads connected within 4 hours after a normal engine starting sequence.

The Battery Chargers shall comply with UL 1236. Provide a fully regulated, constant voltage, current limited, battery charger in a NEMA, Type 1, wall-mounted cabinet. The Battery Charger shall have an equalizing-charging rate based on generator set manufacturer's recommendations shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.

The Battery Chargers shall adjust float and equalize voltages for variations in ambient temperature from minus 20 deg C to plus 40 deg C to prevent overcharging at high temperatures and undercharging at low temperatures. It shall maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.

The Battery Charger shall sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. It shall also sense high

battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel. Provide LED indication of general charger condition, including charging, faults, and modes. Provide an LCD display to indicate charge rate and battery voltage. Charger shall provide relay contacts for fault conditions as required by NFPA110.

Engine generator control shall be microprocessor based and provide automatic starting, monitoring, protection and control functions for the unit. In the Automatic Mode of operation, when mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of generator set. When mode-selector switch is switched to the on position, generator set starts. The off position of same switch initiates generator-set shutdown. (Switches with different configurations but equal functions are acceptable.) When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

In the Manual Mode of Operation, switching on-off switch on the generator control panel to the on position starts generator set. The off position of same switch initiates generator-set shutdown. When generator set is running, specified system or equipment failures or derangements automatically shut down generator set and initiate alarms. Operation of the local (generator set-mounted) and/or remote emergency-stop switch also shuts down generator set.

Operating and safety indications, protective devices, system controls, engine gages and associated equipment shall be grouped in a common control and monitoring panel. Mounting method shall isolate the control panel from generator-set vibration. AC output power circuit breakers and other output power equipment shall not be mounted in the control enclosure.

Provide Indicating and Protective Devices and Controls as required by NFPA 110 for Level 1 system including:

1. AC voltmeter (3-phase, line to line and line to neutral values).
2. AC ammeter (3-phases).
3. AC frequency meter.
4. AC kVA output (total and for each phase). Display shall indicate power flow direction.
5. Ammeter-voltmeter displays shall simultaneously display conditions for all three phases.
6. Emergency Stop Switch: Switch shall be a red "mushroom head" pushbutton device complete with lock-out/tag-out provisions. Depressing switch shall cause the generator set to immediately stop the generator set and prevent it from operating.
7. Fault Reset Switch: Supply a dedicated control switch to reset/clear fault conditions.
8. DC voltmeter (alternator battery charging).
9. Engine-coolant temperature gage.
10. Engine lubricating-oil pressure gage.
11. Running-time meter.
12. Generator-voltage and frequency digital raise/lower switches. Rheostats for these functions are not acceptable. The control shall adjustment of these

- parameters in a range of plus or minus 5% of the voltage and frequency operating set point (not nominal voltage and frequency values.)
13. AC Protective Equipment: The control system shall include over/under voltage, over current, short circuit, loss of voltage reference, and over excitation shut down protection. There shall be an overload warning, and overcurrent warning alarm.
 14. Status LED indicating lamps to indicate remote start signal present at the control, existing alarm condition, not in auto, and generator set running.
 15. A graphical display panel with appropriate navigation devices shall be provided to view all information noted above, as well as all engine status and alarm/shutdown conditions (including those from an integrated engine emission control system). The display shall also include integrated provisions for adjustment of the gain and stability settings for the governing and voltage regulation systems.
 16. Panel lighting system to allow viewing and operation of the control when the generator room or enclosure is not lighted.
 17. DC control Power Monitoring: The control system shall continuously monitor DC power supply to the control and annunciate low or high voltage conditions. It shall also provide an alarm indicating imminent failure of the battery bank based on degraded voltage recover on loading (engine cranking).

The Remote Alarm Annunciator shall comply with NFPA 110. An LED labeled with proper alarm conditions shall identify each alarm event and a common audible signal shall sound for each alarm condition.

The generator, exciter and voltage regulator shall comply with NEMA MG 1. The generator shaft shall be directly connected to engine shaft. The exciter shall be rotated integrally with generator rotor. Electrical Insulation shall be Class H. The Temperature Rise shall be rated for 105degree (C) environment. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, over speed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

The Voltage Regulator shall be SCR type, separate from exciter, providing performance as specified. The voltage regulation system shall be microprocessor-controlled, full wave rectified, and provide a pulse-width modulated signal to the exciter. No exceptions or deviations to these requirements will be permitted. Provide two-thirds pitch stator winding and fully linked amortisseur winding. Subtransient Reactance shall be 15 percent maximum, based on the rating of the engine generator set.

Provide elastomeric isolator pads integral to the generator, unless the engine manufacturer requires use of spring isolation.

Components shall be powder-coated and baked over corrosion-resistant pretreatment and compatible primer in the Manufacturer's standard color.

The generator shall be supplied with a 200-ampere, 3-pole output circuit breaker.

Factory test the engine-generator set using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories. Comply with NFPA

110, Level 1 Energy Converters. In addition, the equipment engine, skid, cooling system, and alternator shall have been subjected to actual prototype tests to validate the capability of the design under the abnormal conditions noted in NFPA110. Calculations and testing on similar equipment which are allowed under NFPA110 are not sufficient to meet this requirement.

The transfer switch shall be guaranteed against defective material and workmanship in accordance with the manufacturer's published warranty for one year from date of start-up.

The Automatic Transfer Switch shall conform to the requirements of:

1. UL 1008--Standard for Automatic Transfer Switches.
2. NFPA 70--National Electrical Code, including use in emergency and standby systems in accordance with Articles 517, 700.
3. NFPA 99--Essential Electrical Systems for Health Care Facilities.
4. NFPA 110--Standard for Emergency and Standby Power Systems.
5. IEEE Standard 446--Recommended Practice for Emergency and Standby Power Systems (Orange Book).
6. IEEE Standard 241--Recommended Practice for Electric Power Systems in Commercial Buildings (Gray Book).
7. NEMA Standard ICS 2-447 Automatic Transfer Switches.

Transfer switches not intended for continuous duty or repetitive load transfer switching are not acceptable. Transfer switches shall be rated in amperes for total system transfer including control of motors, electric-discharge lamps, electric heating, and tungsten-filament lamp load. The Transfer switch shall be rated to withstand the rms symmetrical short circuit current available at the automatic transfer switch terminals, with the type of overcurrent protection specified.

The Transfer switch shall be manufactured by Cummins, Onan, Kohler or AASCO. Transfer switch shall be service entrance rated, 120/208V, 3-pole solid neutral, 200 amperes. The transfer switches shall be furnished in a NEMA 1 enclosure. The withstand and closing ratings with current-limiting circuit breaker protective device shall be 14,000 Amps.

The Transfer switch main contacts shall be of silver composition. All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors. The contact transfer time shall not exceed one-sixth of a second. All moveable parts of the operating mechanism shall remain in positive mechanical contact with the main contacts during the transfer operation without the use of separate mechanical interlocks. All contacts, coils, springs, and control elements shall be conveniently removable from the front of the transfer switch without major disassembly or disconnection of power conductors. The neutral conductor shall be solidly connected as shown on the plans, a neutral conductor terminal plate with fully rated AL-CU pressure connectors shall be provided. Relay contacts shall be included on the transfer switch and be suitable to drive a 120 volt strobe (MTA provided) to indicate when the generator is running. The Transfer switch shall be provided with an auxiliary relay panel.

The control module shall direct the operation of the transfer switch. The module's sensing and logic circuitry must use a solid-state design for maximum reliability and minimum maintenance. The control module shall have a polarized disconnect plug to enable it to be disconnected from the transfer mechanism for routine maintenance. All printed circuit boards for the control module must be conformal coated on both sides for environmental protection. The

control module must be mounted separately from the transfer mechanism unit for safety and ease of maintenance. Interfacing relays shall be industrial control grade plug-in type with dust cover.

The control module shall include lamps to indicate normal or emergency source switch position and normal and emergency source availability. These lamps shall be visible when the enclosure door is closed.

Installation of the generator shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to initial operation and final testing of the system.

The complete generator installation shall be tested to verify compliance with the performance requirements of this specification following completion of all site work. Testing shall be conducted by representatives of the manufacturer, with required fuel supplied by the Turnpike Authority. Tests shall include:

1. Prior to start of active testing, all field connections for wiring, power conductors, and bus bar connections shall be checked for proper tightening torque.
2. Installation acceptance tests to be conducted on site shall include a "cold start" test, a two hour full load (resistive) test, and a one-step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test.
3. Perform a power failure test on the generator installed system. This test shall be conducted by opening the power supply from the utility service and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

The generator equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the Authority.

655.02 Method of Measurement

The Stand-By Generator and Transfer Switch will be measured for payment as one lump sum unit, complete, and accepted.

655.03 Basis of Payment

Payment for installing the generator and transfer switch as described herein will be will be paid for at the Contract Lump Sum price which shall include provision and installation of the

generator, enclosure, battery charger, transfer switch, and all associated hardware and wiring for a complete operational system.

Payment will be made under:

<u>Item</u>	<u>Description</u>	<u>Unit</u>
655.941	Stand-By Generator and Transfer Switch - Southbound	Lump Sum
655.942	Stand-By Generator and Transfer Switch - Northbound	Lump Sum

SPECIAL PROVISION

SECTION 655

ELECTRICAL WORK

(LED Bumper Beacon)

Description

This work shall consist of furnishing and installing one (1) new LED yellow flashing signal head on the center of the front cash lane bumper (surfaced mounted) per lane in the toll plaza cash lanes in accordance with these Specifications, and as shown on the Plans or as approved by the Resident.

General

The Contractor shall submit a shop drawing for installing new LED fixtures for approval.

Materials

Provide the following products per cash lane Bumper Beacon:

- Single section traffic signal 12” housing – Federal Yellow (Black Face), polycarbonate – McCain or equal
- Standard 12” signal tunnel visor – Federal Yellow exterior / Black interior, polycarbonate – McCain or equal
- Dual Circuit Mushroom Flasher unit (1 NB and 1 SB)- Federal Yellow – McCain or equal
- Single 12” LED yellow signal 120V – GE GTx LED Signal Module or equal

Method of Measurement

LED Bumper Beacon will be measured by each unit, installed, and accepted.

Basis of Payment

LED Bumper Beacon will each be paid for at the Contract unit price. Payment shall be full compensation for furnishing and installation of the new Bumper Beacon, and all other materials, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under:

<u>Pay Item</u>	<u>Unit</u>
655.99 LED Bumper Beacon	Each

SPECIAL PROVISIONSECTION 670SEPTIC SYSTEM

The following Section is added:

670.01 Description

This work shall consist of construction of subsurface sewage disposal system with gravity piping to serve the SB Toll Administration Building and sewage pump to serve the NB Toll Administration Building. The work shall include furnishing and installing sanitary sewer piping, proprietary-type distribution system (piping, fittings, adapters, etc.), sewage pump and suitable fill materials. The work shall also include all testing and all other work necessary to complete the construction, all in accordance with these Specifications and as shown on Subsurface Wastewater Disposal System Application (Appendix E) or as directed by the Resident.

All materials, construction methods and details, and approvals shall conform to these Specifications, the Maine Subsurface Wastewater Disposal Rules, Maine Plumbing Code and all other applicable State and Local Laws and Ordinances.

Before beginning work, the Contractor shall verify that all site conditions and elevations that will have a bearing on the work are as shown on the Plans. If any discrepancies are found, the Contractor shall notify the Resident immediately.

Before any portion of the work can be backfilled, the Contractor shall make arrangements to have the Local Plumbing Inspector inspect the work. Backfilling shall proceed pursuant to approval of the work by the Local Plumbing Inspector.

Coordinate work with that of all other trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

Septic tanks shall be located under the parking lots as shown on the plans, and shall have risers and 30" manholes with rim elevations matching the adjacent parking lot elevations.

670.02 Submittals

Shop and working drawing submittals shall include details of all piping, pipe fittings, subsurface disposal system materials, precast concrete structures with risers and manhole and details of interfaces, connections, dimensions, layouts and other pertinent data, including:

Certificates of Compliance for all pipe and precast concrete structures.

670.03 Pipe and Fittings

Gravity sewer pipe (solid) and fittings for the SB toll plaza shall be four inch PVC conforming to ASTM D1785, Schedule 40. Joints shall be integrally formed bell and spigot type, push-on joints conforming to ASTM D3139 with elastomeric gasket conforming to ASTM F477.

Distribution piping, fittings, and adapters for the sewage disposal field shall be as an approved equal as determined by the Resident and as approved by the Rules.

The force main pipe and fittings for the NB toll plaza shall be two inch SDR 21 conforming to ASTM D2241 between the septic tank, sewage pump and leach field.

670.04 Sewage Pump

The sewage pump shall be a Goulds Pump Model 3885WE0511H - single phase (115V) 2" discharge pump, with all the needed components for system operation. The pump will be enclosed in a 4 foot diameter 6 foot deep effluent tank located directly downstream from the septic tank. The effluent tank shall contain a Conery BERS-0200 SST 316 Stainless Steel Base Elbow Rail System 2.00" X 2.00", with stainless steel rail guides and brackets for pump removal and maintenance. The effluent tank shall have a 30 inch diameter riser frame and manhole cover and shall conform to the Catch Basin Frames and Grates as outlined in the 604 SP and be manufactured by EJ Company of Brockton, Massachusetts or an approved equal and shall meet or exceed the AASHTO M306 Loading Requirements. The riser shall be installed to match the adjacent proposed parking lot installation.

The pump and control wiring shall be enclosed in a 1 inch schedule 80 conduit running from the effluent tank to a junction box affixed to the side of the toll building. The pump and control wiring shall be spliced within this junction box and run to the control panel located in the toll utility room. The control panel shall be an Ohio Electric Control individual discrete component control panel and shall be located in the Toll Administration Building toll utility room.

670.05 Special Fill for Disposal Bed

Soil material needed for fill beneath, above and adjacent to the system, including fill extensions, shall be a coarse sand to gravel and meet the requirements of the Maine Subsurface Wastewater Disposal Rules. Crushed stone beneath and adjacent to the chambers as shown on the Plan shall conform to the Rules. The Contractor, prior to bringing the stone and fill material on-site, shall submit a representative five-gallon bucket sample of the disposal bed material to the Resident for approval.

670.06 Insulation

Thermal insulation for the top of the chambers shall be rigid cellular polystyrene in accordance with ASTM C578, Type VII, a minimum two inches thick.

670.07 Bedding Material

Bedding material for pipe and structure subgrades shall be gravel borrow per Subsection 703.20 of the Standard Specifications, except that the largest size particle shall be two inches.

670.08 General Construction

Maintain all excavations in proper condition for carrying on the work, and performing all bailing, draining, or pumping as necessary to keep the excavation free of water.

It shall be the Contractor's responsibility to obtain all necessary permits and pay all fees at no additional cost to the Authority.

Excavation, bracing and sheeting for excavations, dewatering and backfilling shall conform to the requirements of Section 203, Excavation and Embankment, of the Standard Specifications. Trench widths shall be as shown on the Plans. Bedding for the pipes and structures shall be as shown on the Subsurface Wastewater Disposal System Application and as specified herein.

670.09 Excavation

Excavation for trenches and structures shall be as specified in Section 203, Excavation and Embankment, of the Standard Specifications.

Contractor shall provide adequate bracing and shoring of all excavations in accordance with the requirements of all governing codes and regulations.

All existing piping and structures exposed during excavation shall be adequately supported, braced or otherwise protected during construction activities.

670.10 Backfilling

Backfill and compaction for trenches and structures shall be as specified in Subsection 206.03, Backfilling, of the Standard Specifications.

670.11 Disposal Bed

The disposal bed shall be constructed as detailed on the Subsurface Wastewater Disposal System Application, as defined by the "Rules". If unsuitable material is encountered and removed at and below the disposal bed surface, granular fill shall be placed and compacted to bring the grade up to the required bed elevation. The Local Plumbing Inspector shall inspect and approve the prepared leaching bed before placement of fill for the disposal bed. Coarse sand to gravel shall be placed below and adjacent to the stone surrounding the chambers as detailed on the Subsurface Wastewater Disposal System Application.

670.12 Installation of Pipe

Pipe and fittings shall be installed in conformance with ASTM D2321 and as detailed on the drawings and per manufacturer recommendations. Pipe shall be laid on a firm compacted gravel borrow foundation at the line and grade designated. A recess shall be excavated to receive the bell or coupling at each joint if necessary. The piping shall be jointed as specified by the manufacturer to form a watertight joint.

Immediately before laying any pipe, the interior surfaces and ends of sections of pipe shall be cleaned by wiping or other procedure as necessary. All pipe shall be firmly bedded in the underlying soil for its entire length. Joints shall be watertight, adjoining sections of pipe shall form a continuous and smooth invert, spigots shall be fully entered, and the joints shall be slightly flexible. Broken or otherwise damaged pipe shall be replaced at the Contractor's own expense. Pipes shall be kept free

of any deposit or debris. The sewer pipe as laid shall be approved by the Resident before any trench is backfilled or embankment is placed.

Any pipe which is not in true alignment, or which shows any settlement after laying, shall be taken up and re-laid without additional cost to the Authority. Any cribbing or subgrade treatment necessary to prevent settlement shall be placed at the Contractor's own expense.

Any damage to the pipe or invert from any cause shall be promptly repaired by the Contractor at his own expense, before backfill is commenced or water passes through the pipe.

Wherever water piping must cross sewer piping, a vertical separation of 18 inches shall be maintained. In no case shall a water pipe cross under a sewer pipe.

670.13 Testing

Testing/acceptance procedures for the sanitary sewer system shall equal or exceed all state and local requirements.

In case leakage exceeds the above specified amount, the Contractor shall locate the leaks and shall repair them at his own expense. Pipelines with shear-type breaks, fishmouths or damaged gaskets, cracked bells or couplings, hairline fractures, or structural damage of any type shall be replaced in kind. Mechanical sleeve couplings poured concrete collars or similar repairs are not permitted. The use of pressure grouting repair techniques will not be allowed without the written consent of the Resident.

After repairs have been made, the line shall be re-tested and the process of repairing and re-testing shall be repeated until results within the above specified limits are obtained.

670.14 Method of Measurement

All the Sewerage Disposal System work, including but not necessarily limited to, all labor, components, materials, equipment and incidental work necessary for the satisfactory completion of the system will be measured for payment as a lump sum, complete and accepted.

670.15 Basis of Payment

Payment will be made for the accepted Sewerage Disposal System, including all excavation, bedding material, special fill, pipes, fittings, septic tank, effluent pump tank, sewage pump, control panel and wiring, pump guide rail system, backfill, and associated work at the Contract lump sum price, which price shall be full compensation for all labor, materials, equipment and incidental work necessary for the satisfactory completion of the work.

Loam, seed and mulch placed on the completed and accepted sewage disposal system will be paid under their respective pay items.

Payment will be made under:

Pay Item

Pay Unit

670.011 Septic System - Southbound
670.012 Septic System - Northbound

Lump Sum
Lump Sum

SPECIAL PROVISIONSECTION 673STORMWATER FILTER SYSTEM

(Stormwater Soil Filter Bed)

673.01 Description

This work shall consist of constructing a stormwater soil filter bed (Underdrained Soil Filter) to treat stormwater runoff. All work shall be done in accordance with these Specifications and as shown on the Plans, to provide a complete and operating system, and as approved by the Resident.

673.02 Materials

The filter material shall be a thoroughly blended mixture of the following:

- a. Sand shall constitute 50-55 percent by volume of the filter material. Sand shall meet Subsection 703.01, Fine Aggregate for Concrete, except no more than five percent % by weight shall pass the # 200 sieve.
- b. Loam shall constitute 20-30 percent by volume of the filter material. Loam shall be a loamy sand with a clay content between 15-25 percent by weight passing the # 200 sieve.
- c. Bark Mulch shall constitute 20-30 percent by volume of the filter material. Bark Mulch shall be a moderately fine shredded bark mulch with less than five percent by weight passing the #200 sieve.
- d. The Contractor may seek approval from the Resident to use filter material from offsite as provided by a supplier that specializes in providing filter material that complies with the above Specifications and DEP requirements for Stormwater Filters.

673.03 Mixing and Placement

The above materials shall be thoroughly mixed to create a uniform mixture. The stormwater filter material shall be mixed before placement over the top of the underdrain bedding.

The stormwater filter material shall be placed using small equipment (small excavators, small trucks) to distribute the mixed soil material over the top of the underdrain bedding. To preserve filtration characteristics of the material, the stormwater filter material shall not be compacted. Natural compaction over time is preferred over intentional compaction methods. Light compaction due to operation of small equipment operating over the surface of the media to spread the material is acceptable. Such equipment operations shall be minimized to limit compaction. The stormwater filter material shall be graded and leveled to the elevations shown on the Plans and, if required, additional filter material shall be added to fill any depressions or natural settlements that occur prior to acceptance of the work.

673.04 Method of Measurement

The Stormwater soil filter bed will be measured by the number of cubic yards computed using the dimension shown on the Plans for the soil filter bed.

673.054 Basis of Payment

The accepted quantity of stormwater soil filter bed will be paid for at the Contract unit price per cubic yard. Payment shall be full compensation for obtaining the filter bed material, excavating, loading, hauling, mixing, placing, grading, and compacting, and all other materials, tools and labor incidental to the work.

The excavation for the filter bed shall be included for payment under Item 203.20, Common Excavation.

The underdrain for the filter bed and bedding material shall be included for payment under Item 605.016, 6 Inch PVC Underdrain, and Item 605.018, 8 Inch PVC Underdrain.

The drainage geotextile for the filter bed shall be included for payment under Item 620.56, Drainage Geotextile.

The Concrete Barrier Type I – Stormwater Filter but shall be included for payment under Item 526.307, Concrete Barrier Type I – Stormwater Filter.

Payment will be made under:

<u>Pay Item</u>	<u>Pay Unit</u>
673.01 Stormwater Soil Filter Bed	Cubic Yard

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.

SPECIAL PROVISIONSSECTION 800BUILDINGS AND STRUCTURES

(Toll Administration Building)

800.01 Description

Division 800 specifies materials, procedures and requirements for the construction of the Toll Administration Building, complete with all appurtenances, including any and all associated utilities and services within the limits as shown on the Drawings.

The Contractor shall submit to the Resident for approval a cost breakdown of the major components of work for the Toll Administration Building prior to work activities commencing on the building. This breakdown will be used as a basis for monthly pay estimates.

800.02 Work Included

Toll Administration Building construction includes, but is not necessarily limited to, the following:

- Excavating, filling and backfilling for building utilities, services and foundations.
- Fabrication, delivery, and installation of foundation H-Piles.
- Construction of reinforced concrete footings, foundation walls and slabs-on-grade.
- Construction of the Toll Administration Building proper, including all equipment and interior and exterior finishes.
- Furnishing and installing plumbing, heating, ventilating, air conditioning, electrical, data, and telephone, complete with all appurtenances and accessories.
- Furnishing and installing power wires (hot, neutral and ground) from panel DP-1 in the new Toll Administration Building(s) to the lane 1 Booth of the new entry toll plaza(s), complete with all appurtenances and accessories. Note: the conduits outside of the building pay limits are paid for separately.
- Furnishing and installing foundation perimeter 4” diameter underdrain piping, including perimeter 4” diameter underdrain outlet piping. Note: the reducer and 12” OPT III culvert will be paid for separately.
- The Building(s) official acceptance date will be considered the date when the Authority occupies the building for live fare collection operations as described in subsection 107.4.6, Interim Milestone Complete Date C. This date will also commence the building warranty period.

800.03 Method of Measurement

The Toll Administration Building will be measured for payment by the lump sum, for each building complete and accepted.

The horizontal pay limit shall be 5'-0" from the outside of the Toll Administration Building.

All work within this pay limit, including utilities, excavation, backfilling, reinforced concrete foundation, slabs on grade, piles, etc., will be included in this pay item. Work outside of the horizontal pay limit shall be performed under other portions of the Contract documents with the exception of:

- All work associated with the 4" foundation perimeter underdrain piping including the perimeter underdrain outlet piping beyond the 5'-0" horizontal pay limit.

The work described above which shall be included in the Toll Administration Building pay item.

800.04 Basis of Payment

Toll Administration Building construction will be paid for at the lump sum price bid which shall be full compensation for the cost of furnishing all materials, equipment, supplies, tools, incidentals, labor and supervision necessary to satisfactorily complete the work in all respects, to the satisfaction of the Resident. All utility costs to operate the building during construction, testing, commissioning, and general operation will be considered incidental and the Contractor's responsibility until the Authority occupies the buildings for live fare collections, as described in subsection 107.4.6 Prosecution of Work, Interim Completion Date C.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
800.01	Toll Administration Building – Southbound	Lump Sum
800.02	Toll Administration Building – Northbound	Lump Sum

SPECIAL PROVISIONSECTION 800BUILDING AND STRUCTURES

(Toll Plaza Booths, Canopy, Exit Gantry and Tunnel Demolition)

800.31 Description

This work shall consist of all work necessary for the demolition of existing toll plaza booths as well as the demolition of the canopy and the exiting gantry and tunnel as shown on the Plans or described herein.

The contractor shall give the Authority 7 calendar days' notice prior to starting the demolition. The Authority will use this time to remove all material and equipment wanted for salvage. The following work in this item generally includes, but is not limited to the following:

1. The existing canopy shall be removed and disposed of in conformance with all local, State and Federal laws and regulations governing lead based paint and asbestos.
2. The existing exiting gantry shall be removed and disposed when no longer required for toll operations.
3. Toll booths shall be removed, masonry debris shall be disposed of; all other components of shall become property of the Contractor.
4. Granite curb around the toll island shall be removed and shall become property of the contractor.
5. Existing temporary concrete barrier shall be removed and disposed of by the contractor.
6. All mechanical and electrical systems in the tunnel, toll booths, toll canopy and gantry shall be removed and disposed prior to the start of the demolition of those structures.
7. All tolling equipment shall be removed and transported to Transcore's warehouse located at 190 Riverside Drive, Suite 38 in Portland as identified in the Toll Plaza General Notes and as directed by the Resident or Toll Systems Manager.
8. All items to become property of the Authority as identified in the Toll Plaza General Notes shall be transported to the Authority's Sign Shop at Mile 58.3 NB.
9. Any necessary shielding or temporary support during the demolition phasing to ensure structure stability and public safety.

Items not included in this item are:

1. Removal of concrete toll islands, bumpers, pavement slab, top 4 feet of tunnel walls and approach slab will be paid under Item 202.17 Removing Existing Structural Concrete.
2. Removing Asbestos Containing Materials will be paid under Item 202.071.

800.32 Construction Requirements

The Contractor shall take care in removal, transport, and/or storage of any item that is designated to be retained by the Authority.

The Contractor shall ensure that traffic will be protected from debris and construction operations.

800.33 Method of Measurement

The toll plaza booths, canopy and gantry demolition will be measured for payment as one lump sum unit, complete, and accepted.

800.34 Basis of Payment

The accepted quantity of toll plaza booths, canopy and gantry demolition will be paid for at the Contract lump sum price. All labor and materials required shall be incidental to this item.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
800.30	Toll Plaza Booths, Canopy and Gantry Demolition	Lump Sum

SPECIAL PROVISIONSSECTION 800BUILDING AND STRUCTURES

(New Toll Booth Installation)

800.1 Description

Division 800 specifies materials, procedures, and requirements for the construction of the Toll Facilities, comprised of: installation of four toll booths and all associated utilities and services within the limits shown on the Drawings. The work shall be phased as noted on the Plans and outlined in the Specification.

Toll Booth installation includes, but is not limited to the following:

1. Pick up, transport and installation of four (4) toll booths complete with aluminum subframes, floors, doors, windows, counters, etc. Caulking and sealing of booths to concrete is part of the installation.
2. Contractor shall be responsible for providing and installing the booth unit heater exhaust aluminum enclosure (similar to HVAC cassette unit) to enclose the unit heater exhaust/combustion air intake.
3. Furnishing and installing plumbing, heating, ventilating, communications and electrical work in the toll booths and canopy as detailed on the Plans. Electrical work in the toll booths include furnishing and installing a 3 Phase 100 AMP sub-panel fed from the building DP-1 panel and circuit breakers as shown on the electrical panel schedules in Appendix L.
4. Cutting, patching, and sealing as required to complete the work per Plans and Specifications.
5. The toll booth shall be supported by galvanized steel support angles 5" x 3-1/2" x 3/8" (8 ea. @ 12' and 8 ea. @ 4'-8"). The angles shall be installed using 1/2" x 5-1/2" stainless steel wedge anchors (56 each). The Contractor shall provide and install galvanized steel support angles with stainless steel hardware.
6. The top face of the galvanized steel angles that the aluminum booth framing will be bearing on need to be covered with ice/water shield or asphaltic paint to create a barrier between the dissimilar metals.
7. Provide and Install aluminum angle trim: The dimensions of the interior faces of the booth barrier walls are a total of 1" greater than the dimensions of the prefabricated toll booths leaving approximately a 1/2" gap along the sides of the barrier. Install backer rod and Sikasil 728 NS between the booth and top of barrier. Install 1-1/2" x 1-1/2" x 1/4" aluminum angle over the caulked gap; apply a bead of silicone caulking prior to installing the aluminum angle. The provided lengths of aluminum angle are longer than the cut lengths to allow for mitered corners. The 1-1/2" aluminum angle shall be attached using self-drilling hex head stainless steel screws.
8. Provide and Install 6" wide EternaBond EPDM tape to the heat pump roof cassette penetration / unit heater vent bump outs and the aluminum roof skin - an approved equal will be considered for the 6" wide EternaBond EPDM tape.
9. The steel support angle under the toll booth electrical chase will need to be notched for

electrical conduit.

10. Furnishing all needed LP gas line from junction box located in concrete booth bumper, valves, and secondary regulator for the LP Gas Cabinet Unit Heater as noted on the Plans and outlined in this Specification. All gas piping from propane tanks to junction box located in toll lane concrete booth bumpers and from propane tanks to generator is paid for under items 633.031 Propane Service – Southbound and 633.032 Propane Service – Northbound.

The following requirements are included in the LP Gas Cabinet Unit Heater:

- Install 1/2" (Size 18 EHD) Corrugated Stainless Steel tubing from the secondary regulator located in the front booth bumper junction box to each Cabinet Unit Heater (CUH-1) located in the Toll Booths. The 1/2" tubing shall be installed in 2" Schedule 80 PVC conduit as shown on the General Plan Sheet.
- Install a secondary LP gas regulator for the cabinet unit heater in the 16" x 16" x 8" PVC junction box in the front booth concrete bumper.
- At the Cabinet Unit Heaters provide a UL Listed Gas Cock Shut Off Valve and a drip leg.
- Material to be manufactured by Gastite® (or approved equal) corrugated stainless steel tubing complying with ANSI LC 1 "Fuel Gas Piping Systems Using CSST" and listed with CSA®, ICC and IAPMO. Manufacturing materials to be: ASTM A240 type 300 corrugated stainless steel tubing with a minimum wall thickness of .010", jacketing of UV resistant polyethylene meeting the requirements of ASTM E84 for flame spread and smoke density. All mechanical tube fittings are SAE CA360 brass incorporating double wall flare sealing and Jacket-Lock™ jacket capturing for steel tubing protection.

All material associated with Toll Booths installation is included in this item and is shown on the Plan drawings and described in this Special Provision. Electrical and communication items associated with the toll system will be incidental to the toll booth installation item. Furnishing and installing plumbing, heating, ventilating, and electrical items in the toll booths will be paid incidental to the toll booth installation.

Installation includes setting provided aluminum thresholds in non-shrink grout and sealing perimeter of threshold to concrete island with Sikasil-728 NS or approved equal.

The new toll booth roofs are not capable of supporting any structural loads and contractor is responsible for providing any necessary staging or temporary supports for accessing the toll booth roofs.

800.2 Method of Measurement

The Toll Booth installation will be measured for payment by the lump sum, complete, in-place for the Toll Booth installations.

The MTA will supply the toll booths for installation. The contractor shall transport toll

booths from the Authority’s Sign Shop Facility at Mile 58.3 northbound. The installation will include all electrical, mechanical and toll systems required as described in the Plans and within this specification, and all labor, material and equipment needed to provide a fully functioning toll booth will be incidental to this item.

800.3 Basis of Payment

Toll Booths will be paid for at the lump sum price bid which shall be full compensation for the cost of furnishing all materials, equipment, supplies, tools, incidentals, and labor and supervision necessary to satisfactorily complete all work prescribed in Division 800 of these Special Provisions.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
800.401	New Toll Booth Installation – Southbound	Lump Sum
800.402	New Toll Booth Installation – Northbound	Lump Sum

SPECIAL PROVISIONS

DIVISION 800

BUILDING AND STRUCTURES

(Generator Pad)

800.1 Description

The work shall consist of installing a concrete pad for the backup generator as detailed in the project plans and these specifications.

800.2 Materials

Concrete shall be Class “AAA” concrete (4500 PSI) and shall meet the requirements of Section 502.

Reinforcing steel shall meet the requirements of Section 503.

800.3 Method of Measurement

The Generator Pad will be measured for payment by the lump sum, complete, in-place for the Generator Pad installation.

800.4 Basis of Payment

Generator Pad will be paid for at the lump sum price bid which shall be full compensation for the cost of furnishing all materials, equipment, reinforcing steel, ground rods, grounding conductors, terminations, supplies, tools, incidentals, and labor and supervision necessary to satisfactorily complete all work.

Payment will be made under:

<u>Pay Item</u>		<u>Pay Unit</u>
800.901	Generator Pad - Southbound	Lump Sum
800.902	Generator Pad - Northbound	Lump Sum

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART III – DIVISION 800

DIVISION 800

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SECTION 03300

CAST-IN-PLACE (CIP) CONCRETE

PART 1 - GENERAL

- A. Related Documents: Drawings and general provisions of Contract.
- B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

- A. Work included: Provide labor, materials, and equipment necessary to complete the work of this Section and, without limiting the generality thereof, furnish and include the following:
 - 1. The extent of cast-in-place concrete work is shown on drawings and includes (but not by way of limitation) formwork, reinforcing, cast-in-place concrete, accessories, and casting in of items specified under other Sections of the Specifications or furnished by Owner that are required to be built-in with the concrete.
 - 2. Equipment support pads indicated on mechanical drawings to be installed by the Building Contractor.

1.03 RELATED WORK

- A. Miscellaneous Metal: Section 05500
 - 1. Expansion Anchors - Section 05500
 - 2. Embedded Items - Section 05500
- B. Anchor Bolts: Section 05120
- C. Joint Sealants: Section 07900

1.04 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following except where more stringent requirements are shown or specified:

1. ACI 213R-Latest Edition "Guide for Structural Lightweight Aggregate Concrete."
 2. ACI 211.1-Latest Edition "Recommended Practice for Selecting Proportions for Normal Heavyweight and Mass Concrete."
 3. ACI 212.2 Latest Edition "Guide for Use of Admixtures in Concrete."
 4. ACI 301-Latest Edition "Specifications for Structural Concrete for Buildings."
 5. ACI 302.1 Latest Edition "Guide for Concrete Floor and Slab Construction."
 6. ACI 304-Latest Edition "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete."
 7. ACI 304-2 Latest Edition "Placing Concrete by Pumping Methods."
 8. ACI 306 Latest Edition "Cold Weather Concreting."
 9. ACI 308-Latest Edition "Standard Practice for Curing Concrete."
 10. ACI 309-Latest Edition "Recommended Practice for Consolidation of Concrete."
 11. ACI 315-Latest Edition "Details and Detailing of Concrete Reinforcement."
 12. ACI 318-Latest Edition "Building Code Requirements for Reinforced Concrete."
 13. ACI 347-Latest Edition "Recommended Practice for Concrete Formwork."
 14. Concrete Reinforcing Steel Institute, "Placing Reinforcing Bars," Latest Edition.
 15. ACI 211.2-Latest Edition "Standard Practice for Selecting Proportions for Structural Lightweight Concrete."
- B. Materials and installed work may require testing and retesting, as directed by the Architect, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests not specifically indicated shall be done at Owner's expense. Retesting of rejected materials and installed work shall be done at Contractor's expense.
- C. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M for products, facilities and equipment.

1.05 SUBMITTALS

- A. Product Data: Submit manufacturer's product data with application and installation instructions for proprietary materials and items, including reinforcement and forming

accessories, polypropylene fiber admixtures, patching compounds, non-shrink grout, water stops, joint systems, curing compounds, and others as requested by Architect.

B. Shop Drawings:

1. Reinforcement: Submit shop drawings for fabrication, bending and placement of concrete reinforcement. Comply with ACI 315, showing bar schedules, stirrup spacing, and diagrams of bent bars and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures.

C. Samples: Submit samples of materials as specified and as otherwise requested by Architect, including names, sources and descriptions.

D. Laboratory Test Reports: Submit laboratory test reports for concrete materials and mix design test if trial batch method is used for proportioning concrete mixes.

E. Strength Tests: Provide required records of strength tests if field experience method is used for proportioning concrete mixes.

PART 2 - PRODUCTS

2.01 FORM MATERIALS

A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.

1. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with piece bearing legible inspection trademark.

B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.

C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.

2.02 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

- B. Fiber Reinforcing: ASTM C1116, Type III virgin polypropylene fibers as manufactured by FIBERMESH.
1. The Fiber size (length) required shall be based on the largest size of the coarse aggregate in the concrete mix and determined by the manufacturer. Manufacturer shall submit written confirmation as to size of fibers which will be used based on concrete mix specified.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric. Provide welded wire fabric in flat sheets.
- D. Supports for Reinforcement: Provide supports for reinforcement including bolsters, chairs, spacers, and other devices for spacing, supporting and fastening reinforcing bars and welded wire fabric in place. Use wire bar type supports complying with CRSI recommendation, unless otherwise specified. Wood, brick and other devices are not acceptable.
1. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
 2. For exposed-to-view concrete surfaces, where legs of supports are in contact with forms, provide supports with legs which are plastic protected (CRSI, Class I) or stainless steel protected (CRSI, Class 2).

2.03 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I or Type II unless otherwise acceptable to Architect. Use one brand of cement throughout project, unless otherwise acceptable to Architect.
- B. Ground Granulated blast furnace slag: ASTM C989, Grade 100 or 120 (50% maximum/ 30% minimum)
- C. Normal Weight Aggregates: ASTM C 33. Provide from a single source for exposed concrete. Do not use aggregates containing soluble salts or other substances such as iron sulfides, pyrite, marcasite, or ochre which can cause stains on exposed concrete surfaces.
- D. Light Weight Aggregates: ASTM C 330.
- E. Water: Potable.
- F. Air-Entraining Admixture: ASTM C 260.
- G. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C494, Type F or Type G containing not more than 1% chloride ions.
1. Fiber reinforcing shall be added and distributed prior to incorporation of Super Plasticizer.

- H. Normal range water reducing admixture: ASTM C 494 Type A containing no calcium chloride.
- I. Accelerating Admixture: ASTM C 494, Type C or E.
- J. DCI corrosion inhibitor manufactured by WR grace or approved alternate as specified for design mix.
- K. Calcium Chloride not permitted.

2.04 RELATED MATERIALS:

- A. Moisture Barrier: Provide moisture barrier cover over prepared base material where indicated. Use only materials which are resistant to decay when tested in accordance with ASTM E154, as follows:
 - 1. Reinforced Polyethylene sheet not less than 6 mils thick.
- B. Non-Shrink Cement-based Grout: Provide grout consisting of pre-measured, prepackaged materials supplied by the manufacturer requiring only the addition of water. Manufacturer's instructions must be printed on the outside of each bag.
 - 1. Non-shrink: No shrinkage (0.0%) and a maximum 4.0% expansion when tested in accordance with ASTM C-827. No shrinkage (0.0%) and a maximum of 0.2% expansion in the hardened state when tested in accordance with CRD-C-621.
 - 2. Compressive strength: A minimum 28 day compressive strength of 5000 psi when tested in accordance with ASTM C-109.
 - 3. Setting time: A minimum initial set time of 60 minutes when tested in accordance with ASTM C-191.
 - 4. Composition: Shall not contain metallic particles or expansive cement.
- C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M182, Class 2.
- D. Moisture-Retaining Cover: One of the following, complying with ANSI/ASTM C 171.
 - 1. Waterproof paper.
 - 2. Polyethylene film.

3. Polyethylene-coated burlap.

E. Liquid Membrane-Forming Curing Compound:

1. Liquid type membrane forming curing compound complying with ASTM C 309, Type I, Class A unless other type acceptable to Architect. Curing compound shall not impair bonding of any material to be applied directly to the concrete. Demonstrate the non-impairment prior to use.

F. Prefomed Expansion Joint Formers:

1. Bituminous Fiber Type, ASTM D 1751.
2. Felt Void, Poly-Styrene Cap with removable top as manufactured by SUPERIOR.

G. Slab Joint Filler:

1. Multi-component polyurethane sealant (self-leveling type).

H. WaterStop: Duroseal Gasket Waterstop & Duroseal paste by AWS (Absolute Waterproofing Systems, Inc.). Install per manufacturers printed instructions where required.

2.05 PROPORTIONING AND DESIGN OF MIXES

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. Use material, including all admixtures, proposed for use on the project. If trial batch method used, use an independent testing facility acceptable to Architect for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing unless otherwise acceptable to Architect.

B. Submit written reports to Architect of each proposed mix for each class of concrete at least 14 days prior to start of work. Do not begin concrete production until mixes have been reviewed by Architect.

C. Proportion design mixes to provide concrete with the following properties:

1. Interior and exterior concrete.
 - a. Strength: 4000 psi @28 days, 3/8" aggr.
 - b. W/C Ratio: 0.44
 - c. Entrained Air: 4% \pm 1% (optional with interior slabs)
 - d. Slump: 3" \pm 1"
2. Concrete footings and piers.
 - a. Strength: 3000 psi @ 28 days, 3/4" aggr.
 - b. W/C Ratio: 0.46

- c. Entrained Air: 4% \pm 1%
 - d. Slump: 3" \pm 1"
3. Concrete Walls/Frost Walls
- a. Strength: 3500 psi @ 28 days, 3/4" aggr.
 - b. W/C Ratio: 0.44
 - c. Entrained Air: 4% \pm 1%
 - d. Slump: 3" \pm 1"
4. Add air entraining admixture at manufacturers prescribed rate to result in concrete at point of placement having the above noted air contents.
- a. 4% to 8% for maximum 3/4" aggregate.
 - b. 6% to 10% for maximum 3/8" aggregate.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor, when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Architect before using in work.
- 1. Water may be added at the project only if the maximum specified slump and design mix maximum water/cement ratio is not exceeded.
 - 2. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C 94 may be required.

2.06 CONCRETE MIXING

- A. Job-Site Mixing: Will not be permitted.
- B. Ready-Mix Concrete: Must comply with the requirements of ASTM C94, and as herein specified. Provide batch ticket for each batch discharged and used in work, indicating project name, mix type, mix time and quantity.
- 1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required by Engineer.
 - 2. When the air temperature is between 85 degrees F. and 90 degrees F., reduce the mixing and delivery time from 1 1/2 hours to 75 minutes, and when the air temperature is above 90 degrees F., reduce the mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.01 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design, construct, erect, maintain, and remove forms for cast-in-place concrete work in compliance with ACI 347.
- C. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- D. Construct forms to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, keyways, recesses, moldings, rustication's, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like to prevent swelling and for easy removal.
- F. Provide temporary openings where interior area of formwork is inaccessible for clean out, for inspection before concrete placement and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings on forms at inconspicuous locations.
- G. Chamfer exposed corners and edges as indicated, using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- H. Form Ties: Factory-fabricated, adjustable-length, removable or snapoff metal form ties, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
 - 1. Unless otherwise indicated, provide ties so portion remaining within concrete after removal is 1" inside concrete and will not leave holes larger than 1" diameter in concrete surface.
- I. Provision for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- J. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten

forms and bracing after concrete placement as required to eliminate mortar leaks and maintain proper alignment.

3.02 PLACING REINFORCEMENT

A. Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

1. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.
2. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations. Locate and support reinforcing by metal chairs, runners, bolsters, spacers and hangers, as required.
3. Place reinforcement to obtain specified coverages for concrete protection within tolerances of ACI-318. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
4. Fiber Reinforcing shall be introduced directly into the concrete either at the batch plant or job site at the rate of 1.6 pounds (minimum) per cubic yard. If introduced at the batch plant with the aggregate, no extra mixing time is required. If added at the job site, approximately 3 to 5 minutes mixing at agitating speed is required.
5. Install welded wire fabric in flat sheets in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.03 JOINTS

A. Construction Joints: Locate and install construction joints, which are not shown on drawings, so as not to impair strength and appearance of the structure, as acceptable to Architect.

1. Provide keyways at least 1-1/2" deep in construction joints in walls, and slabs; accepted bulkheads designed for this purpose may be used for slabs.
2. Roughened surfaces shall be used between walls and footings unless shown otherwise on the drawings. The footing surface shall be roughened to at least an amplitude of 1/4" for the width of the wall before placing the wall concrete.

3. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
4. Joints in slabs on grade shall be located and detailed as indicated on the drawings. If saw-cut joints are required or permitted, cutting shall be timed properly with the set of the concrete: Cutting shall be started as soon as the concrete has been hardened sufficiently to prevent aggregate being dislodged by the saw, and shall be completed before shrinkage stresses become sufficient to produce cracking.

3.04 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto. Notify other trades to permit installation of their work.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface.

3.05 INSTALLATION OF GROUT

- A. Place grout for base plates in accordance with manufacturer's recommendations.
- B. Grout below setting plates as soon as practicable to facilitate erection of steel and prior to removal of temporary bracing and guys. If leveling bolts or shims are used for erection grout shall be installed prior to addition of any column load.
- C. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

3.06 PREPARATION OF FORM SURFACES

- A. Coat contact surfaces of forms with a form-coating compound before reinforcement is placed.
- B. Thin form-coating compounds only with thinning agent of type, and in amount, and under conditions of form-coating material manufacturer's directions. Do not allow excess form coating to accumulate in forms or to come into contact with concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

3.07 CONCRETE PLACEMENT

- A. **Preplacement Review:** Footing bottoms, structural slab bottoms reinforcement and all work shall be subject to review by the Architect. Verify that reinforcing, ducts, anchors, seats, plates and other items to be cast into concrete are placed and securely held. Notify Architect 48 hours prior to scheduled placement and obtain approval or waiver of review prior to placement. Moisten wood forms immediately before placing concrete where form coatings are not used. Be sure that all debris and other foreign matter is removed from forms.
- B. **General:** Comply with ACI 304, and as herein specified.
1. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.
 2. Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods which will prevent segregation or loss of ingredients and in a manner which will assure that the required quality of the concrete is maintained.
 3. Conveying equipment shall be approved and shall be of a size and design such that detectable setting of concrete shall not occur before adjacent concrete is placed. Conveying equipment shall be cleaned at the end of each operation or work day. Conveying equipment and operations shall conform to the following additional requirements:
 - a. Belt conveyors shall be horizontal or at a slope which will not cause excessive segregation or loss of ingredients. Concrete shall be protected against undue drying or rise in temperature. An arrangement shall be used at the discharge end to prevent apparent segregation. Mortar shall not be allowed to adhere to the return length of the belt. Long runs shall be discharged into a hopper or through a baffle.
 - b. Chutes shall be metal or metal-lined and shall have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal. Chutes more than 20 feet long, and chutes not meeting the slope requirements may be used provided they discharge into a hopper before distribution.
 - c. Pumping or pneumatic conveying equipment shall be of suitable kind with adequate pumping capacity. Pneumatic placement shall be controlled so that segregation is not apparent in the discharged concrete.

- d. The loss of slump in pumping or pneumatic conveying equipment shall not exceed 2 inches. Concrete shall not be conveyed through pipe made of aluminum alloy. Standby equipment shall be provided on the site.
 - e. Tined rakes are prohibited as a means of conveying fiber reinforced concrete.
4. Do not use reinforcement as bases for runways for concrete conveying equipment or other construction loads.
- C. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 18 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, redoing or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI recommended practices.
 2. Use vibrators designed to operate with vibratory equipment submerged in concrete, maintaining a speed of not less than 8000 impulses per minute and of sufficient amplitude to consolidate the concrete effectively. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine, generally at points 18 inches maximum apart. Place vibrators to rapidly penetrate placed layer and at least 6 inches into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion maintain the duration of vibration for the time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix, generally from 5 to 15 seconds. A spare vibrator shall be kept on the job site during all concrete placing operation.
- D. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
1. Consolidate concrete using internal vibrators during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 2. Bring slab surfaces to correct level with straightedge and strikeoff. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations. Do not sprinkle water on plastic surface.
 3. Maintain reinforcing in proper position during concrete placement operations.
- E. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified.

1. When air temperature has fallen to or is expected to fall below 40 deg.F (4 deg.C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg.F (10 deg.C), and not more than 80 deg.F (27 deg.C) at point of placement.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt and other materials containing antifreeze agents or chemical accelerators.
 4. All temporary heat, form insulation, insulated blankets, coverings, hay or other equipment and materials necessary to protect the concrete work from physical damage caused by frost, freezing action, or low temperature shall be provided prior to start of placing operations.
 5. When the air temperature has fallen to or is expected to fall below 40 deg.F, provide adequate means to maintain the temperature in the area where concrete is being placed between 50 and 70 deg.F.
- F. Hot Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg.F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water.
 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
 3. Wet forms thoroughly before placing concrete.
 4. Do not use retarding admixtures without the written acceptance of the Architect.

3.08 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed-to-view in the finish work or by other construction, unless otherwise indicated. This concrete surface shall have texture imparted by form facing material, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 in. in height rubbed down or chipped off.

- B. Smooth Form Finish: For formed concrete surfaces exposed-to-view, or that are to be covered with a coating material applied directly to concrete, or a covering material applied directly to concrete, such as waterproofing, damp-proofing, painting or other similar system. This as-cast concrete surface shall be obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with fins or other projections completely removed and smoothed.
- C. Grout Cleaned Finish: Provide grout cleaned finish to scheduled concrete surfaces which have received smooth form finish treatment. Combine one part Portland cement to 1-1/2 parts fine sand by volume and mix with water to consistency of thick paint. Proprietary additives may be used at Contractor's option. Blend standard Portland cement and white Portland cement, amounts determined by trial patches, so that final color of dry grout will closely match adjacent surfaces.
- D. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.
- E. Related Unformed Surfaces: At tops of walls and grade beams, horizontal offset surfaces occurring adjacent to formed surfaces, strike-off, smooth and finish with a texture matching adjacent unformed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.09 MONOLITHIC SLAB FINISHES

- A. Scratch Finish: Apply scratch finish to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds, and as otherwise indicated.
 - 1. After placing slabs, plane surface to a tolerance not exceeding 1/2 in. in 10 ft. when tested with a 10-ft. straightedge. Slope surfaces uniformly to drains where required. After leveling, roughen surface before final set with stiff brushes, brooms or rakes.
- B. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as hereinafter specified, and slab surfaces which are to be covered with membrane or elastic waterproofing, and as otherwise indicated.
 - 1. After screening, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power-driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to a tolerance not exceeding 1/4 in. in 10 ft. when tested with a 10 ft. straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.

- C. Trowel Finish: Apply trowel finish to monolithic slab surfaces indicated, including slab surfaces to be covered with carpet, resilient flooring, paint or other thin-film finish coating system.
 - 1. After floating, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/4 in. in 10 ft. when tested with a 10-ft. straightedge. Grind smooth any surface defects which would telegraph through applied floor covering system.
- D. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.
 - 1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.10 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with the requirements of ACI 306 as herein specified.
 - 1. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
 - 2. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
 - a. Curing shall be continued for at least 7 days in the case of all concrete except high-early-strength concrete for which the period shall be at least 3 days. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the specified strength, f'c. If one of the curing procedures below is used initially, it may be replaced by one of the other procedures any time after the concrete is 1 day old provided the concrete is not permitted to become surface dry during the transition.

3. When the mean daily temperature is less than 40 deg.F, the temperature of the concrete shall be maintained between 50 and 70 deg.F for the required curing period.
 - a. When necessary, arrangements for heating, covering, insulation, or housing the concrete work shall be adequate to maintain the required temperature without injury due to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.
 - b. Keep protections in place and intact at least 24 hours after artificial heat is discontinued. Avoid rapid dry-out of concrete due to overheating and avoid thermal shock due to sudden cooling or heating.
 - c. Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 5 deg.F in any 1 hour or 50 deg.F in any 24 hour period.
- B. Curing Methods: Perform curing of concrete by moist curing, by moisture-retaining cover curing, by curing compound, and by combinations thereof, as herein specified.
 1. Provide moisture curing by following methods:
 - a. Keep concrete surface continuously wet by covering with water.
 - b. Continuous water-fog spray.
 - c. Covering concrete surface with specified absorptive cover, thoroughly saturating cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-in. lap over adjacent absorptive covers.
 2. Provide moisture-cover curing as follows:
 - a. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 in. and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Provide curing compound to slabs as follows:
 - a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.

- b. Separating compound may be used as a curing medium if applied in accordance with manufacturer's specifications.
- C. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- D. Protection From Mechanical Injury: During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials, or methods, by application of curing procedures, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

3.11 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 deg.F (10 deg.C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be

damaged by form removal operations, and provided curing and protection operations are maintained.

- B. Formwork supporting weight of concrete, such as beam soffits, joints, slabs and other structural elements, may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.
- C. Form facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form facing material without loosening or disturbing shores and support.

3.12 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid

offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Architect.

3.13 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.

3.14 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to the Architect.

1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with

patching. Compact mortar in place and strike-off slightly higher than surrounding surface.

- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Architect. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins, and other projections on surface and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
3. Correct low areas in unformed surfaces during, or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Proprietary patching compounds may be used when acceptable to Architect.
4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 inch

- clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in the same manner as adjacent concrete.
5. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
 6. Use epoxy-based mortar for structural repairs, where directed by the Architect.
 7. Repair methods not specified above may be used, subject to acceptance of the Architect.

3.15 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. The Contractor shall employ a testing laboratory to inspect, sample and test the materials and the production of concrete and to submit test reports. Concrete testing shall be performed by technicians certified by the Maine Concrete Technician Certification Board.
- B. Concrete shall be sampled and tested for quality control during placement of concrete and shall include the following, unless otherwise directed by Architect.
- C. Sampling Fresh Concrete: ASTM C 172.
 1. Slump: ASTM C 143; one test for each concrete load at point of discharge and one test for each set of compressive strength test specimens. A slump test must be run prior to the incorporation of the CFP fibers per recommendations of ACI 544.
 2. Air Content: ASTM C 231 "Pressure method for normal weight concrete." One for each set of compressive strength test specimens.
 3. Concrete Temperature: Test hourly when air temperature is 40 deg.F (4 deg.C) and below, and when 80 deg.F (27 deg.C) and above; and each time a set of compression test specimens are made.
 4. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory cured test specimens except when field-cure test specimens are required.

- a. Fiber reinforced concrete test specimens shall be vibrated externally per recommendations ACI 544.
5. Compressive Strength Tests: ASTM C39; one set for each 100 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; 1 specimen tested at 7 days, 2 specimens tested at 28 days, and 1 specimen retained in reserve for later testing if required.
- a. When frequency of testing will provide less than 5 strength tests for a given class of concrete, conduct testing from at least 5 randomly selected batches or from each batch if fewer than 5 used.
 - b. When total quantity of a given class of concrete is less than 50 cu. yds., strength test may be waived, if in the Architect's judgement, adequate evidence of satisfactory strength is provided.
 - c. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.
 - d. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.
 - e. Test results will be reported in writing to Architect and Contractor on the day after tests are made. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- D. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by the Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods, as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.

3.16 ENGINEER'S REVIEW

- A. The Engineer of Record will conduct periodic reviews of the construction for compliance with the provisions of the Design Documents during the construction period.
- B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for construction not in conformance with the provisions of the

Contract Documents. These modifications and repair details shall be stamped by an engineer licensed to practice in the State of Maine and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION

SECTION 042000UNIT MASONRY, GENERAL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Contract Conditions all other Technical Specifications Sections apply to work of this Section insofar as applicable.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. The location of each type of unit masonry work is shown on the Drawings. In general, the work includes the following:
 - 1. CMU walls and applied weatherproofing.
 - 2. Brick facing and precast concrete sills.
 - 3. All ties, reinforcement and anchors required for securing all masonry work together and to adjacent work, except as otherwise specified.
 - 4. All through-wall metal and fabric flashing.
 - 5. Rigid cavity wall insulation and loose fill CMU insulation.
 - 6. Setting and/or building in all flashing, frames, windows, blocking, loose steel lintels, plates, anchors, bolts, ties, sleeves, door and frame, access doors, and all other items requiring building into work of this section.
 - 7. Cutting and patching of work in this section as required for the work of other sections.
 - 8. Cleaning and pointing.
 - 9. Submission of samples and shop drawings as specified or otherwise requested by the Engineer.
 - 10. Construction of one sample masonry panel for each type of masonry to be used, for Engineer's approval. Each panel will measure approximately 4'-0" x 4'-0".
- B. Masonry Mortar and Grout are specified in Section 042000.12.
- C. Masonry Accessories and Precast Concrete Sills are specified in Section 042000.13.
- D. Brick Masonry is specified in Section 042113.
- E. Concrete Masonry Units are specified in Section 042200.

1.03 QUALITY ASSURANCE

- A. Comply with provisions of following codes, specifications and standards, except as otherwise indicated.
1. "BIA Technical Notes on Brick Construction", except as herein modified.
 2. "Building Code Requirements for Engineered Brick Masonry" from the "BIA Technical Notes".
 3. ACI 531 "Building Code Requirements for Concrete Masonry Structures".
 4. ACI 531.1 "Specification for Concrete Masonry Construction".
 5. ANSI/NBS H74 (A41.2) "Building Code Requirements for Reinforced Masonry".
 6. ANSI/NBS 211 (A41.1) "Building Code Requirements for Masonry".

Where provisions of above codes and standards conflict with building regulations in effect for this Project, the building regulations will govern, but only to establish minimum requirements.

B. Coordination:

Review installation procedures and coordinate with other work that must be integrated with masonry.

C. Test for Masonry Materials:

Test prisms of materials in accordance with ASTM Standard E 447. The fully grouted prism strength shall be greater than 2700 psi.

Not less than three specimens shall be made for each initial preliminary test. Not less than three shall be made for each field test to confirm that the materials are as assumed in the design. The standard age of test specimens shall be 28 days, but seven-day tests may be used provided the relationship between the seven-day and 28-day strengths of the masonry is established by adequate data for the materials used.

Make at least three field tests during construction. Test specimen for grout shall be field formed in accordance with UBC Standard No. 24-22 (NCMA TEK 23A). The compressive strength of grout shall be determined by testing field formed specimen in a damp condition in accordance with applicable provisions of ASTM C 39.

D. Construction Tolerances:

1. Variation from Plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4 inch in 10 feet or one story.

2. Variation from Level: For lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4 inch in any bay or 20 feet maximum, nor 3/4 inch in 40 feet or more.
3. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2 inch in any bay or 20 feet maximum, nor 3/4 inch in 40 feet or more.
4. Variation in Cross-Sectional Dimensions: For columns and thickness of walls do not exceed minus 1/4 inch nor plus 1/2 inch from dimensions shown.

E. Job Mock-Up:

Prior to installation of masonry work, erect a sample wall panel mock-up using materials, bond and joint tooling required for final work. Provide special features as directed for sealant and contiguous work. Build mock-up at the site, where directed, parallel to finished wall of the building, of full thickness and approximately 4 feet long by 4 feet high, indicating the proposed range of color, texture and workmanship to be expected in the completed work, as well as sealants, flashing, insulation, ties, reinforcing, etc. Obtain the Engineer's acceptance of visual qualities of the mock-up before start of masonry work. Retain mock-up during construction as a standard for judging completed masonry work. Do not alter, move or destroy mock-up until work is completed.

1.04 JOB CONDITIONS

A. Materials Protection:

Protect masonry materials during storage and construction from wetting by rain, snow or groundwater and from soiling or inter-mixture with earth and other materials.

Do not use metal reinforcing or ties having loose rust or other coatings, including ice, which will reduce or destroy bond.

Protect grout and mortar materials from deterioration by moisture and temperature. Store in a dry location or in waterproof containers. Keep containers tightly closed and away from open flames. Protect liquid components from freezing. Comply with manufacturer's recommendations for minimum and maximum temperature requirements for storage.

B. Protection of Work:

During erection, cover top of wall with heavy waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress. Extend cover a minimum of 24 inches down both sides and hold cover securely in

place. Protect base of walls from rain-splashed mud and mortar splatter by means of coverings spread on ground and over wall surface.

Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.

Prevent grout or mortar from staining the face of masonry to be left exposed or painted. Immediately remove grout and mortar in contact with such masonry. Protect sills, ledges and projections from droppings of mortar and other materials.

Take special care to keep the cavity between unit masonry wythe and backup material free of buildup which will act as a bridge for water penetration through the wall construction. Constant monitoring of this area shall be required to ensure that the bottom of the cavity does not fill with mortar droppings and that there is no mortar or other buildup between face wythe and backup construction. Method for preventing mortar droppings within the cavity shall be demonstrated for, and approved by, the Engineer.

C. Cold Weather Protection:

Remove all ice or snow formed on masonry bed by carefully applying heat until the top surface is dry to the touch. Remove all masonry determined to be frozen or damaged by freezing conditions.

D. Procedures Required During Construction:

Perform the following construction procedures while the work is progressing. When the outside temperature falls below 40°F during construction the temperature of the mortar shall be within a range of 70°F and a maximum of 120°F after all ingredients have been combined. The following construction requirements shall be followed to obtain the required mortar temperature.

When the outside air temperature is:

From 40°F to 32°F: Heat mixing water or sand to a minimum of 70°F and a maximum of 160°F.

From 32°F to 25°F: Heat sand and water to a minimum of 70°F and a maximum of 160°F, maintain temperature of mortar on boards above freezing.

25°F and below: Heat sand and mixing water to a minimum of 70°F and maximum of 160°F; provide enclosures and auxiliary heat to maintain air temperature above 32°F; do not lay units which have a temperature of less than 20°F. Units shall be heated to about 40°F to prevent sudden cooling of the heated mortar.

E. Procedures Required for Completed Masonry:

Perform the following for protection of completed masonry and masonry not being worked on.

When mean daily air temperature is:

From 40°F to 32°F: Protect masonry from rain or snow for at least 48 hours by covering with weather-resistive membrane.

From 32°F to 25°F: Completely cover masonry with weather-resistive membrane for at least 48 hours.

25°F and below: Maintain masonry temperature above 32°F for 48 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps, or other acceptable methods.

PART 2 - MATERIALS

2.01 GENERAL

Refer to other sections of Division 4 for required masonry mortar, grout, masonry accessories, masonry units, face brick, and installation methods.

PART 3 - EXECUTION

3.01 INSPECTION:

Contractor must examine the areas and conditions under which unit masonry work is to be installed and notify the Authority's representative in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 PREPARATION

Except for absorbent units specified to be wetted by the manufacturer and approved by the Engineer, lay masonry units surface dry and adjust mortar mix to conform to the degree of water absorption for the individual masonry unit. Do not wet concrete masonry units. Use wetting methods which ensure that each masonry unit (except concrete masonry units) is nearly saturated but surface dry when laid.

3.03 INSTALLATION, GENERAL

Build cavity walls, composite walls, and other masonry construction to the full thicknesses shown. Build single-wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.

Build chases and recesses as shown or required for the work of other trades. Unless otherwise shown, provide not less than 8 inches of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.

Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.

Cut masonry units using appropriate motor-driven masonry saws to provide clean, sharp, un-chipped edges. Cut units as required to provide pattern shown and to fit adjoining work neatly. Use full-size units without cutting wherever possible.

3.04 LAYING MASONRY WALLS

A. Mortar Types:

Unless otherwise indicated, use mortar as specified in Section 04100, "Masonry Mortar and Grout".

B. Batch Control:

Measure and batch materials by weight such that the required proportions for mortar can be accurately controlled and maintained. It is recommended that all batch materials be prepackaged to ensure consistency of proportions in the mortar mix. Measurement of sand by shovel will not be permitted.

Mix mortars with the minimum amount of water consistent with workability to provide maximum bond strength of the mortar.

Do not use mortar which has begun to set or if more than 2 hours has elapsed since initial mixing. Re-temper mortar during the 2 hour period only as required to restore workability.

Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to properly locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.

Lay-up walls plumb and true to comply with specified tolerances, with courses level, accurately spaced and coordinated with other work.

C. Pattern Bond:

Lay exposed masonry in the bond patterns indicated. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less than 4 inch horizontal face dimensions at corners or jambs.

D. Mortar Bedding and Jointing:

To ensure that the cavities of walls are kept clean from mortar droppings, all bed joints adjacent to the cavity shall be beveled.

Lay solid brick size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.

Lay solid concrete masonry units greater than 4" in thickness with divided bed joints unless full bedding indicated. Keep drainage channels (if any) free of mortar. Form head joints with sufficient mortar so that excess will be squeezed out as units are shoved into position. Butter both sides of units to be placed, or butter one side of unit-in-place and one side of unit-to-be-placed.

Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical faces of shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout.

Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8 inch joints. Rake out mortar in preparation for application of sealants where shown and directed.

Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.

Tool exposed joints slightly concave unless otherwise indicated.

Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners to fit stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.

E. Collar Joints:

Where shown, fill the vertical longitudinal joint between wythes solidly with mortar by parging the in-place wythe and shoving units into the parging.

F. Stopping and Resuming Work:

Rack back 1/2-unit length in each course; do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.

G. Built-in Work:

As the work progresses, "build-in" items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.

Fill space between hollow metal frames and masonry solid with mortar.

Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal screen lath in the joint two courses below the affected cell or cells, and rod grout into cores for four courses.

H. Horizontal Joint Reinforcing:

Refer to Section 04150 "Masonry Accessories" for type of materials required.

Provide continuous horizontal joint reinforcing as shown and specified. Fully embed longitudinal side rods in mortar for their entire length with a minimum cover of 5/8 inch on exterior side of walls and 1/2 inch on interior side of walls. Lap reinforcement a minimum of 6 inches at ends of units. Do not bridge control and expansion joints with reinforcing.

In single-wythe and multi-wythe walls (solid or cavity) where continuous horizontal reinforcing also acts as structural bond or tie between wythes, space reinforcing as required by code but not more than 16 inches on center vertically.

Reinforce masonry openings greater than 1'-0" wide, with horizontal joint reinforcing placed in 2 horizontal joints approximately 8 inches apart, immediately above the lintel and immediately below the sill. Extend reinforcing a minimum at 2'-0" beyond jambs of the opening, bridging control joints only where indicated.

I. Corners:

Provide interlocking masonry unit bond in each course at corners, unless otherwise shown.

For horizontally reinforced masonry, provide continuity at corners with prefabricated "L" units, in addition to masonry bonding.

J. Intersecting and Abutting Walls:

Unless vertical expansion or control joints are shown at juncture, provide same type of bonding specified for structural bonding between wythes and provide continuity with horizontal joint reinforcing using prefabricated "T" units.

K. Intersecting Load-bearing Walls:

If carried up separately, provide rigid steel anchors at not more than 2'-0" on center vertically. Form anchors of galvanized steel not less than 1- 1/2" x 1/4" x 2'-0" long with ends turned up not less than 2 inches or with cross-pins. If used with hollow masonry units, embed ends in mortar-filled cells.

L. Cavity Walls:

Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.

Tie exterior wythe to back-up with truss type ties embedded in mortar joints. Refer to Section 04150 "Masonry Accessories" for type of ties required.

M. Anchoring Masonry Work:

Provide anchoring devices of the type shown and as specified under Section 04150 "Masonry Accessories". If not shown or specified, assume that anchoring devices are required and request a clarification from the Engineer before commencing masonry work.

Anchor masonry to structural members where masonry abuts or faces such members to comply with the following:

Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise shown. Keep open space free of mortar and other rigid materials.

Anchor masonry to structural members with metal ties embedded in masonry joints and attached to structure. Provide anchors with flexible tie sections, unless otherwise shown.

N. Expansion Joints for Exterior Brick Masonry:

Provide vertical expansion and isolation joints in brick masonry where shown. Build-in related items as the masonry work progresses. Refer to Section 079200, Joint Sealers.

O. Control Joints for Concrete Masonry Units:

Consult the Engineer for the location of control joints.

P. Lintels:

Provide steel lintels where shown, in accordance with Section 055000, Metal Fabrications.

Provide concrete masonry unit reinforced bond beams where shown in accordance with Section 042200 – Concrete Masonry Units.

Provide minimum bearing at each jamb of 4 inches for openings less than 6'-0" wide; 8 inches for wider openings.

Q. Flashing of Masonry Work:

Provide concealed flashings in masonry work at obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Concealed flashings shall be provided at, but not be limited to, the following locations:

- Wall base, continuous and above finish grade.
- Window sills.
- Above steel lintels, relief angles and shelf angles.
- Projections, recesses and caps.
- Top of walls.

Prepare masonry surfaces to be smooth and free from projections which could puncture flashing. Seal penetrations in flashing with approved mastic. Extend flashings the full length of lintels and shelf angles and minimum of 4 inches into masonry at each end. Extend flashing from 4 inches beyond exterior face of masonry, through the outer wythe, turned up a minimum of 4 inches, and through the inner wythe to within 1/2 inch of the interior face of the wall in exposed work. Where interior surface of inner wythe is concealed by furring, carry flashing completely through the inner wythe and turn up approximately 2 inches and adhere to face of interior wythe.

Where inter-backup is other than masonry, install flashing to conform to profile of shelf angle and extend a minimum of 8 inches up (and adhere to) the backup material.

Lap ends of flashings by overlapping a minimum of 6 inches and seal lap with mastic recommended by manufacturer.

Provide 8 inch high end dams at the termination of all non-continuous flashings. Also provide continuous vertical flashings at all wall openings.

Install elastic flashings in accordance with manufacturer's instructions.

Provide prefabricated PVC honeycomb weep joint inserts in the head joints of the first course of masonry immediately above all concealed flashings. Space 24 inches on center, unless otherwise indicated. Provide 1/4 inch diameter cotton rope weeps, returned 12 inches up back-up wall. Take care not to cover weeps with sealant or mortar.

Install nailers for flashing and other related work where shown to be built into masonry work.

3.05 REPAIR, POINTING AND CLEANING

A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.

B. Pointing:

During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar.

Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, and where required, properly prepared for application of sealant.

C. Cleaning Exposed, Unglazed Masonry Surfaces:

Wipe off excess mortar as the work progresses. Dry brush at the end of each day's work.

D. Final Cleaning:

After mortar is thoroughly set and cured, clean 1/2 of sample wall panel as follows. Obtain Engineer's acceptance of sample cleaning before proceeding to clean masonry work.

Dry clean to remove large particles of mortar using wood paddles and scrapers. Use chisel or wire brush if required and approved.

Presoak wall by saturating with water and flush off loose mortar and dirt. Scrub down wall with stiff bristle brushes and water mixed with the appropriate amount of one of the following masonry cleaners:

1. Vana-trol by Prosoco Inc.
2. Light duty Concrete Cleaner by Prosoco Inc.
3. EacoChem MND80 by EaCo Chem, Inc.

Rinse walls using clean, pressurized water, to neutralize cleaning solution and remove loose material. Acid cleaning of masonry will not be permitted.

Protect non-masonry surfaces from damage as necessary during cleaning operations. Restore all items so damaged to a like-new condition acceptable to the Engineer at no additional cost.

E. Protection:

Protect the masonry work from deterioration, discoloration and other damage during subsequent construction operations.

END OF SECTION

SECTION 042000.12

MASONRY MORTAR AND GROUT

PART 1 GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

Masonry mortar for brick and concrete masonry unit are specified in this section.

1.03 QUALITY ASSURANCE

Do not change source or brands of masonry mortar materials during the course of the work.

1.04 SUBMITTALS

A. Manufacturer's Data:

Submit eight (8) copies of manufacturers' specifications and instructions for each manufactured product.

B. Samples:

Submit samples of each type of colored masonry mortar, showing the range of color which can be expected in the finished work. Label samples to indicate type and amount of colorant used. Engineer's review will be for color only. Compliance with all other requirements is exclusively the responsibility of the Contractor.

PART 2 - MATERIALS

2.01 MATERIALS

- A. Portland Cement: ASTM C 150, Type I, non-staining, without air entrainment and of natural color or white as required to produce the required color of mortar or grout.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Aggregates for Mortar: ASTM C 144, except for joints less than 1/4 inch use aggregate graded with 100% passing the No. 16 sieve.

- D. Aggregate for Grout: ASTM C 404.
- E. Water: Clean, potable, free of deleterious materials which would impair strength or bond.
- F. Colored Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with record of satisfactory performance in masonry mortars. Do not exceed pigment-to-cement ratio, by weight, of 1-to-7. Subject to compliance with requirements, colored mortar pigments which may be incorporated in the work include, but are not limited to, the following:
 - 1. Solomon Grind-Chem Services, Inc.; "SGS Mortar Colors".
 - 2. Davis Colors, A Subsidiary of Rockwood Industries, Inc.; "True Tone Mortar Colors".
 - 3. Similar colors manufactured by Bonsol Construction Products or Riverton Lime and Stone Co. are acceptable.

2.02 MORTAR MIXES

- A. Do not lower the freezing point of mortar by use of admixtures or antifreeze agents.
- B. Do not use masonry cement.
- C. Do not use calcium chloride or other antifreeze compounds in mortar or grout.
- D. Mortar for Unit Masonry (Proportion by Volume Method):

Non-staining, cement-lime mortar complying with ASTM C 270, "Table 1, Proportion Specification Requirements", but limiting acceptable types to those listed below for cement-lime mixes.

 - 1. Type M: 1/4 part lime per part of Portland Cement.
 - 2. Type S: Over 1/4 up to 1/2 part lime per part of Portland Cement.
- E. Use the following mortar mix for the applications indicated.
 - 1. Use Type M mortar for masonry below grade and in contact with earth.
 - 2. Use Type S mortar for other applications.
- F. Colored Pigmented Cement Mortar:

Proportion pigments with other ingredients to match sample approved by the Engineer.

2.03 GROUT MIX

Portland cement, sand, gravel and water, proportioned as required to provide a 28-day minimum compressive strength of 2500 psi.

PART 3 - EXECUTION

3.01 Refer to Section 042000, "Unit Masonry, General" for required installation procedures of mortar and grout specified in this section.

END OF SECTION

SECTION 042000.13

MASONRY ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Contract Conditions other Technical Specifications Sections apply to work of this Section insofar as applicable.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. Section 042000, "Unit Masonry, General" specifies the installation of masonry work including the accessories specified under this section.
- B. The location of the masonry work is shown on the Drawings. The types of masonry accessories required include the following:

Continuous horizontal wire reinforcing.

Vertical bar type reinforcing.

Anchoring devices for masonry.

Concealed flashings built into masonry work.

Control joint strips.

Masonry weep joints.

Full height cavity wall drainage mat.

Filler strips at tops of masonry partitions.

Drip Plates

Precast concrete sills.

1.03 SUBMITTALS

- A. Manufacturer's Data:

Submit eight (8) copies of manufacturer's specifications and installation instructions for each masonry accessory required. Include data substantiating that materials comply with specified requirements.

B. Test and Engineering Data:

Submit eight (8) copies of certifications of load tests or engineering data substantiating capability of the anchors to withstand the imposed compression/tension loads.

PART 2 - MATERIALS

2.01 CONTINUOUS WIRE REINFORCING

A. Horizontal Wall Reinforcing: Extra heavy-duty (galvanized in accordance with ASTM A-153 at exterior walls and interior walls in humid and wet areas) continuous truss type in accordance with ASTM A-82. Provide preformed corner and intersection units. Vertical spacing of reinforcement courses shall be 16 inches on center unless closer spacing is shown on the Drawings. However, in all cases, place reinforcement in the first two course joints immediately over and under openings, extending not less than 48 inches on each side, and in bottom of three course beds, and the top course bed. Unit width shall be such that the side rods center on the walls of hollow masonry units. Reinforcing shall be Hohmann & Barnard, Inc. units listed below or approved equal products manufactured by Dur-O-Wall Products, Inc. or AA Wire Products Co.

1. Single Wythe: Hohmann & Barnard, Inc., "Truss Mesh" #120, 3/16 inch side rods, #9 cross rods, hot dip galvanized in accordance with ASTM A 123, Class B2.
2. Double Wythe and Cavity: Hohmann & Barnard, Inc., "#165-S.I.S." consisting of #165 Truss Box Mesh (3/16 inch side rods, #9 cross rods, 3/16 inch boxes); "Seismiclip"; 3/16 inch "Byna-tie"; 3/16 inch Continuous Wire; all hot dip galvanized in accordance with ASTM A 123, Class B2 except continuous wire to be mill galvanized in accordance with ASTM A 116/641, Class 3.

Note: Continuous wire reinforcement is required for all 4 inches thick (nominal) and wider units.

B. Masonry Anchors:

1. Masonry to Steel Stud: Hohmann & Barnard #DW-10 with 3/16 "Byna-Tie" and "Seismiclip", or approved equal by AA Wire Products Co. or Dur-O-Wall, Inc.
2. Masonry to Cast-in-Place Concrete: Hohmann & Barnard #305 Dovetail Slot, #315-BT Flexible Dovetail and "Seismiclip", or approved equal by AA Wire Products Co. or Dur-O-Wall, Inc.

Notes:

All materials shall be hot-dip galvanized in accordance with ASTM A 123, Class B2.

Continuous horizontal reinforcement (e.g., truss type and single wire type) shall be secured to each masonry anchor with "Seismiclips".

- C. Masonry Partition Top Anchors: Refer to the Structural Drawings.
- D. Rigid Steel Anchors: Hot dip galvanized 1 1/2" x 1/4" x 2'-0" long with ends turned up 2 inches in opposite directions or with acceptable cross pins.

2.02 FLASHING FOR MASONRY

Copper Fabric Laminated: Copper sheet weighing 5 ounces per square foot bonded with asphalt between 2 layers of glass fiber cloth. Flashing shall be manufactured by one of the following:

Copper Fabric; Afco Products, Inc.
Copper Fabric Flashing; Sandell Mfg., Co. Inc.
Copper Fabric Flashing; York Mfg., Inc.

Adhesive for flashing shall be as provided by the flashing manufacturer.

2.03 MISCELLANEOUS MASONRY ACCESSORIES

- A. Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60, of the sizes shown.
- B. Preformed Control Joint Gaskets: Material as indicated below, designed to fit standard sash block and maintain lateral stability in masonry wall; size and configuration as indicated or required.
 - 1. Styrene-Butadiene Rubber Compound: ASTM D 2000, Designation M2AA-805
- C. Weep Joints: Provide the following:
 - 1. PVC Honeycomb: Provide 3/8" wide by height of bed joint prefabricated honeycomb units.
- D. Full Height Cavity Drainage Mat: Provide 3/4" thick by full height and width of all cavity wall spaces. Product shall be similar to CavClear Masonry Mat or Mortairvent CW.
- E. Compressible Filler: Premolded filler strips complying with ASTM D1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated; formulated from the following material.
 - 1. Neoprene.
- F. Drip Plate: Provide the following:
 - 1. Manufacturer: Hohmann & Barnard, Inc. Drip Plate DP-FTSA
 - 2. Width: 3"
 - 3. Foam-Tite Seal Width: 2.5"

4. Material: Type 304 Stainless Steel (26 guage)

2.04 PRECAST CONCRETE

- A. Architectural precast concrete: Provide custom fabricated, integrally colored sills, complying with the following:
1. Compressive strength: 5,000 psi minimum at 28 days.
 2. Entrained air: 5% - 6%.
 3. Finish: Light sandblast finish approved by the Authority.
 4. Formwork: Comply with applicable requirements of ACI 347, and with PCA forms of Architectural Concrete. Forms shall bear APA grade-trademark and shall have specially formulated aluminum edge sealer. Provide forms true, straight and square. Where joints occur in forms, the interior surface shall be flush. Forms shall be braced rigidly. Prior to each pour, coat forms with approved non-staining form release agent that will not interfere with adhesion of sealants, insulation adhesives or applied finishes.
 5. Reinforcement: Provide reinforcement as shown on shop drawings and as specified herein. Provide additional reinforcement required for handling, transportation and erection stresses. Reinforcement shall be cold rolled steel complying with ASTM A 615, Grade 60, deformed and welded wire fabric conforming to ASTM A 185. Reinforcing steel shall be hot-dip galvanized after fabrication.
 6. Detailing and fabrication of reinforcement shall conform to ACI 315 and ACI 315R.

PART 3 - EXECUTION

3.01 INSTALLATION

Refer to Section 042000, "Unit Masonry, General" for installation of masonry accessories specified under this section.

END OF SECTION

SECTION 042113

BRICK MASONRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Contract Conditions and other Technical Sections apply to work of this Section insofar as applicable.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. Brickwork is indicated on the Drawings. Installation of the face brick and common brick are specified in Section 042000, "Unit Masonry, General".
- B. Masonry mortar and grout is specified in Section 042000.12, "Masonry Mortar and Grout".
- C. Masonry accessories, including reinforcing, are specified in Section 042000.13, "Masonry Accessories".

1.03 QUALITY ASSURANCE

- A. Obtain face brick from one manufacturer, of uniform texture and color (or uniform blend in the variation thereof).
- B. Standards:
 - Facing Brick: ASTM C 216-75, Grade SW.
 - Building (Common) Brick: ASTM C 62.

1.04 SUBMITTALS

- A. Manufacturer's Data: Submit brick manufacturer's specifications and other data for each type of product required, including certification that each product complies with the specified requirements. Include instructions for handling, storage, installation and protection of each type of brick.
- B. Samples:
 - 1. Submit 5 samples of exposed brick. Include the full range of exposed color and texture to be expected in the completed work. Engineer's review will be for color

and texture only. Compliance with all other requirements is exclusively the responsibility of the Contractor.

2. All brick when submitted for approval shall be accompanied by the manufacturer's statement of the following:

Compressive strength of the brick which will indicate the degree of hardness.

Certification that the brick submitted is Type SW (Severe Weather) brick.

Special instructions for laying the brick, if any.

Any modifications to the mortar mix which might be required for proper bond strength.

PART 2 - MATERIALS

2.01 MATERIALS FOR BRICK MADE FROM CLAY OR SHALE

- A. At Contractor's option, provide solid brick, cored or uncored, for vertical brickwork. Do not use cored brick with net cross-sectional area less than 75% of gross area in the same plane or with core holes less than 3/4 inch from any edge.

2.02 BRICK TYPES

- A. Face Brick: Comply with the requirements of ASTM C 216, Grade SW, Type FBS standard modular size brick shall be one of the following:

Belden Brick: 503-505A

Glen Gery: Carlton

Endicott: Rose Smooth

- B. Building (Common) Brick: Conform to ASTM C 62, Grade SW.

PART 3 - EXECUTION

3.01 INSTALLATION

Refer to Section 042000 "Unit Masonry, General" for installation of brick.

END OF SECTION

SECTION 042200

CONCRETE MASONRY UNIT

PART 1 - DESCRIPTION

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.2 DESCRIPTION OF WORK:

- A. Extent of each type of masonry work is indicated on drawings.
- B. Types of masonry work required include:
 - 1. Face brick veneer- Specified in Section 042113 – Brick Masonry
 - 2. Masonry waterproofing.
 - 3. Concrete masonry units.

1.3 QUALITY ASSURANCE:

- A. Fire Performance Characteristics: Where indicated, provide materials and construction which are identical to those of assemblies whose fire endurance has been determined by testing in compliance with ASTM E 119 by a recognized testing and inspecting organization or by another means, as acceptable to authority having jurisdiction.
- B. Single Source Responsibility for Masonry Units: Obtain exposed masonry units of uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one manufacturer for each different product required for each continuous surface or visually related surfaces.
- C. Single Source Responsibility for Mortar Materials: Obtain mortar ingredients of uniform quality, including color for exposed masonry, from one manufacturer for each cementation's component and from one source and producer for each aggregate.

1.4 DELIVERY, STORAGE, AND HANDLING:

- A. Deliver masonry materials to project in undamaged condition.

-
- B. Store and handle masonry units to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion or other causes.
 - C. Store cementitious materials off the ground, under cover and in dry location.
 - D. Store masonry accessories including metal items to prevent deterioration by corrosion and accumulation of dirt.
 - E. Store aggregates where grading and other required characteristics can be maintained.

1.5 PROJECT CONDITIONS:

- A. Protection of Work: Where exposed to weather during erection, cover top of masonry with waterproof sheeting at end of each day's work. Cover partially completed structures when work is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
- B. Do not apply uniform floor or roof loading for at least 12 hours after building masonry walls or columns.
- C. Do not apply concentrated loads for at least 3 days after building masonry walls or columns.
- D. Staining: Prevent grout or mortar or soil from staining the face of masonry to be left exposed or painted. Remove immediately grout or mortar in contact with such masonry.
- E. Cold Weather Protection:
- F. Do not lay masonry units which are wet or frozen.
- G. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
- H. Remove masonry damaged by freezing conditions.
- I. Perform the following construction procedures while masonry work is progressing. Temperature ranges indicated below apply to air temperatures existing at time of installation.
 - 1. 40 deg F (4 deg C) to 32 deg F (0 deg C):
 - a. Mortar: Heat mixing water to produce mortar temperature between 40 deg F (4 deg C) and 120 deg F (49 deg C).

-
2. 32 deg F (0 deg C) to 25 deg F (-4 deg C):
 - a. Mortar: Same as above.
 3. 25 deg F (-4 deg C) to 20 deg F (-7 deg C):
 - a. Mortar: Same as above.
 - b. Heat both sides of walls under construction.
 - c. Use windbreaks or enclosures when wind is in excess of 15 mph.
 4. 20 deg F (-7 deg C) and below:
 - a. Mortar: Heat mixing water and sand to produce mortar temperatures between 40 deg F (4 deg C) and 120 deg F (49 deg C).
 - b. Masonry Units: Heat masonry units so that they are above 20 deg F (-7 deg C) at time of laying.
 - c. Provide enclosure and auxiliary heat to maintain an air temperature of at least 40 deg F (4 deg C) for 24 hours after laying units.
 5. Do not heat water for mortar to above 160 deg F (71 deg C).
- J. Protect completed masonry and masonry not being worked on in the following manner. Temperature ranges indicated apply to mean daily air temperatures except for grouted masonry. For grouted masonry, temperatures ranges apply to anticipated minimum night temperatures.
1. 40 deg F (4 deg C) to 32 deg F (0 deg C):
 - a. Protect masonry from rain or snow for at least 24 hours by covering with weather-resistive membrane.
 2. 32 deg F (0 deg C) to 25 deg F (-4 deg C):
 - a. Completely cover masonry with weather-resistive membrane for at least 24 hours.
 3. 25 deg F (-4 deg C) to 20 deg F (-7 deg C):
 - a. Completely cover masonry with weather-resistive membrane and insulating blankets or similar protection for at least 24 hours, 48 hours for grouted masonry.

4. 20 deg F (-7 deg C) and below:
 - a. Except as otherwise indicated, maintain masonry temperature above 32 deg F (0 deg C) for 24 hours using enclosures and supplementary heat, electric heating blankets, infrared lamps or other methods proven to be satisfactory. For grouted masonry maintain heated enclosure to 40 deg F (4 deg C) for 48 hours.

2 PART 2 PRODUCTS

2.1 CONCRETE MASONRY UNITS:

- A. General: Comply with referenced standards and other requirements indicated below applicable to each form of concrete masonry unit required.
- B. Provide special shapes where required for lintels, corners, jambs, sash, control joints, headers, bonding and other special conditions.
- C. Concrete Block: Provide units complying with characteristics indicated below for Grade, Type, face size, exposed face and, under each form of block included, for weight classification.
 1. Grade N.
 2. Prism Strength: (f'm) = 1500 psi.
 3. Size: Manufacturer's standard units with nominal face dimensions of 16" long x 8" high x 8" thick (15-5/8" x 7-5/8" x 7-5/8" actual). Other special units of 16" length x 4" high x 4" thick (15-7/8" x 7-5/8" x 3-5/8" actual).
 4. Type I, moisture-controlled units.
 5. Exposed faces: Manufacturer's standard color and texture.
 - a. Where special finishes are indicated, provide units with exposed faces of the following:
 - 1) All CMU blocks shall be manufactured with an integral liquid polymeric water repellent admixture. This admixture shall be equal to "Dry-Block" CMU admixture as produced by Grace Construction Products. The admixture product

shall be compatible with the mortar admixture product utilized for the project. Reference the Mortar and Masonry specification section 04100.

6. Hollow Load-Bearing Block Units: ASTM C90, Type I – Moisture Controlled.
7. Solid Load-Bearing Block Units: ASTM C90, Type I – Moisture Controlled; normal weight.

2.2 BRICK UNITS:

- A. Reference Section 042113 – Brick Masonry

2.3 PRECAST CONCRETE SILLS:

- A. Reference Section 042000.13 – Masonry Accessories.

2.4 MORTAR MATERIALS:

- A. Reference Section 042000.12 – Masonry Mortar and Grout

2.5 JOINT REINFORCEMENT, TIES AND ANCHORING DEVICES:

- A. Materials: Comply with requirements indicated below for basic materials and with requirements indicated under each form of joint reinforcement, tie and anchor for size and other characteristics:
- B. Hot-Dip Galvanized Steel Wire: ASTM A 82 for uncoated wire and with ASTM A 153, Class B-2 (1.5 oz. per sq. ft. of wire surface) for zinc coating applied after prefabrication into units.
- C. Joint Reinforcement: Provide welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10', with prefabricated corner and tee units, and complying with requirements indicated below:
 1. Width: Fabricate joint reinforcement in units with widths of approximately 2" less than nominal width of walls and partitions as required to provide mortar coverage of not less than 5/8" on joint faces exposed to exterior and 1/2" elsewhere.
 2. Wire Size for Side Rods: 0.1875" diameter.
 3. Wire Size for Cross Rods: No. 9 ga.

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4. For Single-wythe masonry provide type as follows with single pair of side rods:
 - a. Truss design with continuous diagonal cross rods spaced not more than 16" oc.
 5. For Multiple-wythe masonry provide type as follows with single pair of side rods:
 - a. Truss design with continuous diagonal cross rods spaced not more than 16" oc. and number of side rods as follows:
 - 1) Number of Side Rods for Multiple-wythe Concrete Masonry: One side rod for each face shell of concrete back-up and of concrete masonry facing wythe.
- D. Manufacturers: Subject to compliance with requirements, provide products of one of the following:
1. AA Wire Products Co.
 2. Dur-O-Wal, Inc.
 3. Heckmann Building Products, Inc.
 4. Hohmann & Barnard, Inc.
 5. Masonry Reinforcing Corp. of America.
 6. National Wire Products Corp.
- E. Brick Veneer Wall Ties and anchors: Reference Specification Section 04085 for specific masonry anchor wall tie requirements.

2.6 CONCEALED FLASHING MATERIALS

- A. Copper Fabric Laminate: 5 oz. Copper sheet bonded with asphalt between 2 layers of glass fiber cloth.
1. Available Products: Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:
 - a. Afco Copper Fabric; Afco Products Inc.
 - b. Copper Fabric Flashing; Sandell Manufacturing Co., Inc.
 - c. Copper Fabric Flashing; York Manufacturing Inc.

2.7 MISCELLANEOUS MASONRY ACCESSORIES:

- A. Reinforcing Bars: Deformed steel, ASTM A 615, Grade 60 for bars No. 3 to No. 18.

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- B. Non-Metallic Expansion Joint Strips: Premoulded, flexible cellular neoprene rubber filler strips complying with ASTM D 1056, Grade RE41.
 - C. Weepholes: Medium density polyethylene, 1/4"x4".
 - D. Vents: Medium density polyethylene, 1/4"x4".
 - E. Cavity Mat: Reference Section 042000.13 – Masonry Accessories.

2.8 INSULATION:

- A. Extruded Polystyrene Board Insulation: Rigid cellular polystyrene thermal insulation with closed cells and integral high density skin, formed by the expansion of polystyrene base resin in an expansion process to comply with ASTM C 578, Type IV; 5-year aged R value of 5 Btuh at 75o F, in manufacturer's standard lengths and widths, in thicknesses as indicated.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Amofam; Amoco Foam Products Company.
 - b. Foamular; UC Industries, Inc.
 - c. Styrofoam: The Dow Chemical Company.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.9 MASONRY CLEANERS:

- A. Acidic Cleaner: Manufacturer's standard strength general purpose cleaner, designed for new masonry surfaces of type indicated; composed of blended organic and inorganic acids combined with special wetting systems and inhibitors; expressly approved for intended use by manufacturer of masonry units being cleaned.
 - 1. Available Products: Subject to compliance with requirements, a product which may be used to clean unit masonry surfaces includes, but is not limited to, the following:
 - a. "Sure Klean" No. 600 Detergent; ProSoCo Inc.

2.10 MORTAR MIXES:

- A. Reference Section 042000.12 – Masonry Mortar and Grout.

3 PART 3 EXECUTION

3.1 INSTALLATION, GENERAL:

- A. Do not wet concrete masonry units.
- B. Cleaning Reinforcing: Before placing, remove loose rust, ice and other coatings from reinforcing.
- C. Thickness: Build cavity and composite walls to the full thickness shown. Build single wythe walls to the actual thickness of the masonry units, using units of nominal thickness indicated.
- D. Build chases and recesses as shown or required for the work of other trades. Provide not less than 8" of masonry between chase or recess and jamb of openings, and between adjacent chases and recesses.
- E. Leave openings for equipment to be installed before completion of masonry work. After installation of equipment, complete masonry work to match work immediately adjacent to the opening.
- F. Cut masonry units using motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining work. Use full-size units without cutting where possible.
- G. Use dry cutting saws to cut concrete masonry units.

3.2 CONSTRUCTION TOLERANCES:

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls and arises do not exceed 1/4" in 10', or 3/8" in a story height not to exceed 20', nor 1/2" in 40' or more. For external corners, expansion joints, control joints and other conspicuous lines, do not exceed 1/4" in any story or 20' maximum, nor 1/2" in 40' or more. For vertical alignment of head joints do not exceed plus or minus 1/4" in 10', 1/2" maximum.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves and other conspicuous lines, do not exceed 1/4" in any bay or 20' maximum, nor 1/2" in 40' or more. For top surface of bearing walls do not exceed 1/8" between adjacent floor elements in 10' or 1/16" within width of a single unit.

- C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls and partitions, do not exceed 1/2" in any bay or 20' maximum, nor 3/4" in 40' or more.
- D. Variation in Mortar Joint Thickness: Do not exceed bed joint thickness indicated by more than plus or minus 1/8", with a maximum thickness limited to 1/2". Do not exceed head joint thickness indicated by more than plus or minus 1/8".

3.3 LAYING MASONRY WALLS:

- A. Layout walls in advance for accurate spacing of surface bond patterns with uniform joint widths and to accurately locate openings, movement-type joints, returns and offsets. Avoid the use of less-than-half-size units at corners, jambs and wherever possible at other locations.
- B. Lay-up walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other work.
- C. Pattern Bond: Lay exposed masonry in the bond pattern shown or, if not shown, lay in running bond with vertical joint in each course centered on units in courses above and below. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4" horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Rack back 1/2-unit length in each course. Do not tooth. Clean exposed surfaces of set masonry, wet units lightly (if required) and remove loose masonry units and mortar prior to laying fresh masonry.
- E. Built in work: As the work progresses, build-in items specified under this and other sections of these specifications. Fill in solidly with masonry around built-in items.
 - 1. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
- F. Where built-in items are to be imbedded in cores of hollow masonry units, place a layer of galvanized metal lath in the joint below, and rod mortar or grout into core.
- G. Fill cores in hollow concrete masonry units with grout 3 courses (24" minimum) under bearing plates, beams, lintels, posts and similar items, unless otherwise indicated.

3.4 MORTAR BEDDING AND JOINTING:

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- A. Lay solid brick size masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not slush head joints.
 - B. Lay hollow concrete masonry units with full mortar coverage on horizontal and vertical face shells. Bed webs in mortar in starting course on footings and in all courses of piers, columns and pilasters, and where adjacent to cells or cavities to be reinforced or filled with concrete or grout. For starting course on footings where cells are not grouted, spread out full mortar bed including areas under cells.
 - C. Maintain joint widths shown, except for minor variations required to maintain bond alignment. If not shown, lay walls with 3/8" joints.
 - D. Cut joints flush for masonry walls which are to be concealed or to be covered by other materials, unless otherwise indicated.
 - E. Tool exposed joints slightly concave using a jointer larger than joint thickness, unless otherwise indicated.
 - F. Remove masonry units disturbed after laying; clean and reset in fresh mortar. Do not pound corners or jambs to shift adjacent stretcher units which have been set in position. If adjustments are required, remove units, clean off mortar and reset in fresh mortar.
 - G. Corners: Provide interlocking masonry unit bond in each course at corners, unless otherwise indicated.

3.5 CAVITY WALLS

- A. Keep cavity clean of mortar droppings and other materials during construction. Strike joints facing cavity flush.
- B. Use continuous horizontal joint reinforcement installed in horizontal mortar joints for bond tie between wythes of concrete masonry units. Install at not more than 16" oc vertically.
- C. Use masonry anchors installed in mortar joints of brick veneer and back up masonry. Install at not more than 16" oc vertically and 24" oc horizontally.
- D. Provide weepholes in exterior wythe of cavity wall located immediately above ledges and flashing, spaced not more than 24" oc.
- E. Provide ventholes in exterior wythe of cavity wall located at or near the top of wall locations as well at directly below thru-wall flashing locations allowing

ventilation to the lower wall cavity. Space not more than 24" oc and offset/stagger from all weep locations.

3.6 CAVITY WALL INSULATION:

- A. On units of plastic insulation, install small pads of adhesive spaced approximately 12" oc both ways on inside face. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly together both ways. Press units firmly against inside of masonry.
 - 1. Fill all cracks and open gaps in insulation with crack sealer recommended by insulation board manufacturer.

3.7 HORIZONTAL JOINT REINFORCEMENT:

- A. General: Provide continuous horizontal joint reinforcement as indicated. Install longitudinal side rods in mortar for their entire length with a minimum cover of 5/8" on exterior side of walls, 1/2" elsewhere. Lap reinforcing a minimum of 6".
- B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.
- C. Reinforce walls with continuous horizontal joint reinforcing at 16" oc. vertically, unless specifically noted to be omitted.
- D. Provide continuity at corners and wall intersections by use of prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other special conditions.
- E. Reinforce masonry openings over 12" wide with horizontal joint reinforcement placed in 2 horizontal joints approximately 8" apart, immediately above the lintel and below the sill. Extend reinforcement a minimum of 24" beyond the jambs of openings except at control joints.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Provide vertical and horizontal expansion, control and isolation joints in masonry where shown. Build in related items as the masonry work progresses.
 - 1. Build in non-metallic joint fillers where indicated.

3.9 LINTELS:

- A. Install steel lintels where indicated reference structural drawings for additional information.
- B. Provide masonry lintels where shown and wherever openings of more than 1'-0" for brick size units and 2'-0" for block size units are shown without structural steel or other supporting lintels. Provide precast or formed-in-place masonry lintels. Cure precast lintels before handling and installation. Temporarily support formed-in-place lintels.
- C. For hollow concrete masonry unit walls, use specially formed U-shaped lintel units with reinforcement bars placed as shown filled with coarse grout.
- D. Provide minimum bearing of 8" at each jamb, unless otherwise indicated.

3.10 FLASHING OF MASONRY WORK

- A. General: Provide concealed flashing in masonry work at, or above, shelf angles, lintels, ledges and other obstructions to the downward flow of water in the wall so as to divert such water to the exterior. Prepare masonry surfaces smooth and free from projections which could puncture flashing. Place through wall flashing on sloping bed of mortar. Seal penetrations in flashing with mastic before covering. Extend flashings through exterior face of masonry and turn down to form drip.
- B. Extend flashing the full length of lintels and shelf angles and a minimum of 4" into masonry at each end. Extend flashing from exterior face of masonry and turn up 8".
- C. Turn flashing, fold and seal at corners, bends and interruptions.

3.11 REPAIR, POINTING AND CLEANING:

- A. Remove and replace masonry units which are loose, chipped, broken, stained or otherwise damaged, or if units do not match adjoining units as intended. Provide new units to match adjoining units and install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep holes, and completely fill with mortar. Point-up all joints including corners, openings and adjacent work to provide a neat, uniform appearance, prepared for application of sealants.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and non-metallic scrape hoes or chisels.

2. Protect adjacent surfaces from contact with cleaner solutions.
 3. Saturate wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 4. Acidic cleaner: apply in compliance with directions of cleaner manufacturer.
 5. Clean concrete unit masonry to comply with masonry manufacturer's directions and applicable NCMA "TEK" bulletins.
- D. Protection: Provide final protection and maintain conditions in a manner acceptable to Installer, which ensures unit masonry work being without damage and deterioration at time of substantial completion.

3.12 WATERPROOFING:

- A. Apply waterproofing to all exterior masonry only in accordance with manufacturer's instructions at recommended spreading rates. Field Applied Water Resistive Barrier: Similar to Carlisle Barritech NP
- B. Thoroughly clean masonry prior to applying penetrating sealers.
- C. Do not apply penetrating sealers until masonry has cured for a minimum of 28 days.

... END OF SECTION 042200

SECTION 05120STRUCTURAL STEEL

PART 1 - DESCRIPTION

- A. RELATED DOCUMENTS: The drawings and the general provisions of the Contract.
- B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

- A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Structural steel is that work defined in AISC "Code of Standard Practice" and as otherwise shown on drawings.
- C. Miscellaneous Metal Fabrications are specified elsewhere in Division 5.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following, except as otherwise indicated:
 - 1. AISC "Code of Standard Practice for Steel Buildings and Bridges-Latest Edition."
 - a. Paragraph 4.2.1 of the above code is hereby modified by deletion of the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any connections designed by the Fabricator as part of his preparation of these shop drawings."
 - 2. AISC "Specification for Structural Steel Buildings-**[Latest Edition]**" including "Commentary" and Supplements thereto as issued.
 - 3. AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts" approved by the Research Council on Structural Connection of the Engineering Foundation.
 - 4. AWS D1.1 - Latest Edition "Structural Welding Code" - Steel.
 - 5. AWS D1.3 - Latest Edition "Structural Welding Code" Sheet Steel.

6. ASTM A 6 "General Requirements for Delivery of Rolled Steel Plates, Shapes, Sheet Piling and Bars for Structural Use."
- B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS D1.1 "Standard Qualification Procedure."
1. Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
 2. If recertification of welders is required, retesting will be the Contractor's responsibility.
- C. Fabricator Qualifications: Fabricator must be a member of the American Institute of Steel Construction (AISC), be certified in Category I of the AISC Quality Certification Program, or be a member of the Structural Steel Fabricators of New England (SSFNE). Provide certification of at least one of the above.

1.04 SUBMITTALS

- A. The Engineer of Record (EOR) shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have received and approved all submittals prior to review by the Engineer. All review by the Architect, Engineer, and Contractor of submittals shall be completed prior to fabrication and installation of any material or product.
- B. Product Data: Submit producer's or manufacturer's specifications and installation instructions for following products. Include laboratory test reports and other data to show compliance with specifications (including specified standards).
1. Structural steel (each type), including certified copies of mill reports covering chemical and physical properties.
 2. High-strength bolts (each type), including nuts and washers.
 3. Structural steel primer paint.
- C. Shop Drawings:
1. General:
 - a. Submit shop drawings prepared under the supervision of a registered professional engineer, including complete details and schedules for fabrication and assembly of structural steel members, procedures and diagrams. Include details of cuts, connections, camber, holes and other pertinent data. Re-use of structural contract documents as erection or detail drawings will not be permitted.

- b. Indicate welds by standard AWS symbols, and show size, length and type of each weld.
- c. Provide setting drawings, templates and directions for installation of anchor bolts and other anchorages to be installed by others.
2. Connection Design: Submit design calculations for those connections not specifically addressed by the AISC "Manual of Steel Construction" (ASD or LRFD), prepared and stamped by a registered professional engineer licensed to practice in the State of Maine.
3. Submittals: Submit (2) black line prints of each shop drawing. Submit (2) copies of the connection calculations.
4. Shop Drawing Review: Review of the shop drawings will be made for the size and arrangement of members and the strength of connections. Conformance of the Shop Drawings to the Design Drawing Set remains the responsibility of the General Contractor. This review in no way relieves the General Contractor of this responsibility.
5. The Engineer/Architect reserve the right to make revisions during the shop drawing review. These revisions shall be incorporated into the shop drawings at no additional cost.
6. Test Reports: Submit copies of reports of tests conducted on shop and field bolted and welded connections. Include data on type(s) of test conducted and test results.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to site at such intervals to insure uninterrupted progress of work.
- B. Deliver anchor bolts and anchorage devices, which are to be embedded in cast-in-place concrete or masonry, in ample time to not delay work.
- C. Store materials to permit easy access for inspection and identification. Keep steel members off ground, using pallets, platforms, or other supports. Protect steel members and packaged materials from corrosion and deterioration.
- D. Do not store materials on structure in a manner that might cause distortion or damage to members or supporting structures. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Structural Steel Shapes, Plates and Bars: ASTM A 36.
- B. Cold-Formed Steel Tubing: ASTM A 500, Grade B, $F_y = 46$ ksi.

- C. Steel Pipe: ASTM A 53, Grade B.
- D. Anchor Bolts:
 - 1. ASTM A 307, headed type unless otherwise indicated.
 - 2. ASTM A 325, headed type as indicated on drawings.
- E. Unfinished Threaded Fasteners: ASTM A 307, Grade A, regular low-carbon steel bolts and nuts.
 - 1. Provide hexagonal heads and nuts for all connections.
- F. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, as follows:
 - 1. Quenched and tempered medium-carbon steel bolts, nuts and washers, complying with ASTM A325.
 - 2. Direct tension indicator washers or bolts may be used at Contractor's option.
- G. Electrodes for Welding: E70XX and comply with AWS Codes.
- H. Structural Steel Primer Paint: TNEMEC 10-99 alkyd rust inhibitive primer, 2.0 to 3.5 mils dry thickness, or approved alternate.
- I. Structural Steel Top Coat for steel permanently exposed to view: TNEMEC Series 2 TNEMEC-gloss enamel, 3.0 to 5.0 mils dry thickness, or approved equal unless otherwise noted on drawings. Approval shall be made by the owner's representative. Paint color shall comply with Architectural Specifications.
- J. Non Shrink Cement-Based Grout: See section 03300
- K. Galvanizing: ASTM A 125, Hot-Dipped.

2.02 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings.
 - 1. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence which will expedite erection and minimize field handling of materials.

2. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs and other defects.

B. High-Strength Bolted Connection: Install high-strength threaded fasteners in accordance with AISC "Specification for Structural

Joints using ASTM A 325 or A 490 Bolts". Unless otherwise indicated, all bolted connections are to be tightened to the snug tight condition as defined by AISC.

C. Welded Construction: Comply with AWS Codes for procedures, appearance and quality of welds, and methods used in correcting welding work.

D. Holes for Other Work: Provide holes required for securing other work to structural steel framing, and for passage of other work through steel framing members, as shown on final shop drawings. Cut, drill, or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.

2.03 SHOP PAINTING

A. General:

1. Shop paint structural steel, except those members or portions of members to be embedded in mortar or concrete.
2. Paint embedded steel which is partially exposed on exposed portions and initial 2" of embedded areas only. Do not paint surfaces which are to be welded.

B. Surface Preparation: After inspection and before shipping, clean steel work to be painted. Remove loose mill scale, splatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) SP-2 "Hand Tool Cleaning."

C. Painting:

1. Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions. Apply primer at a rate to provide dry film thickness given in this specification. Use painting methods which result in full coverage of joints, corners, edges and exposed surfaces.
2. Structural steel exposed to weather or as otherwise indicated in drawings shall be top coated with a minimum of two coats of gloss enamel. Apply top coat to meet thickness requirements given in this specification.

PART 3 - EXECUTION

3.01 ERECTION

- A. General: Comply with AISC Specifications for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.
- B. Surveys: Check elevations of concrete and masonry bearing surfaces, and locations of anchor bolts and similar devices, before erection

work proceeds, and report discrepancies to Architect. Do not proceed with erection until corrections have been made, or until compensating adjustments to structural steel work have been approved by Engineer of Record. Refer to Section 3.03 B.

- C. Temporary Shoring and Bracing: Provide temporary shoring and bracing members with connections of sufficient strength to bear imposed loads. Remove temporary members and connections when permanent members are in place and final connections are made. Provide temporary guy lines to achieve proper alignment of structures as erection proceeds.

D. Anchor Bolts:

- 1. Furnish anchor bolts and other connectors required for securing structural steel to foundations and other in-place work.
- 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.

E. Setting Plates and Base Plates:

- 1. Furnish templates and other devices as necessary for presetting bolts and other anchors to accurate locations. Refer to division 3 of these specifications for anchor bolt installation requirements in concrete.
- 2. Clean concrete bearing surfaces of bond-reducing materials. Clean bottom surface of setting and bearing plates.
- 3. Set loose and attached base plates for structural members on wedges or other adjusting devices.
- 4. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.

F. Field Assembly

- 1. Set structural frames accurately to lines and elevations indicated.
- 2. Align and adjust various members forming part of complete frame or structure before permanently fastening.

3. Clean bearing surfaces and other surfaces which will be in permanent contact before assembly.
 4. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 5. Level and plumb individual members of structure within specified AISC tolerance.
 6. Splice members only where indicated and accepted on shop drawings.
 7. Do not enlarge unfair holes in members by burning or by use of drift pins, except in secondary bracing members. Ream holes that must be enlarged to admit bolts.
- G. Erection bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surface.
- H. Gas Cutting: Do not use gas cutting torches in field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members which are not under stress, as acceptable to the Engineer of Record. Finish gas-cut sections equal to a sheared appearance when permitted.
- I. Paint Damage: Touch up shop applied paint whenever damaged or bare. Clean surface and touch up with shop primer noted in Section 2.01 H and top coat, if required.

3.02 QUALITY CONTROL

A. General:

1. Contractor is responsible for maintaining quality control in the field and for providing a structure that is in strict compliance with the contract documents.
2. Required inspection and testing services are intended to assist the Contractor in complying with the Contract Documents. These specified services, however, do not relieve the Contractor of his responsibility for compliance, nor are they intended to limit the Contractor's quality control efforts in the field.

B. Testing Agency:

1. Contractor shall engage an independent testing agency to inspect all high-strength bolted and welded connections, to perform tests and prepare reports of their findings. All

- connections must pass these inspections prior to the installation of subsequent work which they support.
2. Testing agency reports shall state which specific connections were examined or tested, whether the connections comply with the contract documents and what deviations, if any, were noted. Copies of these reports shall be sent to the Architect for review.
 3. Contractor shall provide access for testing agency to places where structural steel work is being fabricated, produced or erected so that required inspection and testing can be accomplished.
 4. Testing agency may inspect structural steel at plant before shipment. The Engineer, however, reserves right, at any time before final acceptance, to reject material not complying with specified requirements.

C. Inspection Requirements:

1. Bolted Connections: Inspect all bolted connections in accordance with procedures outlined in the AISC "Specification for Structural Joints using ASTM A325 or A490 Bolts."
 - a. Snug Tight Connections:
 1. The inspector shall monitor the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.
 2. If the inspector does not monitor the installation of bolts, he shall visually inspect the connection to determine that all plies of connected material have been drawn together and conduct tests on a sampling connection bolts to determine if they have been tightened to the snug tight condition. The test sample shall consist of 10% of the bolts in the connection, but not less than two bolts, selected at random. If more than 10% of the tested bolts fail the initial inspection, the engineer reserves the right to increase the number of bolts tested.
 - b. Slip Critical Connections:
 1. The inspector shall monitor the calibration of torquing equipment and the installation of bolts to determine that all plies of connected material have been drawn together and that the selected procedure is used to tighten all bolts.
 2. If the inspector does not monitor the calibration or installation procedures, he shall test all bolts in the affected connection using a manual torque wrench to assure that the required pretension has been reached.
2. Welding: Inspect all welded connections in accordance with the procedures outlined in AWS D1.1.

- a. Certify welders and conduct inspections and tests as required. Record work required and performed to correct deficiencies.
- b. Perform visual inspection of all welds. Welds deemed questionable by visual inspection, all partial and full

penetration welds, and any other welds indicated on the drawings shall be tested by one of the following:

- 1. Liquid penetrant inspection: ASTM E 165.
- 2. Magnetic particle inspection: ASTM E 109; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration not acceptable.
- 3. Radiographic Inspection: ASTM E 94 and ASTM E 142; minimum quality level "2-2T".
- 4. Ultrasonic Inspection: ASTM E 164.
- 5. All welds deemed unacceptable shall be repaired and retested at the Contractor's expense.

D. Nonconforming Work: Contractor shall be responsible for correcting deficiencies in structural steel work which inspections laboratory test reports have indicated to be not in compliance with requirements. Additional tests shall be performed, at the Contractor's expense, as may be necessary to show compliance of corrected work. Any costs associated with the Engineer's review and disposition of faulty work shall be borne by the Contractor.

3.03 ENGINEER'S REVIEW

- A. The Engineer of Record will conduct periodic reviews of the construction for general compliance with the provisions of the Specifications and Drawings during the construction period.
- B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for construction not in conformance with the provisions of the Contract Documents. These modifications and repair details shall be stamped by an engineer licensed to practice in the **State of Maine** and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION

SECTION 055000

METAL FABRICATIONS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Contract Conditions and other Technical Sections apply to work of this Section insofar as applicable.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. The work includes furnishing all materials, equipment, labor, supervision, design and drafting services, and fabricating, painting and performing all operations necessary to complete the metal fabrication work as shown on the Drawings, as specified herein, and as is additionally required to properly complete the work. Metal fabrication includes items made from iron, steel and aluminum shapes, plates, bars, strips, tubes, pipes and castings which are not specified elsewhere.
- B. Without in any way limiting the scope of work, the following major items are mentioned:
 - 1. Aluminum bar grating frame.
 - 2. Welded support fabrications.
 - 3. Various anchors for installing/setting in concrete and masonry.
 - 4. Lintels.
 - 5. Shop painting of all ferrous items unless otherwise specified.
 - 6. Gable Louvers.

1.03 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of the following (latest edition including all amendments), except as otherwise indicated:

The State of Maine Building Code.

AISC "Code of Standard Practice for Steel Buildings and Bridges".

AWS D1.1 "Structural Welding Code".

ASCE-7 "Minimum Design Loads for Buildings and Other Structures".

NAAMM "Standard Specifications for Metal Bar Grating and Metal Bar Grating reads" and "Metal Bar Grating Manual".

- B. Qualifications for Welding Work: Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure". Provide certification that welders to be employed in work have satisfactorily passed AWS qualification tests.
- C. Field Measurements: Where possible, take field measurements prior to preparation of shop drawings and fabrication. Do not delay job progress; allow for field trimming and fitting where taking field measurements before fabrication might delay work.
- D. Shop Prefabrication/Assembly: Prefabricate/preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- E. The work specified under this Section shall be performed by firms that have been engaged in the satisfactory manufacture and fabrication of work of the same type and magnitude as specified herein for a period of at least five years.

1.04 SUBMITTALS

- A. Product Data: Submit copies of manufacturers' specifications, anchorage/ installation details and installation instructions for products to be used in miscellaneous metal fabrications, including paint and grout products.
- B. Shop Drawings: Submit shop drawings for fabrication and erection of miscellaneous metal fabrications. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items. Provide templates for anchor bolts, etc., to be installed by others.

Where materials or fabrications are indicated to comply with certain requirements for design loadings, include structural computations, material properties, and other information needed for structural analysis.

Any discrepancies in the Engineer's Drawings shall be brought to the attention of the Engineer for adjustment. The Contractor shall verify field dimensions with those dimensions given on the Engineer's Drawings, and obtain by measurement at the site all necessary dimensions and levels dependent on construction in-place.

Prior to submission of the shop drawings to the Engineer, they shall be pre-checked by the Contractor for conformity of detail with the Contract Documents and site conditions, and shall be coordinated with other work on the Project as necessary. The signature of a representative of the Contractor indicating that the shop drawings have been pre-checked will be required. The Contractor shall be wholly responsible for the

conformity of dimensions and details of the shop drawings with the Contract Documents and site conditions.

After receipt of the shop drawings by the Engineer, they will be reviewed and necessary revisions will be marked on the sepias which will be returned to the Contractor. Revisions shall then be made and the shop drawings resubmitted. This procedure will be continued until the shop drawings are released for construction. The Contractor shall then deliver to the Engineer one transparency and three prints for his record and the use of his personnel.

At least one copy of each released shop drawing shall be kept available in the Contractor's field office; shop drawings not bearing evidence of release for construction by the Engineer shall not be kept on the job.

- C. Samples: Submit 2 sets of representative samples of materials and finished products. Also include a sample weld connection.
- D. Design Calculations: The Contractor shall provide written verification that a registered engineer in the State of Maine has designed connections to supporting structures, and all other structurally related items.

1.05 DELIVERY AND STORAGE

- A. Upon delivery to the jobsite or storage site, the miscellaneous metal fabrications shall be carefully unloaded and stacked at least 1 foot above the ground in such a manner as to provide ready surface drainage and adequate air circulation. All members exhibiting defective coatings, scars, abrasions, poor surface preparation, etc., shall be remedied by the Contractor to the satisfaction of the Engineer prior to placing items in storage or, if in the Engineer's opinion, such damaged items cannot be satisfactorily repaired, said items shall be promptly removed from the site and replaced with new items meeting the Engineer's satisfaction.
- B. Deliver items to the site in a sequence that will allow the work to proceed without delay but will avoid long term storage of items at the site.

PART 2 - MATERIALS

2.01 MATERIALS

- A. Metal Surfaces: For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names and roughness.
- B. Steel Plates, Shapes and Bars: ASTM A 36.
- C. Aluminum: All structural extrusions shall be 6063-T6; all other extrusions shall be 6063-T5.

- D. Expansion Bolts: Stainless steel "Kwik Bolts" as manufactured by Hilti Fastening Systems or approved equal.
- E. Non-Shrink, Non-Metallic Grout: Pre-mixed, factory-packaged, non-staining, non-corrosive, non-gaseous grout complying with CRD-C621. Provide grout specifically recommended by manufacturer for interior and exterior applications required.
- F. Welding Rods: Conform to AWS Specification AWS D1.1.
- G. Fasteners:

Provide stainless steel fasteners for exterior use and where built into exterior walls. Only non-magnetic stainless steel fasteners and washers shall be used where the fastener or washer will be in contact with aluminum.

H. Paint:

Metal Primer Paint: Except as otherwise noted, apply the following Tnemec primer, or approved equal by PPG, Devoe or DuPont to all non-galvanized ferrous surfaces.

Tnemec Series 10-99 Modified Alkyd Rust Inhibitive Primer, 3 dry mils, spray applied.

- I. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds and abrasions in galvanized steel, complying with Military Specifications MIL-P-21035 (Ships).

2.02 FABRICATION

A. Workmanship:

Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished products for the use intended, using proven and acceptable details of fabrication and support.

Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise shown. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.

Provide for anchorage of type shown, coordinated with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

All holes indicated on the Drawings necessary for the installation of anchors shall be made as part of the work of this Section. No holes other than as indicated on the Drawings shall be drilled, punched or cut without the approval of the Engineer. Holes shall not be made by burning.

Material and workmanship shall at all times be subject to the approval of the Engineer.

Thickness of metal and details of assembly and anchors shall provide ample strength and stiffness with anchors concealed where possible. Provide waterproof joints where metal is exposed to the weather. Provide holes and connections for the work of other trades.

B. Codes and Regulations:

All fabrications intended for personnel walking, climbing, guarding and working surfaces, and the installation thereof, shall meet the requirements of the Department of Labor Occupational Safety and Health Standards and all State and local codes. In the event of conflicting requirements, the more stringent or conservative shall apply. All such work shall be stamped by a Professional Engineer registered in the State of Maine.

C. Galvanizing:

Provide a zinc coating for those items shown or specified to be galvanized, as follows:

ASTM A 153 for hot-dip galvanized iron and steel hardware.

ASTM A 123 for hot-dip galvanized iron and steel products.

D. Shop Painting:

Shop paint miscellaneous metal work, except surfaces and edges to be field welded, and galvanized surfaces, unless otherwise indicated. Shop paint the portions of embedded steel to be exposed, and for an additional 2 inches below the exposed portion. Surface preparation and painting shall be performed in accordance with all applicable requirements of Section 09900.

"Commercial Blast Clean" welded support fabrications in accordance with Steel Structures Painting Council (SSPC) SP-6. For ferrous items, clean off heavy rust, loose mill scale, other deleterious materials in accordance with SSPC SP-3 "Power Tool Cleaning".

Remove oil, grease and similar contaminants in accordance with SSPC SP-1 "Solvent Cleaning" prior to performing any other surface preparation procedures.

Immediately after surface preparation, apply primer in accordance with manufacturer's instructions at a rate to provide a uniform dry film thickness of 3.0 dry mils. Use painting techniques which will result in full coverage of joints, corners, edges and all other surfaces.

Unless otherwise specifically indicated, apply one shop coat to all non-galvanized carbon steel fabricated items, except apply 2 coats of paint to surfaces inaccessible after assembly or erection. Change color of second coat to distinguish it from the first.

2.03 MISCELLANEOUS METAL FABRICATIONS

A. Rough Hardware:

Furnish conventional as well as bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels and other miscellaneous steel and iron shapes as required for framing, supporting, anchoring or securing items to concrete, masonry and other materials.

Fabricate items to sizes, shapes and dimensions required. Furnish steel washers for heads and nuts.

B. Miscellaneous Framing and Supports:

Provide miscellaneous steel framing and supports which are not specified elsewhere, as required to properly complete the work.

Fabricate miscellaneous units to sizes, shapes and profiles shown or, if not shown, of required dimensions to receive other work to be retained by framing. Fabricate from structural steel shapes, plates and bars of welded construction using mitered joints for field connections. Cut, drill and tap units as required. No burning of holes shall be allowed.

Hot dip galvanize all miscellaneous carbon steel frames, attachments, supports, etc., to be used in exterior applications and in exterior walls.

C. Aluminum Bar Grating:

Grating shall be pressure-locked type, 1 1/2 inch thick, with rectangular bearing bars. Fabricate grating to be flat, without warp, sized to fit in the utility pit recessed galvanized steel frame. Undercut grating 3/16 inch in both directions to facilitate periodic removal and reinstallation.

D. Brackets, Flanges, Fittings and Anchors:

Provide all types of brackets, closures, flanges, miscellaneous fittings and anchors which are not provided under other specification sections as necessary for the proper completion of the work.

Hot dip galvanize carbon steel members, fittings, brackets, fasteners, and other components for exterior applications and when used in and on exterior walls.

E. Loose Bearing Plates:

Provide loose bearing plates for steel items bearing on masonry or concrete construction, made flat, free from warps and twists, and of required thickness and bearing area. Drill plates to receive anchors and for grouting as required. Galvanize after fabrication.

F. Louvers:

Where indicated on the Drawings, install Airolite type K601D horizontal blade, sightproof louvers (inverted Y) with 4 inch deep blades. Blades and frame shall be extruded aluminum 12 gauge alloy 6063-T52, with "Kawneer 500" finish, custom color to match the windows and frames. Louvers shall be fitted with 16 gauge aluminum insect screen in extruded aluminum frames. The Contractor shall submit the manufacturer's data derived in accordance with AMCA Standard 500 on a 4 foot by 4 foot unit demonstrating that it provided a minimum of 4.11 square feet of free area and shall intake 600 fpm free area at a static pressure drop not exceeding 0.15 inch H₂O. Similar louvers by Construction Specialties, Inc. or Rusken Mfg. Div., Phillip Industries Inc. will be considered for use. Where indicated, detail and fabricate louvers so as to be readily removable from the secure side (interior). Provide blank-off interior panels at gable end louvers. Hollow metal frames shall be supplied under Section 08110.

PART 3 - EXECUTION

3.01 PREPARATION

Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installation of anchorages, such as concrete inserts, sleeves, anchor bolts and miscellaneous items having integral anchors which are to be embedded in concrete or masonry construction. Coordinate delivery of such items to work performed at the site.

3.02 INSTALLATION

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction; including expansion anchors, anchor bolts, toggle bolts, through-bolts, lag bolts, wood screws and other connectors, as required. Only expansion anchors are to be used for attaching items to masonry. All fasteners for exterior construction shall be Type 304 or 316 stainless steel.
- B. Cutting, Fitting and Placement: The Contractor shall perform all measuring, detailing, cutting, drilling and fitting required to install miscellaneous metal fabrications. Set work accurately in location, alignment and elevation, plumb, level, true and free of rack, measured from verified established lines and levels. Provide temporary bracing or anchors in formwork for items which are to be built into concrete, masonry or similar construction.

Fit exposed connections accurately together to form tight hairline joints. Field weld connections which cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up shop paint coat and galvanizing. Do not weld, cut or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.

- C. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding, appearance and quality of welds made, and methods used in correcting welding work.

- D. Setting Loose Bearing Plates:

Clean concrete and masonry bearing surfaces and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.

Set loose bearing plates on wedges. Position bearing members and tighten the anchor bolts. Do not remove wedges but cut-off flush with the edge. Use non-metallic, non-shrink grout, unless otherwise indicated.

Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

- E. Install Louvers in accordance with the manufacturer's instructions and as indicated.

3.03 ADJUST AND CLEAN

- A. Restore finishes damaged during installation so that no evidence remains of corrective work.
- B. Touch-Up Painting: Immediately after erection, power tool clean in accordance with SSPC SP-3, field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide a minimum thickness of 2.0 dry mils of modified alkyd primer.
- C. For Galvanized Surfaces: Thoroughly clean field welds, bolted connections and abraded areas and apply 2 coats of approved galvanizing repair compound.
- D. Restore aluminum finishes as directed by the fabricator and approved by the Resident.

END OF SECTION

SECTION 061000

ROUGH CARPENTRY

PART 1 – DESCRIPTION

1.1 Description of the Work

- A. This section covers wood blocking and furring for masonry walls; wood nailers and blocking for roof fascias, flashing, and cants; wood framing; rough bucks for openings in masonry walls; wood framing for architectural casework and equipment; dressed wood grounds to receive plaster and other finish materials.
- B. This section also addresses requirements for pressure treatment of wood for decay-resistant qualities.
- C. The work covered by this Section includes, but is not necessarily limited to, the following:
 - 1. Furnishing and installing all rough carpentry including miscellaneous grounds, blocking, sills, plates, shoes, shims, and furring, framing, framing anchors, and fasteners.
 - 2. Furnishing and installing plywood wall back-up panels and back boards for telephone and electrical equipment.
 - 3. Drilling concrete and masonry and drilling and tapping of metal work as required for installation of rough carpentry.
 - 4. And any other items of carpentry necessary to complete work properly.

1.2 Related Work Specified Elsewhere

- A. Metal Fabrications – Section 055000.
- B. Finish Carpentry – Section 062013.
- C. Thermal Insulation – Section 0721000.
- D. Sheet Metal Flashing and Trim – Section 076200.
- E. Joint Sealants – Section 079200.

1.3 Submittals

A. The following shall be submitted in accordance with the requirements of Section 01340 – Submittals and Substitutions:

1. Certificates of Compliance

Section – Rough Carpentry

- a. Grade, species, and moisture content of wood-framing materials
- b. Fastener (bolts, anchors, screws).
- c. Wood-preservative treatment.

1.4 Delivery, Handling and Storage

- A. Wood materials shall be securely bundled and shipped with adequate moisture-resistant covers to preclude damage by weather or handling during delivery, when stored, and during construction.
- B. Wood materials that must be stored outdoors before immediate use shall be placed in orderly piles and stored on blocks above ground. Lumber shall be stored in stacks with provision for air circulation within stacks. The material shall be protected from the elements with moisture-resistant covers.

PART 2 PRODUCTS

2.1 Wood Materials

A. General

1. Each piece of framing lumber, board lumber and plywood shall bear the trademark and grade identification of the manufacturer's association or the authorized inspection bureau under rules of which the lumber is manufactured and graded.
2. Softwood lumber shall be seasoned S4S and Kiln-dried or air dried to the specified moisture content. Dressed sizes shall conform to USDC PS20.
3. Structural framing lumber shall be stress graded, with each piece being rated for strength and stamped to indicate the grade and fiber stress in

manufacturer's certificate of inspection.

4. Moisture content shall conform to the rules of the lumber association or the inspection bureau under which the lumber is graded but shall not exceed 19 percent for boards and dimensional lumber and shall be marked "MC-19".

2.2 Structural Framing Materials

- A. All nominal 2 X 6 or smaller framing lumber unless otherwise noted, shall be #2 Spruce-Pine-Fir or better grade and shall have the following minimum allowable stresses:

Section – Rough Carpentry

1. Extreme fiber in bending, $F_b = 1,000$ psi.
 2. Tension parallel to grain, $F_t = 600$ psi.
 3. Compression parallel to grain, $F_c = 675$ psi.
 4. Modulus of elasticity, $E = 1,300,000$ psi.
- C. All nominal framing lumber greater than 2 X 6, unless otherwise noted, shall be #2 Spruce-Pine-Fir or better grade and shall have the following minimum allowable stresses:
 1. Extreme fiber in bending $F_b = 1,000$ psi.
 2. Tension parallel to grain $F_t = 600$ psi.
 3. Compression parallel to grain $F_c = 675$ psi.
 4. Modulus of elasticity $E = 1,300,000$ psi.

2.3 Preservative Treated Lumber

- A. The following wood members shall be pressure-preservative treated in accordance with FS TT-W-00571 and AWPB LP-2. Each piece shall bear the AWPB stamp, indicating point of treatment, preservative symbol, symbol of standard, date of treatment and moisture content after treatment:
 1. Wood sills, plates, rough bucks and frames in exterior masonry wall openings.

2. Wall plates and furring in contact with exterior masonry or concrete.
 3. Nailers that are set into, or are in contact with, concrete or masonry.
 4. Blocking and nailers for roof deck, sub-fascia members, roof cants and saddles.
- B. Preservative shall be either water-borne, conforming to AWPA P5, or oil-borne conforming, to AWPA P8.
- C. Nailers to receive membrane waterproofing and wood members to receive finish materials shall be treated with a water-borne preservative to eliminate preservative bleed-through at nails.
- D. Wood treated with oil-borne preservatives shall be clean, free from surface oil and properly seasoned for use.
- E. Wood treated with water-borne preservatives shall be air dried or kiln-dried to reduce maximum moisture content to 15 percent.

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- F. The Contractor shall provide an affidavit signed by the preservative treatment company stipulating the moisture-retention obtained and certifying that for oil-borne, preservative-treated materials requiring paint or in contact with wood to be painted, the treated material conforms to the paintability, drying time and surface deposit requirements of FS TT-W-572 and that the moisture content for water-borne and preservative-treated materials does not exceed 15 percent upon shipment from the treatment plant.
- G. Cut surfaces of preservative-treated material shall be brush coated with at least two coats of the same preservative used in the pressure treatment.
- H. Treated wood exposed in the final structure shall be free from objectionable odors and shall not be harmful or corrosive to adjacent materials or anchorages.

2.4 Sliding/Folding Door Hardware

- A. Stanley Model No. 2841-8 interior sliding door hardware.
- B. Morgan Folding Door Kit MFD-36A with heavy duty aluminum tracks.

PART 3 EXECUTION

3.1 Installation

- A. Accurately and properly fit and brace all work and secure in position and direction. Framing, studding and blocking shall be as directed on the Drawings or as required by the work. Cooperate with all other trades as required. Use acoustical sealant along shoe and header of all party walls.

3.2 General Framing

- A. All members are to be installed as shown on the drawings. when individual members have built-in camber, the members shall be placed with camber up.
- B. No cutting of holes or notches in trusses for pipe, conduit or other reasons will be allowed.
- C. All bearing surfaces shall be horizontal and even over the entire width of support.

3.3 Plywood Installation

- A. Plywood sheathing shall be installed with face-grain perpendicular to supports and be continuous over a minimum of two spans
- B. End joints of sheets shall be staggered so that joints are not continuous along a support.
- C. When framing members (including walls and roofs) are 24" or more on center, support edges of plywood sheathing perpendicular to and at midpoints between framing with metal "H" clips or solid blocking.

3.4 Miscellaneous Framing Requirements

- A. All wood material in contact with concrete or masonry shall be given two coats of green Cuprinol wood preservative. Note: wood sills shall be pressure treated, not paintable treated.
- B. Set all blocking required to erect all exterior and interior woodwork; cabinets; plumbing, electrical and mechanical equipment; rough bucks and blocking for roofing work.
- C. Cutting and Patching – Do all cutting, patching, heading and blocking required for work of all trades. Notify Telephone Company to place jacks at rough-in stages.
- D. Blocking and Supports – Install 2" nominal thick blocking of width necessary in stud partitions for anchoring all medicine cabinets, mirrors, towel bars, grab bars, handrail brackets, and other items applied to or in the walls.

- E. Backing Boards – Install $\frac{3}{4}$ " plywood backboards for electrical and mechanical trades as required.

3.5 Clean-Up

- A. Keep the premises and working surfaces in a neat, safe and orderly condition at all times during execution of this portion of the work.
 - 1. At the end of each day, or more often if necessary, remove accumulation of sawdust, cut-ends and other debris to proper storage areas for disposal.
 - 2. Upon completion of this portion of the work, thoroughly clean up the area.

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END OF SECTION

SECTION 06190

PREFABRICATED WOOD TRUSSES

PART 1 - DESCRIPTION

- A. Related Documents: Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.
- B. Examine all other sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this section.
- C. Coordinate work with that of all trades affecting or affected by work of this Section. Cooperate with such trades to assure the steady progress of all work under the Contract.

1.02 DESCRIPTION OF WORK

- A. Definition: Prefabricated wood trusses include planar structural units consisting of metal plate connected members which are fabricated from dimension lumber and which have been cut and assembled prior to delivery to the job site.
- B. Types of fabricated wood trusses are indicated on the drawings.

1.03 RELATED WORK SPECIFIED ELSEWHERE

Section 06100 – Rough Carpentry

1.04 QUALITY ASSURANCE

- A. TPI Standards: Comply with applicable requirements and recommendations of the following Truss Plate Institute (TPI) publications:
 - 1. “Design Specification for Metal Plate Connected Wood Trusses.”
 - 2. “Commentary and Recommendations for Handling and Erecting Wood Trusses.”
 - 3. “Commentary and Recommendations for Bracing Wood Trusses.”
 - 4. “Quality Control Manual.”
- B. Wood Structural Design Standard: Comply with applicable requirements of NFPA “National Design Specification for Wood Construction.”
- C. Lumber Standard: Comply with PS 20 and with applicable rules of the respective grading inspecting agencies for species and grade of lumber indicated.

- D. Connector Plate Manufacturer's Qualifications: Provide truss connector plates manufactured by a firm which is a member of TPI and which complies with TPI quality control procedures for manufacture of connector plates published in TPI "Quality Control Manual."
- E. Fabricator's Qualifications: Provide trusses by a firm which has a record of successfully fabricating trusses similar to type indicated and participates in the TPI "Quality Control Inspection Program" as a licensee authorized to apply TPI marks to trusses.
- F. Uniformity of Manufacture for Connector Plates: Provide metal connector plates from a single manufacturer.

1.05 SUBMITTALS

- A. The Engineer shall receive all submittals a minimum of two weeks prior to the start of fabrication. The Contractor shall have received and approved all submittals prior to review by the Engineer. All review by the Architect, Engineer and Contractor of submittals shall be completed prior to fabrication and installation of any material or product.
- B. Product Data: Submit fabricator's technical data covering lumber, metal plates, hardware, fabrication process and treatment (if any).
 - 1. Submit certificate, signed by an officer of fabricating firm, indicating that trusses to be supplied for project comply with indicated requirements.
- C. Shop Drawings:
 - 1. General: Submit shop drawings, prepared under the supervision of a professional engineer, showing species, sizes and stress grade of lumber to be used; pitch, span, camber, configuration and spacing for each type of truss required: type, size, material, finish, design value and location of metal connector plates; and bearing and anchorage details.
 - 2. Design: To the extent engineering design considerations are indicated as the Fabricator's responsibility, submit design analysis and test reports indicating loading, section modulus, assembled allowable stress, stress diagrams and calculations and similar information needed for analysis and to ensure that trusses comply with requirements.
 - 3. Engineer Stamp: Provide shop drawings which have been signed and stamped by a structural engineer licensed to practice in the State of Maine.
 - 4. TPI Approval: All drawing submittals must bear a TPI stamp.
 - 5. Submittal: Submit (1) blue line print and (1) reproducible transparency of each shop drawing.

1.06 DELIVERY, STORAGE, HANDLING

- A. Handle and store trusses with care, and in accordance with manufacturer's instructions and TPI recommendations to avoid damage from bending, overturning or other cause for which truss is not designed to resist or endure.
- B. Time delivery and erection of trusses to avoid extended on-site storage and to avoid delaying work of other trades whose work must follow erection of trusses.

PART 2 – PRODUCTS

2.01 LUMBER

- A. General: Factory mark each plate of lumber with type, grade, mill and grading agency.
- B. Sizes: Nominal sizes are indicated except as shown by detail dimensions. Provide actual sizes as required by PS 20 for dressed lumber, S4S, unless otherwise indicated.
- C. Moisture Content: Provide seasoned lumber with a maximum moisture content of 19% at time of dressing.
- D. Lumber Grade: Lumber members will be graded in accordance with the following grading agency requirements.
 - 1. Eastern Woods: NELMA or NHPMA
 - 2. Western Woods: WWPA
 - 3. Southern Pine: SPIB

2.02 METAL CONNECTOR PLATES, FASTENERS AND ANCHORAGES

- A. Connector Plate Material: Use metal not less than "0.036" thick, coated thickness, (Contractor's option if more than one metal indicated).
 - 1. Galvanized Sheet Steel: ASTM A 446, Grade A, Coating G60.
 - 2. Electrolytic Zinc Coated Steel Sheet: ASTM A 591, Coating Class C, with minimum structural quality equivalent to ASTM A 446, Grade A.
- B. Available Manufacturers: Subject to compliance with requirements, manufacturers offering metal connector plates which may be incorporated in the work, but are not limited to, the following:
 - a. Gang Nail Systems, Inc.
 - b. Hydro-Air Engineering, Inc.

- c. Inter-Lock Steel Co., Inc.
- d. Link-Wood Construction Systems
- e. Robbins Manufacturing Co.
- f. Tee-Lok Corp.
- g. Truss Connectors of America
- h. Truswall Systems Corp.

2.03 FIRE RETARDANT TREATMENT

- A. All trusses will be pressure treated with fire retardant chemicals according to AWPA Standard C 20.

2.04 FABRICATION

- A. Cut truss members to accurate lengths, angles and sizes to produce close fitting joints with wood-to-wood bearing in assembled units.
- B. Fabricate metal connector plates to size, configuration, thickness and anchorage details required for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated using jigs or other means to ensure uniformity and accuracy of assembly with close fitting joints. Position members to produce design camber indicated.
- D. Connect truss members by means of metal connector plates accurately located and securely fastened to wood members by means indicated or approved.

PART 3 – EXECUTION

3.01 GENERAL

- A. Erect and brace trusses to comply with the recommendations of the Manufacturer and the TPI publications referenced above.
- B. Erect trusses with plane of truss webs vertical (plumb) and parallel to each other, located accurately at design spacings indicated.
- C. Hoist units in place by means of lifting equipment suited to sizes and types of trusses required, applied at designated lift points as recommended by fabricator, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Provide temporary bracing as required to maintain trusses plumb, parallel and in location indicated, until permanent bracing is installed.
- E. Anchor trusses securely at all bearing points to comply with methods and details indicated.

- F. Install permanent bracing and related components to enable trusses to maintain design spacing, withstand live and dead loads including lateral loads, and to comply with other indicated requirements.
- G. Do not cut or remove truss members.

3.02 ENGINEER'S REVIEW

- A. The Engineer of Record will conduct periodic reviews of the construction for compliance with the provisions of the Specifications and Drawings during the construction period.
- B. The General Contractor shall employ a licensed professional engineer to analyze and design modifications and repairs for construction not in conformance with the provisions of the Contract Documents. These modifications and repair details shall be stamped by an engineer licensed to practice in the State of Maine and submitted with calculations for approval by the Engineer of Record. Modifications shall not be made without express written approval.

END OF SECTION

SECTION 062013

FINISH CARPENTRY

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Contract Conditions and other Technical Specifications Sections apply to work of this Section insofar as applicable.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. Finish carpentry work is shown on Drawings.
- B. Finish carpentry work includes, but is not limited to the following:
 - 1. Composite PVC standing and running trim and sills at windows
 - 2. Composite PVC panel soffits with soffit vents.
 - 3. Composite PVC exterior standing and running trim.

1.03 SUBMITTALS

- A. Product Data: Submit copies of manufacturer's specifications and installation instructions for each product required.
- B. Shop Drawings: Submit copies of shop drawings showing location of each item, dimensioned plans and elevations, large scale details, installation procedures and requirements, attachment devices and other components.
- C. Samples: Submit the following samples for each species and cut or pattern of architectural woodwork:
 - 1. Composite PVC trim for opaque finish; 6" x 3/4" x 18".
 - 2. Plywood for painted finish (including edge banding), 1 finished sample of each type, 12 inches' square.
 - 3. Composite PVC soffit panels for opaque finish; 6" x 1/2" x 12". Include PVC trim accessories for joining panels.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

Protect finish carpentry products during transit, delivery, storage and handling to prevent damage, soiling and deterioration.

1.07 WORK NOT INCLUDED

- A. Finishing of standing and running trim is specified in Section 099123 - Painting.

PART 2 - MATERIALS

2.01 BASIC MATERIALS AND FABRICATION METHODS

- A. Except as otherwise indicated, comply with following requirements for architectural woodwork not specifically indicated as prefabricated or prefinished standard products.
- B. Wood Moisture Content: Provide kiln-dried (KD) lumber with an average moisture content range of 9% to 12% for interior work; 15% for exterior. Maintain temperature and relative humidity during fabrication, storage and finishing operations.
- C. Interior Wood and PVC:
1. Concealed Solid Wood: Ponderosa Pine, Sugar Pine or Idaho Pine; No. 2 or better.
 2. Interior Plywood - Painted Finish: Interior grade A-B DFPA Douglas fir with matching edge bands where edges are exposed.
 3. Interior Composite PVC Trim – Painted Finish: Azek Trim, or similar as approved by Architect.
 4. Interior Composite PVC Panel – Painted Finish: Azek Sheet, or similar as approved by the Architect.
- F. Exterior PVC
1. Composite PVC Soffits - Painted Finish: Azek Sheet, or similar as approved by the Architect.
 2. Composite PVC Trim - Painted Finish: Azek Trim, or similar as approved by the Architect.
 3. PVC Accessories – “H” profile trim units for butting end joints of panels.
- G. Soffit Vents: Soffit vents shall be aluminum "Vent-a-Strip", Model 70 as manufactured by H.C. Products, Co., or approved equal.
- H. Design and Construction Features: Comply with details shown for profile and construction of finish carpentry; and, where not otherwise shown, comply with applicable Quality Standards, with alternate details at the fabricator's option.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Condition finish carpentry to average prevailing humidity conditions in installation areas prior to installing.
- B. Meet at the site prior to delivery of finish carpentry and review coordination and environmental controls required for proper installation and ambient conditioning in areas to receive work. Include in meeting the Contractor, Resident and other Authority representatives; installers, painting, mechanical work and electrical work, and firms or persons responsible for continued operation (whether temporary or permanent) of HVAC system as required to maintain temperature and humidity conditions. Proceed with installation only when everyone concerned agrees that required ambient conditions can be properly maintained.
- C. Deliver inserts and similar anchoring devices to be built into substrates well in advance of time substrates are to be built.
- D. Prior to installation of, examine shop fabricated work for completion, and complete work as required, including back priming and removal of packing.

3.02 INSTALLATION OF WOODWORK

- A. Install the work plumb, level, true and straight with no distortions. Shim as required using concealed shims. Install to a tolerance of 1/8 inch in 8'-0" for plumb and level (including countertops); 1/16-inch maximum offset in flush adjoining surfaces; and 1/8 inch maximum offsets in revealed adjoining surfaces.
- B. Scribe and cut work to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.
- C. Anchor finish carpentry to anchors or blocking built-in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for a complete installation. Except where prefinished matching fastener heads are required, use fine finishing nails for exposed nailing's, countersunk and filled flush with woodwork, and matching final finish where transparent finish is indicated.
- D. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to the greatest extent possible. Stagger joints in adjacent and related members. Cope at returns, miter at corners, and comply with Quality Standards for joinery.

3.03 INSTALLATION OF EXTERIOR SOFFITS & TRIM

All exterior soffits and trim shall be mitered to tight, hair-line joints and shall be back and edge sealed with clear sealer after all cuts are made (including those for soffit vents) and before installation. Joints in running material shall occur only at supports. Prior to installing, surfaces that will be inaccessible after installation shall be thoroughly back-primed. Fasteners shall be set below the finish surface and the holes filled and sanded smooth. Butted soffit panels shall have PVC "H" channels at seams with concealed fasteners.

3.04 ADJUSTMENT, CLEANING, FINISHING AND PROTECTION

- A. Repair damaged and defective work to eliminate functional and visual defects. Where it is not possible to repair items to the Resident's satisfaction, replace the work at no additional cost. Adjust joinery for uniform appearance.
- B. Lubricate, make final adjustments for proper operation, and clean hardware.
- C. Clean composite PVC exposed and semi-exposed surfaces. Touch-up finishes to restore damaged or soiled areas to the Engineer's satisfaction.
- D. Refer to Section 099123 for final finishing of installed finish carpentry work and architectural woodwork.
- E. Protection:
 - 1. Protect finish carpentry during the remainder of the construction period to ensure that work will be without damage or deterioration at time of acceptance.
 - 2. Cover completed work with protective covering as necessary to protect from damage, applied in a manner which will allow easy removal without damaging finish carpentry, or adjoining work. Remove coverings immediately before Final Acceptance.

END OF SECTION

SECTION 072100

THERMAL INSULATION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Contract Conditions and other Technical Specifications Sections apply to work of this Section insofar as applicable.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. The work includes furnishing of all labor and materials necessary to provide an installation which is complete in every respect and of the composition and quality as specified herein.
- B. Applications of insulation specified in this section include, but are not limited to, the following:
 - 1. Board type for perimeter slab and foundation walls.
 - 2. Board type for masonry cavity walls.
 - 3. Spray foam type for sealing around mechanical and electrical penetrations.
 - 4. Batt type insulation at the bottom chords of roof trusses.
 - 5. Loose masonry insulation for CMU voids.
- C. The work also includes furnishing and installing polyethylene vapor retarders.

1.03 QUALITY ASSURANCE

- A. Thermal Resistance: Where a minimum "R" value is given, provide thickness required to achieve indicated value.
- B. Thermal Transmittance-Heat Transfer: Where a maximum "U" value is given for a wall assembly, provide thickness required to achieve indicated value.
- C. Fire and Insurance Ratings: Comply with fire-resistance, flammability and insurance ratings indicated, and comply with regulations as interpreted by applicable codes and local authorities.

1.04 SUBMITTALS

- A. Product Data: Submit eight (8) copies of the manufacturers' specifications and installation instructions for each type of insulation and vapor barrier material required.
- B. Certified Tests: Submit eight (8) copies of certified test report showing compliance with specified performance values if submitted product is other than those specified.

1.05 PRODUCT HANDLING

Protect insulation from sunlight, from physical damage and from becoming wet, soiled, or covered with ice and snow. Comply with manufacturers' recommendations for handling, storage and protection during installation.

PART 2 - MATERIALS

2.01 MANUFACTURERS

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to those listed below.

2.02 MATERIALS

- A. Extruded Polystyrene Board Insulation: Rigid, closed-cell, extruded, polystyrene insulation board with integral high-density skin; comply with ASTM C 578, Type IV, achieve minimum compressive strength of 25 psi at 10% deformation per ASTM D 1621; achieve maximum moisture absorption of 0.3% by volume per ASTM C 272; 5-year aged R-value of 5 per inch at 75°F.

"SM", "TG" or "RM", Dow Chemical Co.
Formula 400, UC Industries/U.S. Gypsum

Expanded polystyrene insulation board is not acceptable.

- B. Unfaced Glass Fiber Batt Insulation: Thermal insulation produced by combining glass fibers with thermosetting resins to comply with ASTM C 665 for Type I and ASTM E 136.
- C. Concrete Masonry Unit Insulation: Shall be loose fill vermiculite insulation treated for water repellency, conforming to ASTM C 516, Type II, equal to "Zonolite Masonry Insulation" by W.R. Grace & Co.
- D. Spray Foam Insulation: Shall be "Great Stuff" by Dow Chemical Company, or similar as approved by the Architect.
- E. Adhesive for Bonding Insulation: Type recommended by insulation manufacturer and complying with fire-resistance requirements.

- F. Mechanical Anchors: Type and size, as recommended by insulation manufacturer for conditions of application and substrates.
- G. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints between units and filling voids in work.
- H. Vapor Retarder: 6 mil polyethylene film with laboratory tested vapor transmission rating of 0.2 perms, natural color. Provide manufacturer recommended, Engineer approved tape for sealing laps.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

Examine substrate and conditions under which insulation work is to be performed and notify the Engineer in writing of unsatisfactory conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected in an acceptable manner.

Clean substrates of substances harmful to insulations (or vapor barriers, including removal of projections which might puncture vapor barriers).

3.02 INSTALLATION OF INSULATION

- A. Comply with manufacturers' instructions for installation or consult manufacturer's technical representative for specific recommendations before proceeding with work.
- B. Apply insulation (full thickness) over entire area to be insulated. Cut and fit tightly around obstructions, and fill voids with insulation, taking care not to overly compress the insulation. Remove projections which interfere with placement.

C. Under-slab Insulation

Set units in accordance with the manufacturer's instructions and recommendations and protect from damage.

D. Cavity-Wall and Foundation Insulation:

Install polystyrene insulation board with globs of adhesive as recommended by manufacturer. Fit closely around reinforcing and obstructions, with all edges butted tightly.

Seal joints between insulation units by applying mastic to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation and around penetrations with mastic or approved sealant.

- E. Loose CMU and Spray Foam Insulation: Install in strict accordance with the manufacturers' instructions.

3.03 INSTALLATION OF VAPOR RETARDER

- A. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as approved by the Engineer. Extend vapor retarder to cover miscellaneous voids in insulation substrates.
- B. Seal vertical joints in vapor retarders over framing by lapping not less than 2 wall studs. Fasten vapor retarders to framing at top, end and bottom edges, at perimeter of wall openings and at lap joints in a manner acceptable to the Resident; space fasteners 16 inches on center. After retarder has been fastened, cover fasteners and lap joint with approved tape.

3.04 PROTECTION

Protect installed insulation and vapor retarders from harmful weather exposures and from physical abuse. Installer shall advise Contractor of exposure hazards, including possible sources of deterioration and fire hazards.

END OF SECTION

SECTION 074113.16STANDING SEAM METAL ROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. The Contractor shall design, engineer and furnish all materials, equipment, supplies, tools, labor and supervision, and shall perform all work required for the complete installation of weathertight structural standing seam aluminum-zinc alloy coated steel roofing systems for the Building, complete with matching accessories and appurtenances as shown on the Contract Drawings, as specified herein, as required and recommended by the roofing system manufacturer and approved by the Engineer, and as is additionally required for the proper completion of the work, including but not limited: providing a continuous panel anchorage system, waterproofing membrane, expansion joint, crickets, edge treatments, trim closures, penetration flashing, base and cap flashings, transition flashings, miscellaneous flashings, fasteners, sealants, snow guards, etc.

Note: The Contract Drawings depict the design concept and the basic relationship of the various roofs to each other and to other surrounding construction. The metal roofing system shown on the Contract Drawings is a high profile, wide spaced batten system. However, the roof to be provided under this Contract shall be a structural standing seam metal roof as described hereinafter. Edge conditions, flashings, etc., shall remain as shown except where different details are proposed by the roofing system manufacturer to accommodate their particular roofing system and such changes are accepted by the Engineer.

It shall be understood that it is solely the Contractor's responsibility to fully inspect and investigate all conditions affecting the proper installation of the standing seam metal roofing system required, and to insure that all conditions are suitably provided for in the manufacture, fabrication and installation of the roofing system regardless of what may be shown/specified or not shown/specified on the Contract Drawings or in the specifications. The aesthetic requirements shown on the Contract Drawings, other than batten spacing, the requirements of these specifications, and the preferred recommendations of the roofing system manufacturer, as approved by the Resident, shall be complied with in all instances, at no additional cost to the Authority. In case of conflict between requirements, the more stringent and costly requirement, as determined solely by the Resident, shall apply. Therefore, it is incumbent on the Contractor to

review the Contract Work in detail with the proposed roofing system manufacturer(s) prior to submitting a bid for the Contract work.

Single panels with proper lap at intersections shall be use for each slope to cover the perimeter of the roof. Submit Shop Drawings for approval.

- B. Flashing and sheet metal required for the work of this Section, such as for edge conditions and penetration flashings, shall match the roofing and shall be provided in accordance with the requirements of the roofing system manufacturer's approved Shop Drawings and installation instructions.
- C. Joint sealer work that is required to make the roofing installation watertight and weathertight with abutting construction shall be performed as part of the work of this Section in accordance with the, roofing system manufacturer's approved Shop Drawings and installation instructions.

1.03 SUBMITTALS

- A. Shop Drawings: As noted above, the Contract Drawings depict the design concept and the basic relationship of the various roofs to each other and to surrounding construction based on a high profile, wide spaced batten system. It is solely the responsibility of the Contractor to have the proposed roofing system manufacture develop detailed Shop Drawings to properly adapt the proposed roof system to all Project conditions. Shop Drawings shall include but not be limited to: layouts of vapor retarder, waterproofing membrane, and roofing panels, and full scale plans, elevations and details of edge conditions, joints, expansion joints, standing seam profiles, anchorages, blocking, flashings, closures, tie-ins to adjacent construction, and all other details required to fully illustrate all conditions of work. Distinguish between factory and field assembly work.
 - 1. Shop Drawings shall bear the seal and signature of a Professional Engineer, licensed in the State of Maine.
 - 2. Layout drawings and sections shall show adjacent construction, and be keyed into benchmarks and grid lines established on the Contract Drawings.
 - 3. Details shall show dimensions, thicknesses, materials, finishes, continuous anchors, edge trim, sealant locations, fasteners and spacing, etc. Details shall also show and identify joint conditions, anticipated fabrication and erection tolerances, anticipated thermal movement, etc.
 - 4. Provide isometric drawings for each juncture between flashing assemblies, at interfacing and adjacent work, at penetrations, and at typical roof transitions and end conditions.
 - 5. Roofing panel, waterproofing membrane, vapor retarder, edge trim, etc., joints shall be laid out on the Shop Drawings. It shall be understood that the Engineer will be at liberty to revise joint layouts as deemed necessary, at no additional cost and with no time extension.

6. Submit erection drawings showing proposed sequence of installation.
 7. Submit manufacturer's written instructions and comments, fastener descriptions and spacings, and all other pertinent information.
 8. Submit manufacturer's written instructions and details for the snow guard system.
- B. Product Data: Submit specifications for material and fabrication of metal roofing system materials, and detailed instructions and recommendations for handling, storing, installation and maintenance. Include manufacturers' product data for roof panels, fasteners, sealants, backer rod, insulation, vapor retarder, waterproofing membrane, and all other manufactured products. Include certified test reports showing compliance with requirements where a test method is indicated.
- C. Samples
1. Submit samples of roofing system components. Provide assembled sample panels 18 inches long by two panels wide using the same materials to be used in the finished work. Include continuous anchors, fasteners, waterproofing membrane, insulation and other accessories. Provide a horizontal (end) joint on each side of standing seam in the middle of the sample panel.
 2. Submit a 24 inch long radius roof edge fabrication (e.g., edge cover and brake metal closures), each with typical finished mating joints.
- D. Quality Control/Assurance Submittals
1. Submit for review copies of ASCE-7 Load Analysis prepared and/or reviewed and sealed by a Professional Engineer licensed in the State of Maine.
 2. Submit design calculations bearing the seal and signature of a Professional Engineer licensed in the State of Maine, indicating compliance with specified performance criteria and fastener pull-out calculations. The submittal shall indicate fastener types, spacings and numbers required for each installation condition.
 3. Submit test reports for independent testing laboratories bearing the seal of a registered Professional Engineer to certify compliance with the specified performance criteria.
 4. Submit complete and current data for the roof system as follows:
 - a. Thermal cycle testing of the metal roof panel and continuous panel anchors as specified.

- b. Uniform ultimate wind uplift load capacity for the roofing system specified.
 - c. Ultimate pullout capacity for all anchors.
 - d. U.L. 90 classification data specific to the roofing system to be provided. Include letter by U.L. attesting that the roofing system is currently classified and listed.
 - e. Model load test per ASTM E 330, modified.
 - f. Static air infiltration test data.
 - g. Water penetration test data.
5. Submit manufacturer's complete log of field reports (initial, progress and final).
 6. Upon completion of the work, submit letter from the manufacturer certifying that the roof installations are in accordance with the approved Shop Drawings and installation instructions and requirements, and that the manufacturer will issue the specified watertightness warranty.

E. Welding

Submit welder certifications.

F. Warranties

Submit samples of the roofing manufacturer's twenty-year warranty agreeing to repair/replace defective materials and workmanship in an aesthetically acceptable manner, to the Authority's complete satisfaction, as required to maintain the roofing installations, including flashings, trim, etc., in a watertight condition under peak weather conditions. Warranty shall not exclude any conditions, such as flashings, trim, penetrations, etc.

Submit sample of the roofing manufacturer's standard twenty-year sheet steel warranty and material finish warranty.

Warranties shall be in addition to and not a limitation of other rights the Authority may have against the Contractor under the Contract Documents.

1.04 QUALITY ASSURANCE

- A. Contractor shall have a minimum of 5 years continuous successful experience in fabricating and installing roofing systems of similar type (e.g., long field-formed panels) and complexity to that required for this Project and shall be an authorized installer for the roofing system manufacturer. Submit a list of installations. The manufacturer of the roofing system shall have a minimum of 10-years experience in the manufacturer of roofing systems of the type required for this Project.

- B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. Manufacturer's representative is to inspect and approve surfaces to which the roofing system material will be applied prior to start of work and shall instruct and assist installer as deemed necessary. Manufacturer's representative shall also provide intermittent project supervision and final inspection at end of work and before issuance of warranty. Also refer to paragraph 3.03.
- D. In addition to complying with requirements of governmental agencies having jurisdiction, the roofing system shall comply with U.L. Class 90 wind uplift requirements based on wind loads at the site, U.L. Class A fire rating requirements and pertinent recommendations contained in the SMACNA "Architectural Sheet Metal Manual".
- E. Roof System Requirements
 - 1. Structural Tests: Installed roof system shall carry positive uniform design loads with maximum system deflection of $L/180$ as measured at the rib of the panel.
 - 2. Water Penetration: Installed roof system shall exhibit no uncontrolled water penetration when exposed to dynamic rain at 6.25 psf differential air pressure for not less than five minutes, when testing in accordance with ASTM E 331.
 - 3. The metal roof system shall be designed to:
 - a. Drain leakage and condensation to the exterior.
 - b. Provide independent movement of all roof components consistent with a thermal range of -20 to +180 degrees F, and consistent with anticipated movement of the building structures.
 - c. Provide panel weathertightness without reliance on sealants or elastomeric membranes.
 - d. Provide flashing, gutters, downspouts and edge assemblies related to the roof that are watertight.
 - e. Provide required wind uplift resistance as determined by ASCE-7 analysis with a safety factor of 1.5.
- F. Panel Anchor Requirements

Connection of continuous panel anchors to substrate shall be designed to resist loads developed by the specified pressures with due regard to prying forces and/or bending due to eccentric loading. Performances shall be evaluated at positions of extreme thermal movement. Factor of safety for connections shall be 2.5.

- G. Uniform load capacity of 2 times design load shall be determined by testing in accordance with the principles of ASTM E 330, adapted to testing of formed sheet panels by additions to specific sections as follows:
1. Roof test specimens shall represent the conditions evaluated, free of undue influence of perimeter conditions. Panels shall be continuous over one or more interior supports and contain at least four panel widths.
 2. No roof attachments are permitted at the sides other than the standard edge condition. For uplift tests, at least one end seal shall be flexible and in no way restrain the crosswise distortion of the panels.
 3. Roofing panels and accessories are to be production material of the same type and thickness required for use on the Project.
 4. Longitudinal seals or plastic film shall not span any crevice or crack that may tend to separate under differential pressure.
- H. Any necessary welding shall be performed only by skilled workmen with current AWS certification for the type of welding work required for this Contract. Welding shall be performed in accordance with applicable AWS requirements.

PART 2 - PRODUCTS

2.01 GENERAL

- A. Fabricate for waterproof and weather-resistant performance, with expansion provisions for running work, sufficient to permanently prevent leakage, damage, and deterioration of the work. Form work to fit substrates. Comply with roofing system manufacturer's instructions and recommendations for forming material.
- B. Materials shall be selected for their surface flatness and freedom from blemishes. Materials exhibiting waves, roller marks, gouges, dents, creases, pitting, scrapes, scars and similar defects will be rejected.
- C. All metal work shall be formed to produce installed units free from waves, buckling, severe oil-canning and similar defects under all conditions of service. Units shall be formed true to line, with smooth "sharp" bend lines, and with exposed edges folded back to form hems.

2.02 ROOF SYSTEM MANUFACTURERS

- A. The "Zee-Lock Roof System" produced by Berridge Manufacturing Company (as indicated in current literature) is cited as capable of meeting the appearance, quality, construction type, performance and durability requirements of this Contract. Systems by other manufacturers that are equivalent in all respects (i.e., appearance, type of construction, performance and durability), may be used in the work. However, it shall

be understood that the Resident will be the sole judge of a system's acceptability, and that the rejection of a proposed system shall not give rise to any claims for additional compensation or extension to the Time(s) of Completion.

2.03 METAL ROOF PANELS

- A. Minimum 24 gage aluminum-zinc alloy (Galvalume) coated sheet steel conforming to ASTM A 792 in continuous field formed panels of the required lengths. The gage of the coated steel shall be increased from 24 gage, at no additional cost, if necessary to meet Contract requirements.
- B. Panels shall have a minimum 2 inch vertical rib height, spaced 16 inches on center.
- C. Panels shall be true standing seam shape, requiring no foam closures or fillers at terminations.
- D. Standing seams shall incorporate mechanically interlocked continuous anchors of a configuration that will prevent entrance or passage of water.
- E. Continuous concealed anchors shall resist positive and negative loading yet permit thermal expansion and contraction of panels.
- F. Seams that are not mechanically locked are not acceptable.
- G. Standing seams shall contain a factory applied extruded vinyl weather seal to prevent siphoning of moisture through the side joint seam.
- H. Horizontal seams shall not be permitted.

2.04 CONTINUOUS ANCHORS

- A. Standing seam roof panels shall be fastened to continuous zee-shaped anchors that are secured to the substrate.
- B. Manufacturer shall design the continuous anchors, fasteners and fastener spacing to maintain the required wind uplift resistance and other performance criteria.

2.05 MISCELLANEOUS METAL

- A. Provide all necessary terminations, flashings, gutters, edge conditions, special shapes, transitions, expansion joints, etc., required for complete and weathertight installations. All such items shall be the same material as the roof panels, except that edge condition materials and brake metal closures shall be minimum 22 gage.

B. Fasteners

Exposed fasteners shall be Series 300 stainless steel fasteners with neoprene-backed watertight stainless steel washers. All exposed portions of fasteners and washers shall receive a two-coat high quality urethane finish to match the roof panels.

Exposed rivets, where approved by the Engineer, shall be self-plugging type, minimum 3/16 inch diameter, fabricated from Series 300 stainless steel with the same material for stems, and with neoprene seal washers.

Concealed fasteners shall be corrosion resistant type equal to self-drilling "Dril-lex" fasteners with "Stalgard" coating by Elco Industries, Inc., Rockford, IL.

Fasteners and plates for installation of insulation shall be equal to "Sarnafasteners and Plates" by Sarnafil, Inc., Canton, MA.

C. Plywood Sheathing

As specified in Rough Carpentry Section.

D. Roofing Underlayment

Self-adhering metal roofing underlayment shall be similar to Firestone "CLAD-GARD SA – N (North)" metal underlayment. Sheets shall be SBS rubber modified, self-adhesive asphalt blend with a woven slip-resistant traction film on the top surface and an opaque release film on the bottom surface.

G. Sealant

One-part silicone sealant equal to "Spectrem 1" by Tremco Sealants and Coatings, Beachwood, OH.

- H. Fall Protection Roof Anchors: Provide fall protection roof anchors in locations indicated in the drawings. Provide Guardian CB-12 Roof Anchor or similar as approved by the Engineer.

2.06 FABRICATION

- A. Fabricate panels onsite in continuous lengths as required. Examine panels as they are being formed to insure that they are within the manufacturer's acceptable tolerances.
- B. Provide linear sheet metal items in minimum 10'-0" lengths except as otherwise approved on the Shop Drawings. Form flashing using single pieces for the full width. Provide shop fabricated, mitered and joint corners.
- C. Comply with the dimensions, profiles, and details shown, or if not shown, in accordance with details provided by the Engineer.

2.07 SNOW GUARDS

- A. Snow guards shall be prefabricated ladder type, aluminum two-pipe snow guards designed for use with standing seam metal roofing and complete with brackets and fasteners for anchoring as manufactured by Alpine Snow guards. Acceptable alternate bracket manufacturer shall be S-5! Metal Roof Innovations, Ltd. All snow guard components, including brackets and fasteners, shall match the color of the standing seam roof panels as selected by the Architect. No exceptions will be allowed.

2.08 GUTTERS AND DOWNSPOUTS

- A. Gutters and downspouts shall be fabricated in sizes indicated. Gutters shall be seamless. Downspouts shall have sealed joints at bends, continuous seamless lengths at straight sections.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Inspection: Examine substrates to receive roofing. Do not proceed until all defects are corrected.

Verify that decks are sound, dry, and securely attached, and that provisions for flashings, expansion joints, and all items attaching or penetrating through the work of this Section have been provided for and that roofing work may proceed.

Field check dimensions and support alignment.

Provide all fastener alignment markings necessary so that marks can be transferred onto vapor retarder, as appropriate.

- B. Sheathing: Installed as specified - Rough Carpentry Section.
- C. Ice/Waterproofing Membrane: After the sheathing installation has been approved by the roofing system manufacturer's representative, apply ice/waterproofing membrane over sheathing in accordance with the approved Shop Drawings and the membrane manufacturer's installation instructions, taking care to provide 6 inch weatherlapped head joints and 18 inch lapped end joints in a manner to drain any entrapped moisture to the exterior.
- D. Installation of Metal Roofing and Flashing
 - 1. Install roofing in strict accordance with the approved Shop Drawings and installation instructions.

2. Metal workmanship shall conform to applicable standards set forth in the "Architectural Sheet Metal Manual" as published by SMACNA.
3. Isolate dissimilar metals and masonry or concrete from metals with an Engineer approved bituminous coating. Use gasketed fasteners where required to prevent corrosive action between fastener, substrate and panels.
4. Limit exposed fasteners to extent indicated on Shop Drawings.
5. Anchorage shall allow for temperature expansion and contraction movement without stress or elongation of panels or fasteners. Attach continuous panel anchor to structural substrate using fasteners of size and spacing as determined by manufacturer's design analysis to resist specified uplift and thermal movement forces.
6. Coordinate flashing and sheet metal work to provide weathertight conditions at roof terminations. Fabricate and install in accordance with standards of SMACNA Manual using continuous cleats at all exposed edges.
7. Roofing, fascia overlay, gutter and accessories shall be installed in accordance with the approved Shop Drawings and installation instructions such that in plan and elevation, horizontal and vertical lines are true and square, and that other lines are as shown on the approved Shop Drawings. Provide adjustment within system to accommodate variations of existing structure. Deviation from designated locations shall not exceed 1/8 inch per 12 feet of length of any member or 1/4 inch in any total run in any line.
8. Verify with manufacturer locations of fixed connections and expansion connections.
9. Roll form panels on site taking care to properly support long panels (support at maximum 6 foot intervals).
10. Install starter and edge trim and fascia overlay before installing roof panels.
11. Install panels to continuous anchors (ribs) in accordance with the manufacturer's details.
12. Seam panel sidelaps using power-driven seamer as recommended by manufacturer to ensure watertightness.
13. Erect metal roofing with lines, planes, arrises and angles sharp and true, and plane surfaces free from waves, warp, dents, buckles, or other physical defects, with minimum oil canning.
14. Do not allow traffic on completed roof. If required, provided cushioned walk boards.

15. Protect installed roof panels and trim from damage caused by adjacent construction until completion of installation.
16. Remove and replace any panels or components which are damaged beyond successful repair.
17. Fit components accurately together to form joints that will be weathertight.
18. Do not install components which are observed to be defective, including, but not limited to those that are warped, bowed, twisted, dented, abraded, or otherwise damaged, including damage to finish.
19. Do not cut, trim, weld, or braze component parts during erection in a manner which would damage the finish, decrease strength, or result in a visual imperfection or a failure in performance.
20. Do not allow panels to come into contact with dissimilar materials. Apply an Engineer approved isolator between surfaces. Use gasketed fasteners to eliminate the possibility of corrosive or electrolytic action between metals.
21. Coordinate the roofing work with that of other trades as necessary.
22. Thoroughly wipe-down roofing and other surfaces as erection progresses.
23. Install sealant as shown on the approved Shop Drawings and installation instructions.

F. Flashing

1. Comply with "SMACNA" Architectural Sheet Metal Manual" recommendations for installation of work.
2. Conceal fasteners and expansion provisions wherever possible.
3. Fold back edges of concealed side of exposed edge to form hem.
4. Insert metal flashings into reglets, anchor with fasteners and wedges and seal joints.
5. Set sheet metal items level, true to line, and plumb.
6. Secure to wood with screws.
7. Set metal already partly formed in place and fasten by means of cleats.
8. Use cleats to keep laps closed when face width exceeds 8 inches for 24 gauge steel.

- G. Damaged Finishes: Repair damaged finish of panels, trim, closures, flashing, etc., to the satisfaction of the Engineer. If any item cannot be repaired to the Engineer's satisfaction, it shall be promptly replaced.
- H. Snow Guards: Install as indicated on the Plans and as recommended by the manufacturer.
- I. Fall Protection Roof Anchors: Install in accordance with the roof anchor manufacturer's written instructions and in accordance with the metal roofing manufacturer.
- H. Gutters and Downspouts: Install in lengths and locations indicated using straps and hangers matching material and finish of gutters and downspouts.

3.03 FIELD QUALITY CONTROL

A. Manufacturer's Field Service:

1. Manufacturer's representative shall be present at each pre-installation and pre-roofing conference, and during set-up of manufacturer's field forming equipment.
2. Manufacturer's representative shall examine the roof structures with installer prior to beginning roof installation.
3. Manufacturer's representative shall be present during initial layout and installation of roofing system. Observe minimum of initial one week period of roof panel installation on daily basis, ensuring installer follows manufacturer's installation recommendations and shop drawings. Observe initial forming passes for fabrication with acceptable tolerances.
4. Manufacturer's representative shall be on site for the duration of the installation period.
5. Manufacturer's representative shall examine completed installation for conformance to Shop Drawings. Notify installer and Contractor in writing of discrepancies.

3.04 CLEANING

- A. Clean exposed surfaces of work promptly after completion of installation. To prevent rust staining on finished surfaces, immediately removing fillings produced by drilling or cutting.
- B. Clean roof in accordance with manufacturer's recommendations.
- C. Clean exposed surfaces of roofing and accessories after completion of installation. Leave in clean condition at date of Substantial Completion of Project. Touch up minor abrasions and scratches in finish.

D. Remove all scrap and construction debris from the site.

3.05 FINAL INSPECTION

A. Final inspection and certification will be provided by the manufacturer's representative.

3.06 PROTECTION AND CLEAN-UP

A. Leave all work clean, free from grease, finger marks, sealant stains, etc. Remove excess sealant, dirt and other substances from roofing system components and from abutting and surrounding construction. Cleaning materials and procedures shall be approved by the Engineer and be acceptable to the manufacturers of the materials to be cleaned. Advise the Contractor of protective measures and precautions required to ensure that roofing installations will be without damage or deterioration (other than normal weathering) at time of acceptance.

B. Remove all debris and rubbish caused by the work of this Section as the work progresses.

END OF SECTION

SECTION 076200

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings, Contract Conditions and other Technical Specifications Sections apply to work of this Section insofar as applicable.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. The work in this section consists of furnishing all materials, equipment, transportation, labor and supervision, and performing all operations required to provide all sheet metal work including crickets as shown on the Drawings, as specified herein, and as is additionally required to properly complete the work.

1.03 SPECIFIED ELSEWHERE

- A. Ductwork is specified under Division 23 – Heating, Ventilating and Air Conditioning.

1.04 GENERAL REQUIREMENTS

- A. All sheet metal shall have the manufacturer's trade name and thickness or weight marked on each sheet.
- B. Surface to which sheet metal is to be applied shall be even, smooth, sound, thoroughly clean, dry and free from all defects that might affect the installation. Materials furnished under this section which are to be built in by others shall be delivered to the site in time to avoid delays in construction progress. All cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades shall be performed under this section. All accessories and other related items not specifically shown or specified also shall be provided under this section.
- C. During construction, care shall be taken to prevent damage to roofing and flashing in place by not walking over or placing materials on or against them.

1.05 SUBMITTALS

- A. Submit samples of all materials and copies of pertinent literature for approval before proceeding with the work.
- B. Submit Shop Drawings detailing all flashing installations.

PART 2 - MATERIALS

2.01 MATERIALS

- A. All copper shall be cold-rolled, 16 oz. lead-coated, as detailed or noted on the Drawings and specified herein.
- B. Nails and other accessories used for fastening copper shall be copper, bronze or brass of the required sizes.
- C. Solder shall be 40 percent pig lead and 60 percent block tin. Flux shall be muriatic acid killed with zinc, or an approved brand of soldering paste.

PART 3 - EXECUTION

3.01 INSTALLATION

All work shall be as shown on the Drawings, performed in strict compliance with the recommended practice and standard specifications of the Copper and Brass Research Association and "Copper and Common Sense" as published by Revere Copper and Brass.

END OF SECTION

SECTION 078413

PENETRATION FIRESTOPPING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in fire-resistance-rated horizontal assemblies.
 - 3. Penetrations in smoke barriers.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

1.8 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.

2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
 3. W-Rating: Provide penetration firestopping systems showing no evidence of water leakage when tested according to UL 1479.
- D. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined per UL 1479, based on testing at a positive pressure differential of 0.30-inch wg.
 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
- E. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- F. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content:

1. Sealants: 250 g/L.
 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 3. Sealant Primers for Porous Substrates: 775 g/L.
- G. Low-Emitting Materials: Penetration firestopping sealants and sealant primers shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
1. Permanent forming/damming/backing materials.
 2. Substrate primers.
 3. Collars.
 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and

fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Where FM Global-approved systems are indicated, they refer to design numbers listed in FM Global's "Building Materials Approval Guide" under "Wall and Floor Penetration Fire Stops."
- C. Penetration Firestopping Systems with No Penetrating Items: UL Classified System Group 0001-1000.
 - 1. F-Rating: 1 & 2 hour.
 - 2. T-Rating: 1 & 2 hour.
 - 3. W-Rating: No leakage of water at completion of water leakage testing.
 - 4. Type of Fill Materials: As required to achieve rating.
- D. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing: UL Classified System Group 1001-1999.
 - 1. F-Rating: 1 & 2 hour.
 - 2. T-Rating: 1 & 2 hour.
 - 3. W-Rating: No leakage of water at completion of water leakage testing.

4. Type of Fill Materials: As required to achieve rating.
- E. Penetration Firestopping Systems for Nonmetallic Pipe, Conduit, or Tubing: UL Classified System Group 2001-2999.
1. F-Rating: 1 & 2 hour.
 2. T-Rating: 1 & 2 hour.
 3. W-Rating: No leakage of water at completion of water leakage testing.
 4. Type of Fill Materials: As required to achieve rating.
- F. Penetration Firestopping Systems for Electrical Cables: UL Classified System Group 3001-3999.
1. F-Rating: 1 & 2 hour.
 2. T-Rating: 1 & 2 hour.
 3. W-Rating: No leakage of water at completion of water leakage testing.
 4. Type of Fill Materials: As required to achieve rating.
- G. Penetration Firestopping Systems for Cable Trays with Electric Cables: UL Classified System Group 4001-4999.
1. F-Rating: 1 & 2 hour.
 2. T-Rating: 1 & 2 hour.
 3. W-Rating: No leakage of water at completion of water leakage testing.
 4. Type of Fill Materials: As required to achieve rating.
- H. Penetration Firestopping Systems for Insulated Pipes: UL Classified System Group 5001-5999.
1. F-Rating: 1 & 2 hour.
 2. T-Rating: 1 & 2 hour.
 3. W-Rating: No leakage of water at completion of water leakage testing.
 4. Type of Fill Materials: As required to achieve rating.
- I. Penetration Firestopping Systems for Miscellaneous Electrical Penetrants: UL Classified System Group 6001-6999.
1. F-Rating: 1 & 2 hour.
 2. T-Rating: 1 & 2 hour.
 3. W-Rating: No leakage of water at completion of water leakage testing.
 4. Type of Fill Materials: As required to achieve rating.
- J. Penetration Firestopping Systems for Miscellaneous Mechanical Penetrants: UL Classified System Group 7001-7999.
1. F-Rating: 1 & 2 hour.
 2. T-Rating: 1 & 2 hour.
 3. W-Rating: No leakage of water at completion of water leakage testing.
 4. Type of Fill Materials: As required to achieve rating.
- K. Penetration Firestopping Systems for Groupings of Penetrants: UL Classified System Group 8001-8999.
1. F-Rating: 1 & 2 hour.

2. T-Rating: 1 & 2 hour.
3. W-Rating: No leakage of water at completion of water leakage testing.
4. Type of Fill Materials: As required to achieve rating.

END OF SECTION 078413

SECTION 079200

JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. In general, the conditions requiring joint sealers are shown on the Drawings. This phase of work includes the furnishing all equipment, labor and materials necessary to provide joint sealant installations which are complete in every respect and of the composition and quality as specified herein.
- B. The required applications include, but are not necessarily limited to the following:
 - 1. Pavement and sidewalk joints subjected to foot or vehicular traffic.
 - 2. Exterior building wall joints, including joints at windows, doors and louvers.
 - 3. Flashing and coping joints.
 - 4. Miscellaneous concrete construction joints.
 - 5. Partition, ceiling, and door frame joints.
 - 6. Masonry expansion joints; exterior and interior.
 - 7. Construction joints in islands, curbing, pavement and barrier walls.
 - 8. Plumbing fixtures,
- C. Sealants for glazing are specified in Section 088000.

1.03 SUBMITTALS

- A. Manufacturer's Data: Submit copies of manufacturers' specifications, recommendations and installation instructions for each type of material and application

required. Include manufacturer's published data, or letter of certification, or certified test laboratory report indicating that each material complies with the requirements and is intended generally for the applications shown.

- B. Samples: Submit three 12-inch-long samples of each color required for each type of joint sealer exposed to view. Install sample between 2 strips of material similar to or representative of typical surfaces where sealer will be used, held apart to represent typical joint widths. Samples will be reviewed by the Engineer for color and texture only. Compliance with all other requirements is exclusively the responsibility of the Contractor.
- C. Guarantee: Submit two copies of written guarantee agreeing to repair or replace joint sealers which fail to perform as airtight and watertight, or fail in joint adhesion, cohesion, abrasion resistance, weather resistance, extrusion resistance, migration resistance, stain resistance, or general durability, or appear to deteriorate in any other manner not clearly specified by submitted manufacturer's data as an inherent quality of the material for the exposure indicated. The Contractor shall provide signed guarantee for a period of two years.

1.04 QUALITY ASSURANCE AND COORDINATION

- A. Prior to commencing work required by this Section, the Contractor shall examine the areas and conditions which exist where joint sealer work is to be performed and notify the Engineer in writing of any conditions which are in conflict with requirements of the Contract Documents and are detrimental to the proper and timely completion of the Work. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Do not proceed with installation of sealants under adverse weather conditions, or when temperatures are below or above the manufacturer's recommended limitations for installation. Proceed with the work only when temperatures are below or above manufacturer's recommended limitations for installation. Proceed with the work only when forecasted weather conditions are favorable for proper cure and development of high early bond strength. Wherever joint width is affected by ambient temperature variations, install elastomeric sealants only when temperatures are in the lower third of manufacturer's recommended installation temperature range.

PART 2 - MATERIALS

2.01 MATERIALS

- A. Colors: For exposed materials provide color as indicated or, if not indicated, as selected by Engineer from manufacturer's standard colors. For concealed materials, provide the color which has the best overall performance characteristics.

- B. Hardness: As recommended by manufacturer for application shown, unless otherwise indicated or required by the Engineer.
- C. Modulus of Elasticity: Provide the lowest available modulus of elasticity which is consistent with exposure to weathering, indentation, vandalism, abrasion, support of loading, and other requirements.
- D. Compatibility: Before purchase of each required material, confirm its compatibility with each material it will be exposed to in the joint system. Notify the Resident of potential problems.
- E. Size and Shape: As shown or, if not shown, as recommended by the manufacturer and approved by the Resident for the type and condition of joint, and for the indicated joint performance or movement.
- F. Grade of Sealant: For each application, provide the grade of sealant (non-sag, self-leveling, no-track, knife grade, preformed, etc.) as recommended by the manufacturer and approved by the Resident for the particular condition of installation (location, joint shape, ambient temperature, and similar conditions), to achieve the best possible appearance and overall performance. Grades specified herein are for normal conditions of installation.

2.02 ELASTOMERIC SEALANTS

- A. Foot Traffic Joints: Two-component polyurethane sealant; polyurethane- based, 2-part elastomeric sealant, complying with FS TT-S00227E, Type 1, Self-leveling, Class A. Provide one of the following:

Pecora NR-200; Pecora
SL-1 Sonolastic Pavement Joint Sealant; Sonneborn/Contech, Inc.
Tremco THC - 900/901; Tremco
- B. Exterior Joints and Interior Moving Joints: Polymeric base sealant; modified polyurethane rubber, 2 or 3-part elastomeric sealant complying with FS TT-S00227E, Type II, Non-sag, Class A. Provide one of the following:

Dymeric Sealant; Tremco
Dynatrol II; Pecora
Sonolastic NP-2; Sonneborn/Contech Inc.

Note: Wherever polyurethane sealants are in contact with anodized aluminum, the sealant manufacturer's recommended primer shall be used.

2.03 NON-ELASTOMERIC SEALANTS

Interior Non-moving and Non-watertight Joints: One-component, non-staining, non-sagging, non-bleeding acrylic emulsion base latex sealant. Use only at interior joints where movement is not likely and watertightness is not necessary. Sealant shall be "Mono" by Tremco or approved equal by Pecora or Sika.

Interior Non-Moving Watertight Joints: One-component non-sag wet-curing mildew-resistant silicone sealant for use at waterproof joints around plumbing fixtures and wet environment assemblies.

Spectrum 1: Tremco
Pecora 898NST: Pecora

2.04 JOINT FILLERS

- A. Bituminous and Fiber Joint Filler:
- B. Provide resilient and non-extruding type premolded bituminous impregnated fiberboard units complying with ASTM D 1751, FS HH-F-341, Type 1 and AASHTO M 213. Provide where concrete slabs meet walls and similar isolation points as shown on the Drawings or directed by the Engineer.
- C. Joint Primer/Sealer: Provide the type of joint primer/sealer recommended by the sealant manufacturer for the joint surfaces to be primed or sealed.
- D. Bond Breaker Tape: Self-adhering polyethylene tape or other plastic tape as recommended by the sealant manufacturer to be applied to surfaces where bond of sealant to the substrate or joint filler or backer rod must be avoided for proper performance of sealant.
- E. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable, closed-cell, non-absorptive, non-gassing material as recommended for compatibility with sealant by the sealant manufacturer and approved by the Engineer. Install backer rod behind the sealant in all exterior and interior masonry expansion joints unless otherwise detailed.
- F. Compressible Filler and Fire-rated Sealant: Filler shall be "Polytite" precompressed expanding tape as manufactured by Sandell Mfg. Co. or approved equal by W. R. Grace or Willseal. Sealant shall be approved gun-grade material by 3M Co. or Hilti.

PART 3 - EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified, and except where manufacturer's technical representative directs otherwise.

3.02 JOINT PREPARATION

- A. Clean joint surfaces immediately before installation of sealant. Remove dirt, insecure coatings, moisture and other substances which would interfere with bond of sealant. Etch concrete and masonry joint surfaces as recommended by sealant manufacturer. Roughen vitreous or glazed joint surfaces if recommended by sealant manufacturer.
- B. Prime joint surfaces wherever shown or recommended by the sealant manufacturer. Do not allow primer to spill or migrate onto adjoining surfaces.
- C. At exterior masonry joints where flexible thru-wall flashing has been left extended 4 inches beyond the wall, carefully secure the flashing to the upper masonry wall in order to prepare the joint to receive sealant.

3.03 INSTALLATION

- A. Set joint filler units at proper depth and position in the joint to coordinate with other work, including the installation of bond breakers and backer rods. Do not leave voids or gaps between the ends of joint filler units; bond ends together as recommended by the manufacturer.
- B. Install sealant backer rod for elastomeric sealants, except where shown to be omitted or recommended to be omitted by sealant manufacturer for the application shown.
- C. Take care to ensure that sealant does not cover any weep holes.
- D. After the joints where the flexible thru-wall flashing occurs have been sealed and the sealant has cured sufficiently to prevent deformation of the joint, carefully cut off the extended thru-wall flashing to protrude 1/8 inch beyond the end of the horizontal leg of any exposed steel lintel at a window or door opening.
- E. Install bond breaker tape wherever shown and required by the manufacturer's recommendations to ensure that elastomeric sealants will perform properly.
- F. Employ only proven installation techniques which will ensure that sealants will be deposited in uniform, continuous ribbons without gaps or air pockets, and with complete "wetting" of the joint bond surfaces on opposite sides. Except as otherwise indicated, fill sealant rabbet to a slightly concave surface, slightly below adjoining

surfaces. Where horizontal joints are between a horizontal surface and vertical surface, fill joint to form a slight cove so that joint will not trap moisture and dirt.

- G. Install sealant to depths as shown or, if not shown, as recommended by the sealant manufacturer but within the following general limitations, measured at the center (thin) section of the bead.

For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other types of abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 3/4-inch-deep nor less than 3/8 inch deep.

For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2-inch-deep nor less than 1/4 inch deep.

For joints sealed with non-elastomeric sealants fill joints to a depth in the range of 75% to 125% of joint width.

- H. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces or glass, or to migrate into the voids of adjoining surfaces. Clean such surfaces by whatever means may be necessary to eliminate evidence of spillage, as approved by the Engineer.
- I. Recess exposed edges of gaskets and joint fillers slightly behind adjoining surfaces, unless otherwise shown, so that compressed units will not protrude from the joint.
- J. Bond ends of gaskets together with adhesive or by other means as recommended by the manufacturer to ensure continuous watertight and airtight performance. Miter-cut and bond ends at corners unless molded corner units are provided.

3.04 CURING AND PROTECTION

Cure sealants in compliance with manufacturer's instructions and recommendations to obtain high early bond strength, internal cohesive strength and surface durability. Advise the Contractor of procedures required for the cure and protection of joint sealers during the construction period, so that they will be without deterioration or damage (other than normal wear and weathering) at the time of Authority's acceptance.

END OF SECTION

SECTION 081113HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. Standard steel doors and frames (including transoms and louver frames) are indicated on the Drawings and details, and are itemized in the Door Schedule. The work includes furnishing all materials, equipment, labor and supervision, and performing all operations necessary to furnish and install steel doors and frames complete in every respect, as shown on the Drawings, as specified herein, and as is additionally required to properly complete the work.
- B. The application of finish hardware for steel doors is part of the work of this section but hardware is provided under Section 087100.
- C. Furnishing and installing steel frames for louvers is part of the work of this section. Furnishing and installing louvers is specified under Section 101010.
- D. Glass and glazing will be performed under Section 088000.

1.03 QUALITY ASSURANCE

- A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications: Standard Steel Doors and Frames" (SDI-100) and complying with these specifications. Doors shall be Grade II, Heavy Duty, Model 1, galvanized at exterior locations; face sheets for exterior doors shall be 16 gage, face sheets for interior doors shall be 18 gage. If a conflict should exist between the standard and the specifications, the more stringent or conservative requirement shall apply.

1.04 SUBMITTALS

- A. Product Data: Submit for the Engineer's approval, eight (8) copies of manufacturer's specifications for fabrication and installation, including data substantiating that products comply with specified codes and requirements. Also provide technical data for prime paint material and application.

- B. Shop Drawings: Submit for the Engineer's approval, one transparency and three prints of drawings to be used for the fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of finish hardware and reinforcements, and details of joints, connections, anchorages and accessory items.
- C. Provide a schedule of doors and frames using same reference numbers for details and openings as those on the Contract Drawings.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials cartoned or crated to provide protection during transit and jobsite storage.
- B. Inspect materials upon delivery for damage. Minor damage may be repaired provided finished items are equal in all respects to new work and acceptable to the Engineer, otherwise, remove and replace damaged items at no additional cost.
- C. Store doors and frames at the site under cover in accordance with the manufacturer's recommendations. Place units on wood dunnage at least 4 inches high, or otherwise store on floors in manner that will prevent rust and damage. Avoid use of non-vented plastic or canvas shelters which could create humidity chambers. If cartons become wet, remove them immediately. Provide 1/4 inch to 1/2 inch space between stacked doors and frames to promote air circulation.

PART 2 – MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

Provide steel doors and frames by Steelcraft, Republic, or Curries.

2.02 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 568 and ASTM A 569.
- B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.
- C. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526 having ASTM A 525, G60 zinc coating, mill phosphatized.
- D. Supports and Anchors:
 - 1. Furnish wall anchors as required to secure frames to adjacent construction, formed of not less than 18 gage galvanized steel sheet (before galvanizing), as follows:

- a. Concrete Masonry Unit Construction: Adjustable, T-shape flat, corrugated or perforated, to suit frame size with leg not less than 3 inches wide by 10 inches long. Furnish at least 4 anchors per jamb.
 - b. Floor Anchors: Provide floor anchors for each jamb and for mullions which extend to the floor, formed of not less than 0.0625 inch thick (No. 16 gage) galvanized steel sheet, as follows:
 - Monolithic Concrete Slabs: Clip type anchors, with 2 holes to receive fasteners, welded to bottom of jamb and mullions.
 - Head Anchors: Provide 2 anchors at head of frames exceeding 36 inch wide.
2. Spreader Bars: Provide 2 removable spreader bars across the bottom of frames, tack welded to jambs and mullions.
- E. Inserts, Bolts and Fasteners: Manufacturer's standard units, except hot-dip galvanize items to be built into exterior walls, complying with ASTM A 153, Class C or D, as applicable. Expansion anchors shall be "Kwik-Bolts" as manufactured by Hilti Fastening Systems or approved equal.
- F. Shop-Applied Paint: High quality rust-inhibitive baked-on enamel suitable as a base for specified finish paints.

2.03 FABRICATION

- A. Fabricate steel door and frame units (including transoms), to be rigid, neat in appearance, and free from defects, warp or buckle. Wherever practicable, fit and assemble units in manufacturer's plant. Clearly identify and match-mark work that cannot be permanently factory-assembled before shipment to assure proper assembly at the site.
- B. Fabricate exposed faces of doors, and frames for exterior door and louver units from cold-rolled steel only.
- C. Fabricate frames for interior doors, concealed stiffeners, reinforcement, edge channels, louvers and moldings from either cold-rolled or hot-rolled steel at manufacturer's option.
- D. Doors prepared for glass lights shall have the openings securely framed and shall be complete with screwless snap-in glazing beads on the non-security side.
- E. Finish Hardware Preparation:

Prepare doors and frames to receive mortised and concealed finish hardware in accordance with the approved Finish Hardware Schedule and templates provided by

hardware manufacturer. Comply with applicable requirements of ANSI A 115 series specifications for door and frame preparation for hardware. Where surface mounted hardware is to be applied, frames shall have reinforcing plates.

Minimum thickness of hardware reinforcing plates shall be as follows:

Hinge reinforcements - 7 gage 1-1/4" x 10" minimum size.

Strike reinforcements - 12 gage.

Flush bolt reinforcements - 12 gage.

Closer reinforcements - 12 gage.

Reinforcements for surface-mounted hardware - 12 gage.

Locate knobs, levers, panic devices, push plates, and pulls in accordance with the requirements of ANSI A117.1-86, "Specifications for Making Buildings and Facilities Accessible to and Usable by, Physically Handicapped People" and ADA Guidelines. Locate other finish hardware items in accordance with "Recommended Locations for Builder's Hardware", published by Door and Hardware Institute.

- F. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.
- G. Plaster Guards: Provide 26 gage (minimum) steel plaster guards or mortar boxes, welded to frame at back of finish hardware cutouts where mortar or other materials might obstruct hardware installation or operation.
- H. Shop Painting:

Clean, treat and paint exposed surfaces of steel door and frame units, including galvanized surfaces.

Clean steel surfaces of mill scale, rust, oil, grease, dirt and other foreign materials before application of paint.

Apply shop coat of prime paint of even consistency and bake to provide a uniformly finished surface ready to receive finish paint.

2.04 STANDARD STEEL DOORS

- A. Provide metal doors of the types and styles indicated on the Drawings or Schedules and complying with SDI SD 100, Grade II, Heavy Duty, Model 1, galvanized for exterior locations. Doors shall be made of commercial quality, level cold-rolled steel and free of scale, pitting or other surface defects. Face sheets for interior doors shall be not less than 18 gage. Face sheets for exterior doors shall be not less than 16 gage and shall be hot dip galvanized.

B. Flush Door Construction:

All doors shall be of the types and nominal sizes shown on the Door Schedule and approved shop drawings. Minimum door thickness shall be 1-3/4 inches.

All doors shall be strong, rigid and neat in appearance, free from warpage and buckle. Corner bends shall be true, straight and of the minimum radius for the gage of metal used.

Doors shall be reinforced, stiffened and sound deadened with impregnated kraft honeycomb core (or approved closed-cell insulation at exterior locations), completely filling the inside of the door and laminated to the inside faces of panels. Other core construction, standard with approved manufacturer's meeting specified U.L. Label requirements and providing effective sound deadening, are acceptable.

Top and bottom edges of all doors shall be closed with a continuous recessed steel channel not less than 16 gage extending the full width of the door and spot welded to both faces (hot-dip galvanized for exterior doors). Exterior doors shall have an additional flush closing hot-dip galvanized channel at their top and bottom edges with suitable openings be provided in the bottom closure to permit the escape of entrapped moisture.

Beveled edge profiles shall be provided on both vertical edges of doors.

C. Door Louvers:

Provide sightproof stationary louvers for interior doors where indicated, constructed of inverted V-shaped or Y-shaped blades formed of 24 gage cold-rolled steel set into 20 gage steel frames.

2.05 STANDARD STEEL FRAMES

Provide metal frames for doors and transoms, including frames for wood doors, of types and styles as shown on Drawings and schedules (butted and wrap-around), utilizing concealed fastenings, unless otherwise indicated.

Frames for exterior openings and interior U.L. labeled doors shall be made of commercial grade cold-rolled steel, not less than 14 gage. Exterior frames shall be hot dip galvanized steel. Frames shall be designed for a minimum 25 pounds per square foot horizontal load.

Frames for other interior openings shall be either commercial grade cold-rolled steel or commercial grade hot-rolled and pickled steel. Metal thickness for frames shall be not less than 16 gage.

Frames for exterior doors, interior masonry walls and drywall openings shall be press brake formed with 5/8" high integral stops. Corners shall be back seam and face welded with face welds ground neatly smooth.

Fabricate frames of full welded unit construction, with corners mitered, reinforced, continuously welded the full depth and width of frame, with welds dressed smooth and flush. Knock-down type frames are not acceptable. Frames shall be manufactured by the same manufacturer who is supplying the hollow metal doors.

PART 3 - EXECUTION

3.01 INSPECTION

Examine substrate and conditions under which steel doors and frames are to be installed and notify the Engineer in writing of any conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner.

3.02 INSTALLATION

- A. Install hollow metal units and accessories in accordance with final shop drawings, the manufacturer's approved installation instructions, and as specified herein.
- B. Placing Frames: Comply with provisions of SDI-105 "Recommended Erection Instructions For Steel Frames", unless otherwise indicated.

Place frames prior to construction of enclosing walls and ceilings. Protect hardware securements from mortar spillage, joint compound, and other damage. Set frames accurately in position, plumbed, aligned, and securely braced until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders leaving surfaces smooth and undamaged. Door frame installation also includes setting of thresholds where applicable.

In masonry construction, locate 4 wall anchors per jamb. Building-in of anchors and grouting of frames is specified in Division 4.

Install fire-rated frames in accordance with NFPA Pamphlet No. 80.

- C. Finish Hardware:

Install finish hardware in strict accordance with the final approved shop drawings and the manufacturers' instructions, and adjust for easy action. Set locksets level and true with the proper backset. Adjust striking plates to be in exact alignment with bolts and latches. Adjust spindles and latch bolts for easy action. Set all screws flush with the metal surface without any broken or damaged heads.

All wrapping on knobs, handles, pulls, etc., furnished by the manufacturer shall be replaced on the hardware after it is installed and shall remain until final acceptance of the work, at which time the Contractor shall remove and dispose of all coverings.

D. Door Installation:

Hang doors plumb and true with a uniform clearance at the head and jambs, in accordance with SDI-100 and NFPA Pamphlet 80, and with all hardware in perfect working order.

3.03 ADJUST AND CLEAN

- A. Prime Coat Touch-up: Immediately after erection, sand smooth rusted and damaged areas of prime coat and touch-up with compatible air-drying primer.
- B. Final Adjustments: Check and re-adjust operating finish hardware items leaving steel doors and frames undamaged and in complete and proper operating condition. Remove and replace defective work.

END OF SECTION

SECTION 084113ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

The work in this section consists of furnishing all materials, equipment, transportation, labor and supervision, and performing all operations required to furnish and install an aluminum entrance door, frame, transom, sidelite, associated hardware, and joint sealing as shown on the Drawings, as specified herein, and as is additionally required to properly complete the work.

1.03 SPECIFIED ELSEWHERE

- A. Joint sealing related to aluminum frames is part of the work of this section and shall be performed in accordance with the requirements of Section 079200, Joint Sealers.
- B. Glass and glazing shall be performed under Section 088000.

1.04 GENERAL REQUIREMENTS

- A. Aluminum entrance door, frame and transom, as detailed on the Drawings and specified herein are as manufactured by Kawneer Architectural Products. Products of similar quality and appearance manufactured by Vistawall or Wausau will be considered for use. The door detailed is a Wide Stile Kawneer "350 Entrance Door" with "451T" framing.
- B. Performance: The design and construction of the aluminum entrance doors shall be such as to pass the tests listed below.
 - 1. Dual Moment Load Test as follows:
 - a. Test sections shall consist of a standard top door corner assembly. Side rail section shall be 24 inch long and top rail section shall be 12 inch long.
 - b. Anchor "top rail" positively to test bench so that corner protrudes 3 inches beyond bench edge.

- c. Anchor a lever arm (capable of supporting 300 pounds) positively to "side rail" at a point 19 inches from inside edge of "top rail". Attach weight support pad at a point 19 inches from inner edge of "side rail".
- d. Test section shall withstand a load of 270 pounds on the lever arm before reaching the point of failure which shall be considered a rotation of the lever arm in excess of 45°.

1.05 SHOP DRAWINGS AND PRODUCT DATA

Submit eight (8) copies of shop drawings showing door and frame details for approval. Submit seven copies of manufacturers' product data for door, framing, and each type of hardware required.

1.06 SAMPLES

- A. Submit two (2) sets of 12 inch long samples of extrusions and formed shapes. Include 3 or more samples in each set showing near-limits of variations in color and finish. Once approved, samples submitted under this section will establish the extreme variation in color acceptable.
- B. Submit samples of each type of hardware required.

PART 2 - MATERIALS

2.01 MATERIALS

- A. Sections shall be extruded from 6063-T3 aluminum alloy (ASTM B 221, alloy GS 10A-T5).
- B. Major portions of the door stiles shall be .125 inch in thickness; glazing molding shall be .050 inch thick.

2.02 CONSTRUCTION

- A. Doors. - The Kawneer "350 Entrance Door" shall have vertical stiles of 5 inches, top rails of 5 inches, and bottom rails of 6-1/2 inches. Corner construction shall consist of both SIGMA deep penetration welds and mechanical clip fastening. Glazing stops shall be of the snap-in type with neoprene bulb-type glazing for 1 inch insulated glass units, located on the non-security side of the door. No exposed screws shall be required to secure stops. Stops on exterior side shall be lock-in tamper proof type.
- B. Framing. - The Kawneer "451T" framing system shall provide for flush glazing on all sides with no projecting stops. Vertical and horizontal members shall have a nominal face dimension of 2 inches, a nominal depth of 4 1/2 inches, and shall provide for 1 inch insulated glass units. All entrance framing members shall be weatherstripped.

- C. Weather-stripping: Provide Kawneer "Sealair" weather-stripping system in the doors and frames consisting of a dense, semi-rigid polymeric material which remains resilient and retains its weathering ability through temperature extremes. The system shall be provided with an EPDM blade gasket sweep strip attached to the door bottom with concealed fasteners. Weather-stripping and sweep shall be compatible with the threshold provided.

2.03 FINISH

All exposed members shall be free of scratches and other surface blemishes. All aluminum shall have fluoropolymer paint coating conforming to requirements of AAMA 605.2-92. Custom color will be selected.

2.04 HARDWARE

- A. Hardware for aluminum entrance doors (including the interior vestibule doors) shall be furnished and installed by the door manufacturer except otherwise noted, and shall include the following hardware items by the manufacturers specified or approved equal.
1. Pivots shall be Rixson 195xM190 (with intermediate pivot).
 2. Rim Exit Device shall be Von Duprin CD 98 x less pull x US 32D with cylinder and interchangeable core provided under Section 08700.
 3. LCN Cush-N-Stop surface closer with adjustable hold open feature or approved equal by Russwin or Sargent.
 4. Pull shall be Rockwood No. 158 x US 32D or approved equal by Brookline or Ives.
 5. Aluminum threshold shall be supplied and installed under Section 087100.
- B. Anchors and Fastenings: Furnish and install all bolts, nuts, anchors, sleeves and clips necessary for proper anchorage and support of aluminum work. All fastening devices shall be aluminum or non-magnetic stainless steel. Expansion bolts shall be stainless steel "Kwik-Bolts" as manufactured by Hilti Fastening Systems or approved equal.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum units where feasible, otherwise nonmagnetic stainless steel; except, at fabricator's option, brackets not exposed to weather or abrasion may be hot-dip galvanized steel complying with ASTM A 386. Provide nonstaining, nonferrous shims for installation and alignment of metal work.
- D. Concealed Flashing: Non-magnetic stainless steel, 26 gage, type selected by manufacturer for compatibility.

PART 3 - EXECUTION

3.01 INSPECTION AND PREPARATION

Furnish inserts at proper times for setting in concrete formwork, masonry, and similar construction indicated to support work of this Section.

3.02 INSTALLATION/ERECTION

- A. General: Comply with manufacturer's instructions for protection, handling and installation of the door, fabricated components, and hardware with particular attention and care to the preservation of applied finishes and to provide a weathertight installation. Discard and/or remove and replace damaged members immediately upon discovery.
- B. Framing Erection: Install components plumb, level, accurately aligned and accurately located. Anchor components securely in place in the manner indicated on the approved shop drawings, shimming and allowing for required movement, and providing separators and insulators to prevent corrosion and electrolytic deterioration, and to prevent "freeze-up" of moving joints.
- C. Installation of Door and Finish Hardware:
1. Make sure that the door, frame and transom are properly installed with square corners, plumb sides, level at the head, securely attached to surrounding construction and of the size and hand shown on the Drawings. Do not install the door in an improperly installed frame.
 2. Door openings shall not have more than the clearance specified by the manufacturer at sides, top, and bottom.
 3. Apply finish hardware in strict accordance with the final approved shop drawings and the manufacturers' instructions. Use care not to damage adjacent surfaces when installing hardware. Adjust door to be in exact alignment and hardware for easy action. Set all screws flush with the metal surface without any broken or damaged heads.
- D. Dissimilar Contact Surfaces:
1. Metals - Where aluminum is placed in contact with any metal other than non-magnetic stainless steel, the aluminum contact surface shall be given a heavy brush coating of zinc chromate primer made with a synthetic resin vehicle followed by two coats of an aluminum metal paint or shall be separated with an approved non-absorptive tape or gasket.
 2. Masonry - Aluminum placed in contact with masonry, mortar or concrete shall be given a heavy brush coating of an approved alkali-resistant, non-migrating, bituminous paint.

- E. Sealants and Joint Fillers: Furnish and install in accordance with Section 079200, Joint Sealants.
- F. Glazing: Provided under Section 088000, Glazing.

3.03 ADJUST AND CLEAN

- A. Just prior to the completion of all work under this section, the Contractor, with the Engineer, shall inspect all portions of the work, and shall make all required adjustments and corrections to the work, leaving all operable portions in proper operating condition and insuring that all jointing is tight. In addition, each piece of finish hardware shall be inspected to see that it is undamaged and in perfect working order.
- B. Clean completed work, inside and out, promptly after erection to the Engineer's satisfaction. Remove dirt and other substances from aluminum and other affected surfaces.
- C. Remove protective coating (if any) when completion of construction activities no longer requires its retention. Removal shall be in accordance with manufacturer's instructions.
- D. Perform minor touch-up work to members with finish damage to the Engineer's satisfaction. Should the Engineer, as sole judge of acceptability of repairs, deem a repair as unsatisfactory, the Contractor shall promptly remove and replace such damaged members at no additional cost.
- E. Institute protective measures and other precautions required to assure that all metal work and doors will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION

SECTION 085113

ALUMINUM WINDOWS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. The work in this section consists of furnishing all materials, equipment, supplies, transportation, labor and supervision, and performing all operations required to furnish and install, weathertight, all aluminum windows, including insulating glass, as shown on the Drawings, as specified herein, and as is additionally required to properly complete the work.
- B. Related sealant and glass and glazing work are included as part of the work of this section and shall be provided in accordance with the requirements of Sections 07900 and 08800, respectively.

1.03 GENERAL

- A. The Contractor shall verify all measurements at the building site and shall be responsible for dimensions, fitting, and the proper attachment of items related to the aluminum windows. Windows shall be fixed type. Window units shall be factory fabricated insofar as possible, consisting of, as applicable, frame, sash, sills, panning, mullions, insulating glass, sealants and anchors.
- B. Storage and Protection: Materials shall be stored out of contact with the ground and under a weathertight covering. Storage shall be arranged to avoid bending, warping, or otherwise damaging the materials and to provide adequate ventilation.
- C. Window frames, mullions, panning, screens, etc., shown on the Drawings are Kawneer 451T framing system as manufactured by Kawneer Co., Inc. Similar thermal-break windows by other reputable manufacturers will be considered provided they meet or exceed the requirements of the Kawneer windows specified. The Contractor shall obtain preliminary approval of the manufacturer's stock details from the Resident before complete shop drawings are prepared. Final approval will be based upon complete shop drawings showing all features of window fabrication and conditions of installation as detailed on the Drawings. All detailed requirements must be met.

- D. Performance Requirements: Windows shall exceed the current specifications of the Architectural Aluminum Manufacturers Association (AAMA) and shall bear the Quality Certified Seal of AAMA for PA3-A3HP.

1.04 SUBMITTALS

- A. Submit eight (8) copies of product data for all materials and shop drawings to the Engineer for approval. Shop drawings shall indicate the location and elevation of each type of window and shall show type and location of hardware, weather-stripping, locations of sealants, details of construction, including insulated glass/aluminum spandrel panels, glazing, anchorages, methods of assembly, and installation of all components.
- B. Submit two (2) sets of 12 inch long samples of extrusions and formed shapes. Include 3 or more samples in each set showing near-limits of variations in color and finish. Once approved, samples will establish the extreme variation in color acceptable.
- C. Submit samples of each type of hardware required.

PART 2 - MATERIALS

2.01 GENERAL

- A. Frames unless otherwise noted shall be fabricated from extruded aluminum sections incorporating a continuous rigid polyurethane thermal barrier (break). Members shall not be less than 4-1/2 inches deep from front to back. Face dimensions of frames shall be approximately 2 inches; webs and flanges shall be not less than .090 inch thick.
- B. Glass: Shall be 1" insulating units as specified in Section 088000, Glazing.
- C. Sealants: Shall be as specified in Section 079200, Joint Sealants.

2.02 CONSTRUCTION

- A. Fabricate aluminum windows in accordance with the approved shop drawings.
- B. All joints in aluminum framing shall be hairline and mechanically fastened.
- C. The back wall of the polyurethane pocket shall be removed to form a thermal barrier system. There shall be no frame members, corner construction or hardware application that bridges or violates the thermal barrier in any way.
- D. Special acrylic or butyl small-joint sealer shall be applied at all intersections to provide permanent watertight joints. Sections shall be designed to provide a flush condition of frame and vent members on the exterior and to position all glass in the same vertical plane.

2.03 GLAZING

Windows shall be arranged for inside glazing with aluminum extruded snap-in glazing beads designed to accommodate 1 inch insulating glass units and 1 inch insulated spandrel panels. Snap-in glazing beads shall securely interlock into the extruded window sections without extending underneath the glass or spandrel panel, or bridging the thermal barrier. Glazing rabbet legs shall be a minimum of 3/4 inches in height.

2.04 FINISH

All exposed aluminum for windows, sills, panning, and flashing shall have a fluoropolymer paint coating conforming to requirements of AAMA 605.2-92. Custom color will be selected to match aluminum storefront framing and door specified in Section 08400.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Windows shall be installed in strict accordance with the approved shop drawings and the manufacturer's approved installation instructions, without forcing or distortion so that sills and heads are level and jambs are plumb. Window frames shall be securely anchored in place with heavy gauge anchors, four (4) per jamb.
- B. Glass units shall be furnished, installed and cleaned in accordance with the applicable requirements of Section 088000, Glazing.
- C. Sealants shall be furnished and installed in accordance with the requirements of Section 079200, Joint Sealants.

3.02 ADJUSTMENT AND CLEANING

- A. After installation, glass and metal surfaces shall be cleaned and any staining or discoloring of the finish shall be restored to the Engineer's satisfaction or the unit shall be replaced at no additional cost. All other work detrimentally affected by the installation of the windows shall also be cleaned or otherwise restored to the Resident's satisfaction.

END OF SECTION

SECTION 087100

DOOR HARDWARE

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

The work in this section consists of furnishing all labor, materials, equipment and transportation and performing all operations required to furnish all finish hardware as shown on the drawings and specified herein.

1.03 SPECIFIED ELSEWHERE

- A. The following related work items shall be furnished and installed under other sections of these specifications as indicated.
 - 1. Hardware for Aluminum Entrance Door - Section 084113.
 - 2. Hardware for Cabinets - Section 062013.

1.04 GENERAL

- A. No finish hardware shall be delivered until all operations causing dampness have been completed. Care shall be taken to protect hardware from scratching and foreign matter, such as paint, joint compound, etc.
- B. All items of hardware shall be packed in approved manufacturers' containers with all trimmings, bolts, screws, etc., as required. Each container shall be accurately labeled and marked with an item location corresponding to the number listed on the approved Finish Hardware Schedule.
- C. Strikes for locks shall be box type with sufficient lip protection to protect frames and trim.
- D. All locks shall be construction master keyed. Four (4) construction master keys shall be furnished. All locks shall be set to new building master keys as directed by the Resident. Furnish six (6) master keys and two keys for each lock.

- E. Where size or shape of members is such as to prevent the use of the types specified, hardware shall be furnished of suitable type having as near as practicable the same operation and quality as the specified type; sized to be adequate for the required service, and approved by the Engineer.

1.05 SUBMITTALS

As part of the submission of shop drawings, the Contractor shall submit to the Engineer for review eight (8) copies of the schedule of finish hardware to be provided, giving manufacturers' names, catalog number references, type numbers, finish, and location of each item of hardware (identified with the door for which it is intended), and also the catalog cuts for each hardware item.

PART 2 - MATERIALS

2.01 MATERIALS

- A. All finish hardware shall be of the best grade of solid metal, entirely free from imperfections in manufacture and finish. Finish shall be US 26D Satin Chromium Plated and US 32D Satin Stainless Steel, as applicable. Door closer units shall have sprayed lacquer finish to match balance of hardware.
- B. The following items and manufacturers thereof indicate the quality and design of the hardware required.
1. Hinges: All door butts shall be Stanley No. FBB199 (US 32D), shall conform to ANSI A156.1 (A2111). Equivalent hinges manufactured by Hager Hinge Co. are also acceptable.
 2. Locksets shall Best Lock 35H x 16H x L x US 32D with anti-friction latch bolts and interchangeable cores. Function will be determined at time of hardware submittal by the Resident at no additional cost.
 3. Door Closers shall be LCN Smoothee Series with parallel arm "Cush-N-Stop" for push side and LCN's heaviest duty arm for pull side. Comparable closers manufactured by Sargent and Russwin will be considered for use. Provide coordinator at pairs of doors with adjustable safety release and internal override.
 4. Silencers shall be manufactured by Trimco, Sargent & Co. or Glynn-Johnson.
 5. Thresholds shall be of a style approved by the Resident, manufactured by Reese, National Guard or Pemko. All exterior doors shall have an extruded aluminum threshold with an integral slip-resistant surface set in sealant to provide watertight condition. Thresholds shall be secured to floor construction with suitable stainless steel flat head screws in expansion shields. Slip-resistant coating shall be equal to "PemKote" by Pemko. If size is not shown, provided threshold width equal to jamb depth.

Threshold - Type A: Pemko 171A w/PemKote
 Threshold - Type B: Pemko 270A and 282A, each with 1/4" high w/PemKote.

6. Kick plates and mop plates shall be 22 gage stainless steel, 8" high by width of door less 2", attached with stainless steel screws, as manufactured by Brookline, Ives or Rockwood.
7. Weather-stripping Systems shall be provided at all exterior doors and frames consisting of a dense, semi-rigid polymeric material which remains resilient and retains its weathering ability through temperature extremes. Weather-stripping and sweep shall be compatible with the threshold provided. Weather-stripping shall be of a style approved by the Resident, manufactured by Reese, National Guard or Pemko.

Door Shoe: Pemko 234AV (cold weather seal)
 Jamb & Head: Pemko 319CR

8. Floor Stops, and Wall Stops shall be manufactured by H.B. Ives Co., Brookline Industries Inc., Stanley, or Glynn-Johnson.
9. Exit Device and Pull: Refer to Section 08400.
10. Electric Strike: Provide Galaxy Model 1006-12/24D-630 X KM-630 with removable core for Best Cylinder.
11. Electric Lock: Provide self-contained mortised unit with internal, battery-powered, self-contained electronic lock; consisting of complete lockset, motor-driven lock mechanism, and actuating device, enclosed zinc-dichromatic-plated, wrought steel case, and strike that suits installation condition. Provide key override, low battery detection and warning, LED status indicators, and ability to program the lock. Provide Best Access Systems Mortised latchbolt.
12. Electric Hinges: Provide heavy duty electric hinge by Stanley or Hager.

2.02 FINISH HARDWARE SCHEDULE – US26D

SET NO. 1

For Door Nos. 101 & 102 and All Tunnel Stair Enclosure Doors (Aluminum Entrance Door)

1 Electric Strike
 1 Threshold
 1 Card Reader (provided by The Authority)
 1 Power Supply
 Balance of hardware specified in Section 08400

SET NO. 2

For Door No. 103

- 1 1/2 Pair Butts
- 1 Card Reader (provided by The Authority)
- 1 Electric Strike
- 1 Lockset – Store Room Function
- 1 Closer
- 1 Kick Plate
- 1 Head and Jamb Weatherstripping Set
- 1 Door Bottom
- 1 Threshold
- 1 Power Supply

SET NO. 3

For Door No. 104

- 1 1/2 Pair Butts
- 1 Lockset – Passage Function
- 1 Door Stop
- 3 Silencers

SET NO. 5

For Door No. 105

- 1 1/2 Pair Butts
- 1 Lockset – Privacy Function with Occupancy Indicator
- 1 Closer
- 1 Kickplate
- 1 Door Stop
- 3 Silencers

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Hardware shall be installed accurately in accordance with the manufacturers' templates and approved instructions.
- B. All knobs, levers, panic devices, push plates, pulls and other hardware shall be installed in accordance with the requirements of ANSI A117 and ADAAG.

END OF SECTION

SECTION 088000

GLAZING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. The term "glass" includes prime, processed and fabricated glass products. "Glazing" includes glass installation and all materials used to install glass. Types of work include glass and glazing for:
 - 1. Exterior aluminum entrance door, associated windows, and transom.
 - 2. Exterior hollow metal door vision lights.
 - 3. Glass for aluminum windows.

1.03 QUALITY ASSURANCE

- A. Prime Glass Standard: Comply with FS DD-G-451.
- B. Heat Strengthened and Fully Tempered Glass Standard: FS DD-G-1403.
- C. Safety Standards for Hazardous Locations: Conform to requirements of Building Code which applies to the Project and to all local ordinances and regulations.

1.04 SUBMITTALS

- A. Submit 2 samples, 12 inches square, of each glass type specified. Submit 12 inch lengths of installed (mocked-up) glazing systems including metal framing and sealant components. Submit insulating glass samples with completed edge seal construction. Hermetic seal need not be maintained.
- B. Submit copies of manufacturer's specifications, product information sheets, warranties, and installation instructions and recommendations.

1.05 JOB CONDITIONS

Meet with glazier and other trades affected by glass installation prior to beginning of installation. Do not perform work under adverse weather or job conditions. Install liquid sealants only when temperatures are within lower or middle third of temperature range recommended by manufacturer.

1.06 SPECIFIED PRODUCT WARRANTY

- A. Provide insulating glass manufacturer's written warranty, agreeing to, within specified warranty period, furnish FOB project site, replacement units for insulating glass units which have defective hermetic seals (excluding that due to glass breakage); defined to include intrusion of moisture or dirt, internal condensation at temperatures above -20°F (-31°C), deterioration of internal glass coatings, and other visual evidence of seal failure or performance failure; provided manufacturer's instructions for handling, installing, protecting and maintaining units have been adhered to during warranty period.
- B. Warranty period is 10 years after seal date permanently imprinted on units, but in no case less than 9 years after the date of substantial completion.

PART 2 - MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

Pilkington
PPG Industries, Inc.
Guardian Industries
Ford Glass Company

2.02 PRIME GLASS

Float Glass: Type I, Quality q3, clear or tinted glass as indicated.

2.03 PROCESSED GLASS

Tempered Glass: Provide clear or tinted glass as indicated, which has been heat treated to strengthen glass in bending to not less than 4.5 times annealed strength. Tong marks shall not be visible in glass after it is glazed in openings. Glass shall be of the thicknesses indicated, equal to Pilkington Tempered Glass. Color will be selected by the Architect.

2.04 FABRICATED GLASS UNITS

- A. Laminated Safety Glass: Laminate 2 sheets of clear or tinted float or tempered glass (as specified) with a 30-mil interlayer of poly-vinyl butyral, by manufacturer's standard

heat-plus-pressure process with dirt, air pockets and foreign substances excluded; 1/4 inch thick if not otherwise indicated. Units shall be equal to Pilkington Laminated Glass. Color will be Pilkington Artic Blue High Performance Tint.

- B. Tinted Sealant-Edged Insulating Glass: Provide manufacturer's standard double-pane with a seal classification of "A" as tested and certified by IGCC, with a permanent hermetically sealed, dry air or gas filled space of width indicated, dual-sealed edge construction, edge seal consisting of twin primary sealant beads of polyisobutylene, positioned and retained by tubular aluminum spacer bar. Provide manufacturer's standard protective, rust resistant metal edge banding on insulating glass units, labeled with fabricator's name and date of seal. Units shall be equal to Pilkington Insulated Glass. Color will be Pilkington Artic Blue High Performance Tint.

2.06 GLASS TYPES

Provide the following glass types as indicated in the Glazing Schedule:

Type A - 1 inch tinted insulated: 1/4 inch tinted exterior light, 1/2 inch desiccated air space, 1/4 inch interior light.

Type B - Same as Type A but both lights tempered.

Type C - 1 inch obscured tinted insulated: 1/4 inch tinted exterior light, 1/2 inch desiccated air space; 1/4 inch clear obscure (frosted or sandblasted) interior light.

2.07 GLAZING SEALANTS AND COMPOUNDS

Provide color of exposed sealant/compound as selected by Engineer from manufacturer's standard colors. Comply with manufacturer's recommendations for selection of hardness, depending upon the location of each application, conditions at time of installation, and performance requirements. Carefully select materials for compatibility with surfaces contacted in the installation.

2.08 GLAZING GASKETS

- A. Molded Neoprene Glazing Gaskets: Molded or extruded neoprene gaskets of the profile and hardness required for watertight construction. Glazing gaskets shall be standard for the glass framing systems supplied and shall be purchased from the frame manufacturer unless otherwise approved.
- B. Vinyl Foam Glazing Tape: Closed cell, flexible, self-adhesive, non-extruding, polyvinyl chloride foam tape; recommended by manufacturer for exterior, exposed, watertight installation of glass, with only nominal pressure in the glazing channel; complying to ASTM D 1667.

2.09 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers and Sealers: Type recommended by sealant and gasket manufacturers.
- B. Setting Blocks: Neoprene or EPDM, 70-90 durometer hardness, with proven compatibility with sealants used.
- C. Spacers: Neoprene or EPDM, 40-50 durometer hardness, with proven compatibility with sealants used.
- D. Compressible Filler (Rod): Closed cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

PART 3 - EXECUTION

3.01 STANDARDS AND PERFORMANCE

- A. Watertight and airtight installation of each piece of glass is required. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating units) without failure, including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials and other defects.
- B. Protect glass from edge damage during handling and installation, and subsequent operation of glazed components of the work. During installation, discard units with edge damage and other imperfections.
- C. Glazing channel dimensions shown are intended to provide for necessary bite on glass, minimum edge clearance and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.
- D. Comply with combined recommendations and technical reports of manufacturers of glass and glazing products as used in each glazing application, and with recommendations of Flat Glass Marketing Association "Glazing Manual," except where more stringent requirements are indicated or specified.
- E. Install insulating glass units to comply with recommendations by Sealed Insulating Glass Manufacturers Association, except as otherwise specifically indicated or recommended by glass and sealant manufacturers.

3.02 PREPARATION FOR GLAZING

- A. Clean glazing channel and other framing members to receive glass immediately before glazing. Remove coatings which are not firmly bonded to substrate. Remove lacquer from metal surfaces where elastomeric sealants are used.
- B. Apply primer or sealer to joint surfaces where recommended by sealant manufacturer.

3.03 GLAZING

- A. Install setting blocks of proper size in sill rabbet, located 1/4 of the glass width from each corner. Set blocks in thin course of heel-bead compound.
- B. Provide spacers inside and out, of proper size and spacing, for glass sizes larger than 50 united inches, except where gaskets or preshimmed tapes are used for glazing. Provide 1/8 inch minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
- C. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
- D. Miter cut and bond ends together at corners where gaskets are used for channel glazing so that gaskets will not pull away from corners and result in voids or leaks in the glazing system.

3.04 CURING, PROTECTION AND CLEANING

- A. Protect glass from breakage immediately upon installation. Do not apply markers to surfaces of glass. Remove non-permanent labels and clean surfaces. Cure sealants as necessary to provide high early strength and durability.
- B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during the construction period, including natural causes, accidents and vandalism.
- C. Wash and polish glass on both faces not more than 4 days prior to date scheduled for inspection intended to establish date of Substantial Completion. Comply with glass manufacturers' recommendations for final cleaning.

END OF SECTION

SECTION 092900

GYPSUM BOARD AND METAL FRAMING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. This section provides minimum standards for gypsum drywall work. The work required consists of furnishing all materials, equipment, accessories, labor and supervision, and performing all operations necessary to provide finished gypsum drywall work as shown on the Drawings, as specified herein, and as is additionally required to properly complete the work.
- B. Without in any way limiting the work to be performed, the following gypsum drywall work items are mentioned:
 - 1. Gypsum board and metal furring over concrete masonry units.
 - 2. Gypsum board and metal drywall framing for partitions and fire rated ceilings.
 - 3. Drywall finishing of gypsum boards (joint tape-and-compound treatment).
 - 4. Ceiling access doors.
 - 5. Cement backer panels for ceramic tile.

1.03 QUALITY ASSURANCE

- A. Gypsum Board Standard: GA-216 by Gypsum Association.
- B. Metal Support Standard: ASTM C 754.
- C. Manufacturer: Obtain gypsum board products and accessories from a single manufacturer, or from manufacturers recommended by the manufacturer of gypsum boards.
- D. Allowable Tolerances: 1/16" offsets between planes of board faces, and 1/8" in 8'-0" for plumb, level, warp and bow.

1.04 SUBMITTALS

Submit manufacturer's product specifications and installation instructions for each gypsum drywall material (i.e., gypsum board, furring, etc.), component, including other data as may be required to show compliance with these specifications.

1.05 PRODUCT HANDLING

Deliver, identify, store and protect gypsum drywall materials to comply with Gypsum Association Specification GA-216.

PART 2 - MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work are listed in the following paragraphs.

2.02 METAL SUPPORT MATERIALS

- A. Furring Members: ASTM C 645; 20 gage, hat-shaped (C-shaped studs in some locations).
- B. Studs: ASTM C 645; 20 gage unless otherwise indicated. Studs, runners and accessories in or abutting exterior walls shall be galvanized; otherwise primed. Studs shall be 3-5/8" except as otherwise indicated. Studs at designated plumbing walls shall be 6". Runners shall be the type recommended by stud manufacturer for floor and ceiling support of studs, and for abutment of drywall work at other work. Provide stud manufacturer's standard clips, ties, reinforcements, fasteners, grommets, and other accessories as needed for a complete stud system.
- C. Fasteners: Type and size recommended by furring manufacturer for the substrate and application indicated.
- D. Manufacturers: Provide materials by one of the following firms:

Allied Structural Industries
Dale Industries, Inc.
United States Gypsum Co.

2.03 GYPSUM DRYWALL

- A. Gypsum Drywall and Related Products:

Provide materials by one of the following firms:

The Flintkote Company

Gold Bond Building Products Div., National Gypsum Co.
United States Gypsum Co.
Georgia-Pacific

- B. Exposed Gypsum Drywall: Regular type with tapered long edges.

Thickness: Provide gypsum drywall of the thicknesses indicated on the Drawings. Where not indicated, comply with thickness requirements of GA-216 for each application and support spacing. Comply with requirements for indicated fire-resistance ratings.

Sheet Size: Maximum length available which will minimize end joints.

Insulating Type: Provide in all exterior walls (aluminum foil backing).

Type WR: Provide in Toilet and Storage.

Type X: Provide at Fire Rated assemblies and as indicated.

- C. Cement Backer Panels for Ceramic Tile: Provide Durock brand by United States Gypsum Company.

2.04 TRIM ACCESSORIES

Provide manufacturer's standard trim accessories of types indicated for drywall work, formed of galvanized steel unless otherwise indicated, with either knurled and perforated or expanded flanges for nailing and beaded for concealment of flanges in joint compound. Provide corner beads, L-type edge trim-beads, U-type edge trim-beads, special L-kerf-type edge trim-beads, and one-piece control joint beads.

2.05 JOINT TREATMENT MATERIALS

- A. ASTM C 475; type recommended by the manufacturer for the application indicated, except as otherwise noted.
- B. Joint Tape: Perforated or plain type.
- C. Joint Compound: Provide chemical-hardening-type for bedding and filling, ready-mixed vinyl-type or vinyl-type powder for topping.

2.06 MISCELLANEOUS MATERIALS

- A. Provide auxiliary materials for gypsum drywall work of the type and grade recommended by the gypsum board manufacturer.
- B. Gypsum Drywall Fasteners: Comply with GA-216.

2.07 ACCESS DOORS

Ceiling hatch shall be 2-hour fire rated (2'-0" X 2'-6") with 16 gauge galvanized steel frame and 20 gauge galvanized steel upward acting door. Door shall be insulated with 1 inch minimum thickness mineral wool insulation. Door shall be equipped with a spring lever, as manufactured by Babcock-Davis, Bilco Co., Cedrex/Intertek, or approved equal.

PART 3 - EXECUTION

3.01 PREPARATION FOR METAL SUPPORT SYSTEMS

- A. Coordinate work of this section with other work to ensure that all inserts and other items have been provided for.
- B. Furnish concrete inserts, clips and similar devices to other trades for installation well in advance of time needed for such other work.

3.02 INSTALLATION OF METAL SUPPORT SYSTEMS

- A. Do not bridge building expansion joints with furring system; frame both sides of joints with furring.
- B. Space wall furring members 16" o.c., except as otherwise indicated.
- C. Install supplementary framing, runners, furring, blocking and bracing at openings and terminations in the work, and at locations required to support fixtures, equipment, services, heavy trim, furnishings and similar work which cannot be adequately supported directly on gypsum drywall alone.

3.03 GENERAL GYPSUM DRYWALL INSTALLATION REQUIREMENTS

- A. Pre-Installation Conference: Meet at the Project site with the installers of related work and review the coordination and sequencing of work to ensure that all work to be concealed by gypsum drywall has been accomplished and approved.
- B. Locate exposed end-butt joints as far from center of walls as possible, and stagger not less than 1'-0" in alternate courses of drywall.
- C. Install drywall boards vertically to avoid end-butt joints wherever possible.
- D. Install exposed gypsum drywall board with face side out. Do not install imperfect, damaged or damp boards. Butt boards together for a light contact at edges and ends with not more than 1/16" open space between boards. Do not force into place.
- E. Locate edge joints over supports. Position boards so that tapered edges abut, and mill-cut or field-cut ends abut. Do not place tapered edges against cut edges or ends.
- F. Attach gypsum drywall to framing and blocking as required for additional support at openings and cutouts.

- G. Form control joints and expansion joints with space between edges of boards, prepared to receive trim accessories.

3.04 METHOD OF GYPSUM DRYWALL APPLICATION

Apply gypsum boards to supports with recommended screws. Follow the manufacturer's recommendations for single layer applications.

3.05 INSTALLATION OF DRYWALL TRIM ACCESSORIES

- A. Where feasible, use the same fasteners to anchor trim accessory flanges as required to fasten gypsum board to supports. Otherwise, fasten flanges by screwing in accordance with manufacturer's instructions and recommendations.
- B. Install metal corner beads at external corners of drywall work.
- C. Install metal edge trim whenever edge of gypsum board would otherwise be exposed or semi-exposed. Provide type with face flange to receive joint compound. Install L-type trim where work is tightly abutted to other work, and install special kerf-type where other work is kerfed to receive long leg of L-type trim. Install U-type where edge is exposed, revealed, gasketed, or sealant-filled.
- D. Install metal control joint (beaded-type) where indicated.

3.06 ACCESS DOORS

Install access doors in the locations shown, in strict accordance with the manufacturer's instructions and recommendations.

3.07 DRYWALL FINISHING

- A. Apply drywall treatment at gypsum board joints (both directions), flanges of trim accessories, penetrations, fastener heads, surface defects and elsewhere as required to prepare work for subsequent application of finishes. Prefill open joints and tapered edges, using type of compound recommended by manufacturer.
- B. Apply joint tape at joints between gypsum boards, except where a trim accessory is indicated or required.
- C. Apply joint compound in 3 coats (not including prefill of openings in base), and sand between coats and after last coat.
- D. Drywall finishing shall be performed so that all joints, fastener locations, trim flanges, etc., are indiscernible after painting.

E. Refer to Section 099123 for painting finishes to be applied to drywall work.

3.08 PROTECTION OF WORK

Protect gypsum drywall work from damage and deterioration during the entire construction period.

END OF SECTION

SECTION 093013

CERAMIC TILING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

The work in this section consists of furnishing all materials, equipment, supplies, transportation, labor and supervision, and performing all operations required to install all ceramic tile work as shown on the Drawings and schedules, as specified herein, and as is additionally required to properly complete the work.

1.03 SPECIFIED ELSEWHERE

- A. Cement backer board for ceramic tile - Section 092900
- B. Toilet, bath, and laundry accessories - Section 102800

1.04 GENERAL REQUIREMENTS

- A. Ceramic mosaic floor tiles over concrete and glazed ceramic wall tiles over gypsum board shall be manufactured by American Olean Tile Co., United States Ceramic Tile Co., or Dal-Tile.
- B. Deliver all materials to the site in manufacturers' unopened containers with grade seals unbroken and labels intact; keep tile cartons dry.
- C. Maintain temperature at 50°F. minimum during tile work and for 7 days after completion.
- D. All work shall be installed in strict accordance with the requirements of the latest revision of the Tile Council of America (TCA), "Handbook for Ceramic Tile Installation".

1.05 SUBMITTALS

- A. The Contractor shall submit samples of the tiles to the Resident for selection and approval.

- B. Submit copies of manufacturers' specifications and installation instructions for each material required.

1.06 MAINTENANCE STOCK

- A. Provide 1 full box of each type of tile and any non-installed full tiles to the Owner at final completion for Owner's use as maintenance stock.

PART 2 - MATERIALS

2.01 CERAMIC FLOOR TILE

- A. Tile shall be "Ayers Rock" by Daltile. Tile shall be colorbody, impervious porcelain type, 5/16 inch thick. Tile shall be standard colors, all as selected from samples submitted to the Architect. Tile size shall be 13" x 13".
- B. Tile shall be standard grade conforming to ANSI A137.1.

2.02 GLAZED CERAMIC WALL TILE

- A. Tile shall be "Unity" by Daltile. Tile shall be polished colorbody impervious porcelain type, 5/16 inch thick. Tile shall be standard colors, all as selected from samples submitted to the Architect. Tile size shall be 12" x 24".
- B. Tile and base shall be standard grade conforming to ANSI A137.1.

2.03 DRY SET MORTAR

Dry set mortar shall conform to ANSI A118.1.

2.04 GROUTING MATERIAL

Grouting material shall conform to ANSI A118.6. Color of grout for walls and floors shall be selected by the Architect. Grout shall have integral sealer component.

2.05 SEALANT

Sealant shall be #784 white silicone as manufacturer by Dow Corning Co. Similar sealant by General Electric may be submitted for the Engineer's approval.

2.06 METAL TRIM UNITS

Provide metal trim units with cove profile at wall and floor interior corner transitions. Provide flat edge metal trim units at top of wall tile. Similar to Schluter brushed stainless steel finish.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Before tiling, be sure variations of surface to be tiled is not more than 1/8 inch in 8 feet for walls and 1/8 inch in 10 feet for floors and that all plumbing fixtures, fittings and connections are in place and surfaces are free of curing membranes, oil, grease, wax and dust.
- B. Tile applied shall be properly spaced, and set true, plumb and straight.
- C. Install metal trim strips at all tile interior corners in walls and floors and wall top cap.
- D. Ceramic tile shall be set with dry set mortar conforming to ANSI A108.5.
 - 1. Floor: TCA Method F113.
 - 2. Wall: TCA Method W202.
- E. Grout shall be placed and thoroughly worked in to all tile joints to form a smooth dense surface free of voids. Clean all tile surfaces with water as soon as grout becomes firm.
- F. Where tile abuts steel, wood or other material, seal the joint with sealant.
- G. It will be the responsibility of the tile contractor to protect the work in this section and the work of others from damage resulting from this work. Damaged items shall be refinished, replaced or repaired, as determined by the Engineer, at no additional cost.
- H. Cover tile completely with heavy reinforced non-staining sisal kraft paper, lapped a minimum of three inches, with joints sealed and taped. No traffic shall be allowed on tile floor for at least three days after installation.

END OF SECTION

SECTION 09123ACOUSTICAL TILE CEILINGS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

The work in this section consists of furnishing all materials, equipment, supplies, incidentals, labor and supervision, and performing all operations required to furnish and install all lay-in suspended ceiling components as shown on the schedules and Drawings, and as specified herein and as is additionally required to properly complete the work.

1.03 GENERAL REQUIREMENTS

- A. All ceilings shall be installed in accordance with the approved instructions of the manufacturer of the suspension system and ceiling panels.
- B. All overhead mechanical and electrical work, excluding surface mounted equipment, shall be completed and in-place prior to the installation of the ceilings.
- C. Installation of lay-in ceiling panels shall not begin until residual moisture from concrete and masonry work has dissipated. Before installation, the building shall be enclosed and permanent heating equipment in operation.

1.04 SUBMITTALS

- A. One linear foot of main runner, cross tee, edge molding and hanger wire.
- B. One square foot of panel.
- C. Shop drawings shall be submitted and approval obtained prior to delivery of ceiling system components to the site. Drawings shall clearly delineate all components of the system and shall show proposed layout of ceiling grid.
- D. Submit manufacturer's product data for all materials.

1.05 MAINTENANCE STOCK

- A. Provide 1 full box and any non-installed ceiling tiles to the Owner at final completion for Owner's use as maintenance stock.

PART 2 – MATERIALS

2.01 MATERIALS

- A. All materials shall be delivered in their original unopened packages.
- B. Hanger wires shall be galvanized carbon steel, ASTM A 641, soft temper, prestraightened, prestretched, yield-stress load of at least 3 times design load but not less than 12 gage. Wire coils will not be permitted.
- C. Ceiling panels shall be 24" x 48" x 3/4" thick regular lay-in type commercial ceiling tile "Dune Second Look II (2712) by Armstrong World Industries, conforming to Class A (Fed. Spec. SS-S-118B) flame spread rating. No substitutions allowed.
- D. Suspension system shall be an exposed interlocking grid assembly complying with ASTM C 635, Standard Specification for Metal Suspension Systems for "Acoustical Lay-in Panel Ceilings." Suspension system shall be classified heavy duty. Exposed members shall have a factory applied low gloss white baked enamel finish. System shall be "Prelude ML" by Armstrong World Industries or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Installation shall be in accordance with ASTM Recommended Practice C 636. Grid system shall be true, straight and level to a tolerance of one in 1000, with border units of the greatest possible size. Install hangers directly to supporting structure. All members and panels shall be installed in strict accordance with the manufacturer's recommendations. All joints around electric outlets, ducts, pipes and other work extending through the ceiling treatment shall be sealed tight with Engineer approved nonhardening caulking compound. At completion of the ceiling treatment, joints in grid shall be straight and true-to-line, with exposed surfaces flush and level with hairline joints. Units shall be neatly jointed to connecting work. Provide angles at intersections of all vertical surfaces.
- B. Following erection, dirty and discolored surfaces of acoustical units and/or support system shall be cleaned in accordance with the manufacturer's recommendations and left free from defects. Grid components and acoustical tiles that are damaged in any way or improperly installed shall be removed and replaced as directed, at no additional cost.

END OF SECTION

SECTION 096513

RESILIENT BASE & ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

The work includes furnishing all materials, equipment, supplies, labor and supervision, and performing all operations required to provide resilient accessories as shown on the Drawings, as specified herein and as is additionally required to properly complete the work. Location of wall base and accessories are shown or scheduled on the Drawings.

1.03 QUALITY ASSURANCE

Provide each type of resilient accessory as produced by a single manufacturer, and include manufacturers' recommended primers, adhesives, sealants, leveling compounds, etc.

1.04 SUBMITTALS

- A. Product Data: Submit 8 copies of manufacturer's technical data and installation instructions for each type of resilient wall base, accessory, and installation materials such as adhesive, leveling compound, etc.
- B. Samples: Submit samples of each type, color, and pattern of resilient wall base, and accessory required, indicating full range of color and pattern variations. Provide 6" long sections of wall base and accessories.

For initial selection of colors and patterns submit, prior to above, samples in form of actual sections of resilient wall base and accessory, showing full range of colors and patterns available for each.

- C. Certification for Fire Test Performance: Submit manufacturer's certification that resilient wall base and accessories furnished comply with required fire test performance and have been tested and meets indicated standards.
- D. Maintenance Instructions: Submit 8 copies of manufacturer's recommended maintenance practices for each type of resilient wall base and accessory required.

1.05 JOB CONDITIONS

Maintain minimum temperature of 65°F (18°C) in spaces to receive resilient wall base and accessories for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. Store materials in spaces where they will be installed for at least 48 hours before beginning installation. Subsequently, maintain minimum temperature of 55°F (13°C) in areas where work is completed.

Where possible, install resilient wall base and accessories after other finishing operations, such as painting, have been completed.

1.06 MAINTENANCE STOCK

A. Provide Owner will all non-installed undamaged product in original packaging at the completion of the work

PART 2 - PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

Subject to compliance with requirements, provide products of one of the following manufacturers:

Armstrong Company, Floor Division
Azrock Industries, Inc., Floor Division
Burke Industries Inc.
Flexco
Johnsonite; a Tarkett Company
Kentile Floors, Inc.
Roppe Corporation, USA
VPI Corporation

2.02 MATERIALS

- A. Colors and Patterns: As selected by the Architect from the manufacturer's standards.
- B. Vinyl Wall Base: Standard straight base 1/8 inch thick by 4 inches high, with preformed or molded corner units, matte finish.
- D. Adhesives (Cements): Waterproof stabilized type as recommended by resilient materials manufacturers to suit material and substrate conditions.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Broom clean or vacuum surfaces to be covered and inspect substrate. Start of installation indicates acceptance of conditions and full responsibility for completed work.

3.03 INSTALLATION OF WALL BASE AND ACCESSORIES

- A. Apply vinyl wall base to walls, casework and other permanent fixtures and vertical surfaces in rooms or areas where base is required, including closets. Install base in lengths as long as practicable, with preformed or molded corner units. Tightly bond base to substrate throughout length of each piece, with continuous contact at horizontal and vertical surfaces.

3.04 CLEANING AND PROTECTION

- A. Remove excess adhesive and other surface blemishes using neutral type cleaners as recommended by manufacturer.
- B. Finishing: After completion of the work, just prior to inspection of the work for Substantial Completion, thoroughly clean floors, wall base and accessories.

END OF SECTION

SECTION 099123PAINTING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

- A. The work includes furnishing all materials, equipment, tools, supplies, transportation, staging, drop cloths, wet-paint signs, labor and supervision, etc., and performing all operations required for interior and exterior "on site" painting as noted on the Drawings, as described herein, and as is additionally required to properly complete the work.
- B. Unless otherwise indicated in the Paint Schedule, prepare surfaces and apply the number of coats scheduled herein regardless of shop or field coats specified elsewhere. Surface preparation and touch-up of shop coats is included in the work.
- C. In general, it is intended that all non-shop finished exposed surfaces throughout the interior and exterior of the building be painted as described herein and as indicated on the Drawings.
 - 1. Except as otherwise noted or directed by the Architect, the following are not to be painted: bronze; stainless steel; aluminum and other non-ferrous metals; prefinished metals; concrete sidewalks; finish hardware; glass and glazing materials; acoustical ceilings; resilient floor/wall coverings and base; plastic laminate; lighting units and pipes, ducts, conduit, insulation, etc., in mechanical rooms except where they abut surfaces scheduled to be painted.
 - 2. Except as otherwise noted, paint all steel doors, steel door and louver frames; exposed structural steel and miscellaneous metals, interior and exterior; gypsum board walls; exposed concrete masonry units; exposed interior concrete; standing and running trim; shelving and drawers in casework; exposed rough carpentry work (e.g., plywood, back-up panels etc.); all exterior woodwork; back-priming all exterior woodwork; piping/conduit, hangers, supports, and related equipment and accessories in areas designated to be finish painted (except where finish painted by the manufacturer or specifically excluded by this specification, the Drawings or the Architect).

- D. The Contractor shall perform all work in accordance with this Specification Section and shall complete all incidental details, whether or not such details are specified herein, as is required to produce thoroughly finish painted work of the best quality.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. All paints and associated materials shall be first quality products manufactured by the following companies:

Benjamin Moore
Dur-A-Flex
Tnemec Company, Inc.
Sherwin Williams

- B. Insofar as possible, paints used for this Contract shall be produced by a single manufacturer.
- C. All materials used in the work are to be of the best of their brand or class, brought to the site in original unopened containers. Containers of materials must have original labels intact in order to be accepted for use on the Project. Driers, thinners and solvents shall be as recommended by the manufacturer of the paint being used.
- D. No claim as to the unsuitability of any material used will be considered unless such claim is made in writing before the materials are approved by the Resident. By submitting a product for approval, the Contractor assumes complete responsibility for the suitability of the paint and for the results obtained therewith.
- E. The Schedule of Painting listed herein designates specific manufacturers to denote the standard of quality and the type of finish desired. Materials of other manufacturers listed above shall be submitted to the Engineer for approval prior to purchase of any materials. Requests for substitution shall list the material specified and the specific material being offered as a substitute, including appropriate supportive technical data.

2.02 COLORS AND FINISHES

- A. All colors and finishes shall be as selected and/or scheduled by the Architect. Prepare for approval by the Architect, two (2) panels for each color and finish selected (i.e., semi-gloss, flat, etc.). Submit these samples at least 3 weeks in advance of the date scheduled for beginning painting work.
- B. Panels shall be at least 12 inches by 12 inches.
- C. Approved samples shall be kept in the Contractor's field office for reference for the duration of the painting work.

2.03 GENERAL REQUIREMENTS

- A. Inspect all surfaces requiring painter's finish and remedy all remaining defects.
- B. All surfaces to be painted shall receive a prime coat and two finish coats, unless otherwise noted.
- C. Take adequate precautions for protection against soiling and damage to adjacent equipment, structures, and surfaces. Protect floors, paved areas and all other adjacent surfaces against spatter and spillage. Leave and maintain protection in place until all final painting has been performed and approved in the affected area.
- D. Erect, maintain and dismantle scaffolding and access equipment without damage to structures, machinery, pipes, etc.
- E. Store rags, cleaning cloths, and waste materials smeared or contaminated with paint, oils, solvents, and other flammable materials in approved covered metal containers and remove them from buildings and dispose of them off-site after each shift and as otherwise directed by the Resident.
- F. Take precautions so that surface preparation, including dust blow-off, does not do any damage. With the approval of the Resident, equipment, machinery and items that could be damaged by grit and dust may be masked and sealed dust-tight in a suitable manner. Take precautions so that grit and dust does not fall on surfaces ready for painting or onto newly painted surfaces.
- G. As necessary, remove solvent and paint fumes by suitable means.
- H. Do not perform spray painting in areas where welding is in progress nor near operations involving open flames, sparks or high heat.
- I. Do not perform painting near or on energized electrical equipment or rotating equipment without proper precautions being taken nor until approval to proceed is received from the Engineer.
- J. Take all necessary precautions to ensure that paint is not introduced into working parts of equipment, machinery, filters, motors, controls, etc. Where the indicated application method may cause damage, notify the Resident so that the Resident and manufacturer can agree on an alternate method of application.
- K. Mask and otherwise protect nameplates, gauges, glass, fire rating labels, instructions, lubrication fittings, instruments and similar items as necessary to retain their original conditions after completion of the painting work. Remove protection after painting is completed.
- L. Follow the manufacturers' recommendations and OSHA regulations regarding precautions and protective clothing and equipment to be used by painters.

- M. Adequately provide for the proper electric and static grounding of spray equipment, of items being painted and other static-producing equipment and electrical tools. The motors on painting and coating related equipment shall be explosion proof. Supply all ventilation equipment, respirators, safety lines, and eye, face, head and body protection.
- N. The Contractor shall be responsible for all damage done to other work and for repairing same to the satisfaction of the Engineer. Replace all materials damaged to such an extent that they cannot be restored to their original condition. This work shall be done at the Contractor's expense.

2.04 SUBMITTALS

Submit 8 copies of the manufacturers' technical information including paint label analysis and application instructions for each material proposed for use.

2.05 DELIVERY AND STORAGE

- A. Deliver all materials to the jobsite in original, new and unopened packages and containers bearing the manufacturer's name and label. Technical data sheets covering use of the product shall be included with every consignment delivered. Each container shall bear the label of the manufacturer and be clearly marked in a durable manner to show the following information:
 - 1. Type of paint by generic description.
 - 2. Manufacturer's paint name and reference number.
 - 3. Gross and net weights and/or volumes.
 - 4. Date of manufacture and shelf-life.
 - 5. Recommended thinner and mix ratios.
 - 6. Recommended safety precautions and antidotes in case of contact or ingestion.
- B. Store materials in an enclosed, protected storage area with provisions for maintaining the materials in storage at not less than 60°F nor more than 95°F unless more restrictive temperatures are required by the paint manufacturer to guarantee shelf-life. Provide adequate ventilation in storage areas. No paint stored longer than the manufacturer's specified shelf-life shall be used in the work. Keep the storage space neat and clean and repair all damage to the space and surroundings.

PART 3 - EXECUTION

3.01 APPLICATION CONDITIONS

- A. Apply water-base paints only when the temperature of the surface to be painted and the surrounding air temperature is between 50°F and 90°F., unless otherwise permitted by the paint manufacturers' printed instructions.
- B. Apply solvent thinned paints only when the temperature of the surface to be painted and the surrounding air temperature is between 45° and 95°F., unless otherwise permitted by the paint manufacturers' printed instructions.
- C. Do not apply paint in snow, rain, fog or mist, or when the relative humidity exceeds 85%. Do not apply paint to damp or wet surfaces nor when the temperature of the surface to be painted is lower than the corresponding wet-bulb temperature for the existing air temperature and relative humidity, unless otherwise permitted by the paint manufacturers' printed instructions.
- D. Continue painting during inclement weather only if the areas and surfaces to be painted are enclosed and maintained within the temperature and humidity limits specified by the paint manufacturer during both the application and drying periods.
- E. Do not perform exterior painting when windblown dust or debris may contaminate the work. Isolate interior painting areas as required to prevent dust circulation. Provide temporary closures where isolation cannot be effected by closing doors and windows.
- F. Prepare trial coats as requested by the Resident for coats differing in color, shade, application method, etc.
- G. Each coat of paint must be dry before the succeeding coat is applied or any surface preparation (i.e., sandpapering) is done.
- H. Perform painting and finishing in the best and most workmanlike manner known to the trade. No paint shall be applied by other than skilled workmen. All surfaces are to be left smooth, even and free from brush marks and visible paint laps. If surfaces are not thoroughly covered, apply additional coats or otherwise remedy problems until finished surfaces are of an acceptable uniform color, texture and sheen, at no additional cost.
- I. Provide specified and approved finish coats which are compatible with prime paints. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coating system for various substrates. Upon request from other trades, furnish information on the characteristics of finish materials proposed for use to ensure that compatible prime coats are used. Provide barrier coats over incompatible primers or remove primer and reprime as required. Notify the Resident in writing of any anticipated problems using the specified coating systems over substrates primed by others.
- J. If a prime coat does not dry to a uniform sheen over the entire surface, spot prime the areas that indicate suction before applying the finish coat.

- K. After the first coat is applied, if the surface is not smooth, sand and refinish it.
- L. Maintain a record, in a form approved by the Resident, of all painting work performed. Indicate on the record the locations and types of surfaces painted, manufacturers' stock numbers, color numbers, quantity of each paint type applied, surface preparation, and the number and mil thickness of each coat applied.

3.02 INSPECTION

- A. Examine the areas and conditions under which painting work is to be applied and notify the Resident in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
- B. Commencement of painting work will be construed as the Contractor's acceptance of the surfaces and conditions within that particular area.

3.03 SURFACE PREPARATION

A. General:

1. Perform surface preparation and cleaning procedures in strict accordance with the paint manufacturers' instructions and recommendations, and as is additionally specified herein.
2. Thoroughly inspect, clean and repair all surfaces which have received a shop coat of paint under other sections of the specifications prior to application of additional coats. Where shop primer has been damaged, the field painting work includes surface preparation and touch-up painting of abraded and otherwise defective primer, as well as priming of uncoated field welds, field bolting, and all other bare surfaces before application of the first field coat. Feather edges of sound primer into defective prime areas, bare field welds, etc., and apply touch-up paint to overlap the adjacent sound primer by at least 2 inches.
3. Provide non-damaging protection for all hardware, hardware accessories, machined surfaces, plates, and similar items in place which are not to be finish painted, prior to surface preparation and painting operations.
4. Clean all surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Schedule cleaning and painting operations so that contaminants from the cleaning process will not fall onto newly cleaned or newly painted surfaces.
5. Failure on the part of the Contractor to remedy surface imperfections that remain visible following the finish coat of paint shall be cause for rejection, solely at the discretion of the Engineer, and shall be considered due cause for refinishing the surface area involved by the Contractor, at no additional cost.

6. Cut out and fill with spackle or other approved compounds, all scratches, cracks, abrasions, etc., adjoining trim materials. Make all patches flush with adjoining surfaces and allow to dry and then properly seal before application of the prime coat. In general, interior caulking and sealants will be installed prior to start of field painting; however, certain sealants require that painting be applied first. It shall be the Contractor's responsibility to coordinate such work with the trades involved.
- B. Specific Surface Preparation: The painting systems will indicate one or more of the following methods of surface preparation for each item or surface to be painted.
1. Solvent Cleaning: Cleaning in accordance with Steel Structures Painting Council (SSPC) Specification SP 1.
 2. Alkaline Cleaning: Wash with weak alkaline solution consisting of 1 part trisodium phosphate to 32 parts of water, rinse thoroughly with clean, potable water, and dry.
 3. Masonry and Concrete: (Concrete Block and Concrete) - remove all form oil, dust, dirt, efflorescence, chalk, loose material, laitance, etc., by wire brushing, stone rubbing and other appropriate means (use of acid cleaners must be approved by the Engineer). Comply with paint manufacturers' recommendations regarding neutralizing surface for oil base paints or wetting for water base paints. Patch all ratholes and rough spots with an Engineer approved compound. Keep patches damp (where applicable) for a period of at least 24 hours and then allow to dry thoroughly prior to application of paint. Patch in a neat and workmanlike manner. Test each patch for adhesion before painting. Do not paint new concrete and masonry for at least 28 days after placement to permit the concrete and mortar to cure and dry out sufficiently.
 4. Wood and PVC Surface: Perform alkaline cleaning to remove grease, oil, wax, etc. Remove alkali solution with water soaked wipers and then dry the surfaces. Smooth surface by fine sanding. Blunt sharp edges with light hand sanding. Seal knots and pitch streaks with shellac. For surfaces which are to receive an opaque finish, fill holes, cracks, etc., with a latex base compound and when hardened, sand smooth. In areas where the wood is to be stained, mix proper colored stain with the wood filler before application to ensure color match of the filler to surrounding woodwork. Do not apply paint or stain to unfinished wood having a moisture content of more than 10% (at a minimum 3/16 inch depth) as checked by a Painter's Moisture Register - Model 9.
 5. Ferrous Metals: Clean iron and steel surfaces that have not been previously shop coated, and which do not require sand blasting, of rust and scale in accordance with Steel Structures Painting Council Specification SP-3, Power Tool Cleaning, prior to application of prime coat. Prior to mechanical cleaning, solvent or alkaline clean surfaces to remove oil, grease, and other contaminants. Clean surfaces the same day the surfaces are to be painted. Take special care to avoid burnishing surfaces by wire brushing.

6. Galvanized Surfaces: Solvent clean and scrub with scouring pads to remove all oil and "white rust". Follow by rinsing with clean, water soaked wipers, and then dry the surfaces. When required (i.e., prior to application of alkyd coatings), apply a "wash primer" in accordance with the paint manufacturers' recommendations.
7. Preparation for Touch-up Painting: Clean all field bolting, field welds, unprimed steel, and all other miscellaneous uncoated metal of rust, scale, welding contaminants, grease, oil and other foreign matter by alkaline and power tool cleaning. Remove all weld spatter, sharp edges and points by chipping and grinding. Remove damaged primer until sound primer is encountered. Feather the edge of paint surrounding damaged areas and overlap adjacent sound primer by at least 2 inches with touch-up primer.
8. Drywall (Gypsum Board): Prepare all drywall surfaces so that there are no cracks, holes or other physical damage present, nor any chalkiness, insufficiently slaked lime, excessively porous surfaces, crazing, joint compound fins and holidays. Do not apply any paint to plaster or drywall surfaces when the surface moisture, as measured by Painter's Moisture Register - Model 9, exceeds that allowed by the paint manufacturer.

3.04 MATERIALS PREPARATION

Mix and apply paint in compliance with the manufacturer's directions. Thoroughly stir paint materials until the ingredients therein are completely intermixed and, if necessary, strain prior to application. Do not mix any surface film into the paint. If required, use thinners furnished or recommended by the paint manufacturers for the specific materials and application conditions. Do not use thinner in excess of the manufacturer's recommendations. Proportion and prepare catalyzed paints in exact accordance with the manufacturer's directions. Make sure that personnel mixing paint are knowledgeable of the products being mixed.

3.05 APPLICATION

- A. In general, the painting systems specifications indicate the required method of application; brush, roller or spray. Where spray equipment is required, the equipment and application pressures shall conform to the paint manufacturer's recommendations, and shall be subject to acceptance by the Engineer. Where the indicated application method is not feasible or appropriate, obtain the Engineer's acceptance of an alternate method. Bring to the attention of the Engineer all discrepancies between these specifications and manufacturers' instructions and recommendations, and await the Engineer's decision of resolution before proceeding with the work in question. Where more than one method of application is given, use the method recommended by the manufacturer for the particular application.
- B. Use only tools and equipment which are suitable, clean, in good condition, and recommended by the paint manufacturer. Spray equipment shall produce proper

atomization and leave a satisfactory film on the surface. Do not leave brushes and rollers to harden before cleaning. Do not use paint mitts.

- C. Apply paint as necessary to produce tough, durable and well-bonded films that will provide long-term protective performance and satisfactory appearance. Apply paint to produce a uniform thickness, free of defects such as pinholes, holidays, skips, missed areas, blistering, runs, sags, wrinkles, excessive film build-up, lack of film build-up, uneven film thickness, bubbles, cratering, cracking, crazing, poor adhesion, delamination, lifting, peeling, dry spray, overspray, excessively thinned coatings, contaminated coatings, flattening, orange peel, brush marks, solvent traps, and embedded dust and dirt.
- D. Do not apply paint to a surface that has not been properly prepared, nor when the ambient and surface conditions are not satisfactory. Do not apply paint at humidities and temperatures that will cause blistering, porosity or be otherwise detrimental to the performance and life of the paint. Provide suitable air and surface thermometers, sling psychrometers, etc., at the jobsite as are essential for the work to monitor temperature and humidity conditions.
- E. As paint application is in progress, check each coating frequently by means of suitable wet film thickness gauge to achieve the proper dry film thickness, taking in to account theoretical coverage versus actual coverage, as well as solvent loss.
- F. Strictly adhere to the manufacturers' recoat time. Do not apply paint over undercoats which have not properly cured. Conversely, adequately and properly prepare surfaces of paints which have cured past their critical recoat time. Before painting, prepare and repair undercoats deteriorated from long exposure to the weather or other adverse conditions.
- G. Use the cross-spray technique to insure uniform coverage, free of defects and missed areas. "Stripe paint" sharp edges to ensure proper build-up at the edges, prior to the application of the specified number of coats.
- H. Do not force dry paint.
- I. Protect newly painted surfaces from rain, condensation, dirt, debris, and other contamination until paint has cured.
- J. Apply additional top coats when undercoats, stains and other conditions show through the final coat. Take care to insure that all surfaces, including edges, corners, crevices, welds, exposed fasteners, etc., receive a dry film thickness equivalent to that of flat surfaces. To insure this, stripe or spot paint such areas first and then recoat as the remainder of the surface is being painted.
- K. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.

- L. Paint interior surfaces of ducts that are visible through registers and grilles with an appropriate flat finish black paint.
- M. Paint the back and sides of access panels and removable and hinged covers to match the exposed surfaces.
- N. Finish tops and edges of exterior doors the same as the "pull" side faces.
- O. Sand lightly between coats if recommended by the manufacturer.
- P. If the dry film thickness at any of the inspection times is less than specified, apply an additional coat of the material specified, or increase the film thickness of the succeeding coat or coats, at the discretion of the Engineer, as required to ensure that the specified total dry film thickness for the finished work is obtained. Conceal all brush marks, laps, and joints between successive work days.
- Q. Scheduling Painting:
 - 1. Before applying paint, remove all dust, grit, loose rust particles, dirt, etc., from surfaces by vacuuming or blowing off with dry, oil-free air, as appropriate for the application.
 - 2. Apply paint as soon as possible after the surfaces have been cleaned, pretreated, or otherwise prepared for painting, and before subsequent surface deterioration.
 - 3. Allow sufficient time between coats to permit proper drying.

3.06 RETOUCHING

- A. Touch-up all work painted under this Contract which, for any reason, has been damaged during construction work.
- B. It is required that all finish work have acceptable surfaces when the building is ready for acceptance by the Engineer.

3.07 CLEAN-UP AND PROTECTION

- A. Upon completion of painting work, clean all paint-spattered surfaces. Remove spattered paint by approved methods, using care not to scratch or otherwise damage finished surfaces.
- B. Correct all damage caused by cleaning, repairing, replacing, and repainting, as acceptable to the Engineer.
- C. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.08 "AS-BUILT" RECORD

Submit, for record purposes, a finish paint schedule for each area and surface receiving "painter's finish", indicating actual paints applied, including manufacturer, type, gloss, color blend, etc.

3.09 GUARANTEE

Give the Authority a written guarantee that the materials and workmanship are of the highest quality and that the paint will not discolor, fade, peel, chalk, craze, chip, alligator, etc., and that any work which becomes defective within one (1) year of acceptance of the work will be promptly made good by the Contractor to the satisfaction of the Authority without cost.

3.10 PAINT SYSTEMS AND SCHEDULE

A. The following paragraphs list the various paint systems to be used for the work, and most of the major items and surfaces requiring painting. The mention of specific items and surfaces to be painted shall not be construed as limiting the total number of items and surfaces that are to be painted. The intent of this section is to have all items and surfaces painted as specified for other materials in the same environment, except for those items which are specifically excluded.

B. Systems

1. System A(1) - (Gloss Alkyd)

- a. Surface Preparation: For bare metal, alkaline clean, Power Tool Clean and solvent clean in accordance with SSPC SP-3 and SSPC-SP-1.
- b. Touch-up: Prepare damaged galvanizing with ZRC Cold Galvanizing Compound or equal and prime all galvanizing with Tnemec 151-1051 Elasto-Grip.
- c. Prime Coat: Prime touch-up areas and bare metal with Tnemec Series v10 Rust Inhibitive Primer.
- d. Finish Coat: Two coats of Tnemec Series 2H Hi-Build Tneme-Gloss Alkyd Enamel; 2.5 to 3.5 dry mils each coat (spray, brush or roller applied).

2. System A(2) - (Semi-Gloss Alkyd)

- a. Surface Preparation: For bare metal, alkaline clean, Power Tool Clean and solvent clean in accordance with SSPC SP-3 and SSPC-SP-1.
- b. Touch-up: Prepare damaged shop primer and galvanizing in accordance with touch-up specifications.

- c. Prime Coat: Prime touch-up areas and bare metal with Benjamin Moore Corotech Acrylic Metal Primer (V110).. Repair damaged galvanizing with ZRC Cold Galvanizing Compound or equal, and prime all galvanizing with Benjamin Moore Galvanized Metal Primer (155).
 - d. Finish Coats: Two (2) coats of Benjamin Moore Super Spec Oil Semi-Gloss DMT (P24); 1.5 dry mils for each coat (spray, brush or roller applied).
3. System B - Concrete Masonry Units (Satin Alkyd)
- a. Surface Preparation: Prepare surfaces in accordance with specifications for masonry and concrete.
 - b. Prime Coat: Benjamin Moore Moorcraft Super Craft Latex Block Filler (285) or equal, applied as necessary to produce a smooth, dense surface.
 - c. Finish Coats: Two (2) coats of Benjamin Moore Advance Satin Waterborne Alkyd (0792); 1.5 dry mils for each coat (spray, brush or roller applied).
4. System C - Drywall (Low-Sheen Latex)
- a. Surface Preparation: Prepare surfaces in accordance with the specifications for drywall.
 - b. Prime Coat: Benjamin Moore Ultra Spec Interior Latex Primer (N534); 1 dry mil (spray, brush or roller applied).
 - c. Finish Coats: Two (2) coats of Benjamin Moore Ultra Spec Interior Latex Flat (N536); 1.5 dry mils for each coat (spray, brush or roller applied).
5. System D - Drywall (Satin Alkyd)
- a. Surface Preparation: Prepare surfaces in accordance with the specifications for drywall.
 - b. Prime Coat: Benjamin Moore Ultra Spec Interior Latex Primer (N534); 1 dry mil (spray, brush or roller applied).
 - c. Finish Coats: Two (2) coats of Benjamin Moore Advance Satin Waterborne Alkyd (0792); 1.5 dry mils for each coat (spray, brush or roller applied).
6. System E – Wood, PVC and Plywood - Painted Finish (Satin Alkyd):
- a. Surface Preparation: Prepare surfaces in accordance with specifications for wood surfaces.

- b. Primer Coat: Benjamin Moore PS 5800 INSLX Lock Oil Primer/Sealer Undercoater; 1.5 dry mils (spray, brush or roller applied).
 - c. Finish Coats: Two (2) coats of Benjamin Moore Advance Satin Waterborne Alkyd (0792); 1.5 dry mils for each coat (spray, brush or roller applied).
8. System F - Concrete Floors (Epoxy):
- a. Surface Preparation: In accordance with finish system manufacturer's instructions, which may include brush blasting concrete floors to provide a dense 2 mil anchor profile. Acid surface etching will also be allowed.
 - b. Prime Coat: Benjamin Moore I.M.C Epoxy-Ester Enamel (M25) applied at a rate of 550 square feet per gallon.
 - c. Finish Coat: Same as prime coat except add and thoroughly mix dry, washed, 50 mesh silica sand to paint as directed by the Engineer to produce a satisfactory slip-resistant surface.

C. Mechanical and Electrical Work:

Except for manufacturer painted items, paint all exposed mechanical and fire protection piping, valves, fittings, traps, conduit, miscellaneous fittings and boxes, pipe and duct insulation, steel hangers and attachments, floor, ceiling and wall plates (except those which are plated), ducts, diffusers, grilles, supports, clamps, straps, etc., in rooms and spaces designated to be finish painted. Painting systems shall be based on the surface and its environment, as approved by the Resident.

D. Equipment:

In general, switchboards, disconnect switches, motors, light and power panels, etc., will be completely shop finished by the manufacturers. All equipment shall be touched-up by the installer where finish is damaged during installation.

3.11 PAINTING SCHEDULE

SURFACE	SYSTEM
A. Interior	
1. Concrete and Concrete Masonry Unit Walls	B
2. Concrete Floors (including equipment pads)	F
3. Metals	

- a. Steel Doors and Steel Frames A (2)
 - b. Exposed Conduit, Light Fixture Pendants, Pipe, etc. A (2)
- 4. Gypsum Wallboard
 - a. Walls D
 - b. Exposed Ceilings C
- 5. Wood and PVC
 - a. Standing and Running Trim E
 - b. Shelves E
- B. Exterior
 - 1. Metal
 - a. Steel Doors and Frames A(1)
 - b. Bollards A(1)
 - c. Structural Steel for Canopy (Exposed) A(1)
 - 2. PVC
 - a. Trim E
 - b. Soffit E
 - c. Back-priming (fascia backup-panels, trim, etc.) E (primer only)
- C. In general, miscellaneous brackets, angles, plates, etc., shall receive the same finish coats as the items to which they are associated. Surface preparation and prime coats shall be as specified for similar materials in the same space/environment or as otherwise directed by the Engineer.
- D. In general, ductwork, piping and conduit running exposed on walls and ceilings (including attachment devices, supports, accessories, etc.) shall receive the same type finish coat as adjacent surfaces. Surface preparation and prime coats shall be as specified for similar materials in the same space/environment or as otherwise directed by the Engineer.

END OF SECTION

Section 101423

ROOM IDENTIFICATION SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes room-identification signs that are directly attached to the building.

1.3 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For room-identification signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, including raised characters and Braille, and layout for each sign at least half size.
- C. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- D. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and manufacturer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design", the ABA standards of the Federal agency having jurisdiction, and ICC A117.1.

2.2 ROOM-IDENTIFICATION SIGNS

- A. Room-Identification Sign: Sign with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allen Industries Architectural Signage.
 - b. APCO Graphics, Inc.
 - c. ASE, Inc.
 - d. ASI Sign Systems, Inc.
 - e. Best Sign Systems, Inc.
 - f. InPro Corporation (IPC).
 - g. Mohawk Sign Systems.
 - h. Signature Signs, Inc.

- i. Vomar Products, Inc.
 - j. Welch Signs, LLC
2. Laminated-Sheet Sign: Photopolymer face sheet with raised graphics laminated over subsurface graphics to acrylic or phenolic backing sheet to produce composite sheet.
 - a. Composite-Sheet Thickness: Manufacturer's standard for size of sign.
 - b. Surface-Applied Graphics: Applied paint.
 - c. Color(s): As selected by Architect from manufacturer's full range.
 3. Sign-Panel Perimeter: Finish edges smooth.
 - a. Edge Condition: Bullnosed.
 - b. Corner Condition in Elevation: Rounded to radius.
 4. Mounting: Surface mounted to wall with hook-and-loop tape.
 5. Text and Typeface: Accessible raised characters and Braille; typeface as selected by Architect from manufacturer's full range. Finish raised characters to contrast with background color, and finish Braille to match background color.

2.3 SIGN MATERIALS

- A. Acrylic Sheet: ASTM D 4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- B. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
- B. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
 1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 - 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Accessibility: Install signs in locations on walls according to the accessibility standard.
- C. Mounting Methods:
 - 1. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips 0.250 inch away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10142

SECTION 102800TOILET, BATH AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

The work in this section consists of furnishing all materials, equipment, supplies, labor and supervision, and performing all operations required to install all toilet accessories as shown on the Drawings, as specified herein, and as is additionally required to properly complete the work.

1.03 SUBMITTALS

Submit eight (8) copies of manufacturers' product data for approval. Product data shall indicate all materials, dimensions, gauges of steel, assembly, hardware and finishes.

PART 2 - MATERIALS

2.01 TOILET ACCESSORIES

- A. All toilet accessories shall be as manufactured by Bobrick Washroom Equipment Inc., Bradley Corp., or ASI.

Catalog numbers listed below are for Bobrick Products.

Mirror	B-290-2436
Sanitary Disposal Unit	B-270
Wall Shelf	B-295 x 16
Soap Dispenser with Shelf	Furnished by MTA, Install by GC
Paper Towel Dispenser	Furnished by MTA, Install by GC
Waste Receptacle	Furnished by MTA, Install by GC
Toilet Roll Holders	Furnished by MTA, Install by GC

- B. Grab Bars: Grab bars shall be satin finish stainless steel, 1 1/2 inch diameter, of the lengths shown, with concealed mounting flanges, and mounting flange cover plate with four set screws for securing. Bars shall be equal to Bobrick Products B 5806x18, B 5806x36 & B 5806x42.

- C. Obtain all toilet accessories from a single manufacturer.
- D. Mop Hanger: Mop hanger shall be 24 inches long, 3 inches wide stainless steel with three (3) rubber tool grips equal to Catalog No. 889-CC as manufactured by Crane Plumbing and Fiat Products, or equal by Florestone or E.L. Mustee & Sons, Inc.

PART 3 - EXECUTION

3.01 INSTALLATION

Install accessories where shown on the Drawings, in accordance with the manufacturer's approved instructions.

END OF SECTION

SECTION 104416

FIRE EXTINGUISHERS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

The work in this section consists of furnishing all materials, equipment, transportation, labor and supervision, and performing all operations required to install all fire extinguishers and mounting brackets as shown on the Drawings, as specified herein, and as is additionally required to properly complete the work.

1.03 SUBMITTALS

Submit copies of material brochures and installation instructions and details for approval.

1.04 GENERAL

- A. Provide fire extinguishers, mounting brackets, and accessories manufactured by the same company.
- B. Provide fire extinguishers which are U.L. listed and bear U.L. "Listing Mark" for type, rating and classification of extinguisher indicated. All fire extinguishers shall be rechargeable.

PART 2 - MATERIALS

2.01 PRODUCTS

- A. Unless otherwise indicated, the fire extinguishers, brackets and accessories are as manufactured by J. L. Industries. Equivalent models manufactured by Ansul Co. or Walter Kidde and Co. are also acceptable.
- B. Fire extinguishers shall be multi-purpose 10 lb. dry chemical for A, B & C fires, complete with an accurate pressure safety gauge, Model Cosmic 10E with Bracket No. MB 846. Refer to the Drawings for locations.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install brackets and extinguishers in the locations indicated on the Drawings at mounting heights to comply with applicable regulations of governing authorities.
- B. Securely fasten mounting brackets to structure, with proper reinforcement, square and plumb, to comply with manufacturer's approved installation instructions.
- C. Check extinguishers for proper charge operations. Remove and replace damaged, defective and undercharged units.

END OF SECTION

SECTION 105113

METAL LOCKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Knocked-down lockers.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of metal locker.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.
- B. Shop Drawings: For metal lockers.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - 2. Show locker trim and accessories.
 - 3. Include locker identification system and numbering sequence.
- C. Samples: For each color specified, in manufacturer's standard size.
- D. Samples for Initial Selection: Match Owner's existing building custom color.
- E. Product Schedule: For lockers.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.9 COORDINATION

- A. Coordinate sizes and locations of wood bases for metal lockers.
- B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.10 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures.
 - b. Faulty operation of latches and other door hardware.
 - 2. Damage from deliberate destruction and vandalism is excluded.
 - 3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain metal lockers, locker benches, and accessories from single source from single locker manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.3 KNOCKED-DOWN TWO-TIER CORRIDOR LOCKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. ASI Storage Solutions; ASI Group.
 2. Lyon Workspace Products, LLC.
 3. Penco Products, Inc.
 4. Republic Storage Systems, LLC.
- B. Doors: One piece; fabricated from 16 gauge nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.
1. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch nominal-thickness steel sheet; welded to inner face of doors.
 2. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed, of die-formed metal with full perimeter flange and sound-dampening material; welded to inner face of doors.
 3. Door Style: Unperforated panel.
- C. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated steel sheet with thicknesses as follows:
1. Tops, Bottoms, and Intermediate Dividers: 24-gauge nominal thickness, with single bend at sides.
 2. Backs and Sides: 24-gauge nominal thickness, with full-height, double-flanged connections.
 3. Shelves: 24-gauge nominal thickness, with double bend at front and single bend at sides and back.
- D. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral, full-height door strikes on vertical main frames.
1. Cross Frames between Tiers: Channel formed and fabricated from same material as main frames; welded to vertical main frames.
 2. Frame Vents: Fabricate face frames with vents.
- E. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.
1. Continuous Hinges: Manufacturer's standard, steel, full height.
- F. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond door face; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks.
 - a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
 - b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.
 - G. Door Handle and Latch for Lockers: Stainless-steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.
 - H. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum plates, with numbers and letters at least 3/8 inch high.
 - I. Hooks: Manufacturer's standard ball-pointed type hooks, aluminum or steel; zinc plated.
 - J. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet.
 1. Closures: Vertical-end type.
 - K. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
 - L. Materials:
 1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
 - M. Finish: Baked enamel or powder coat.
 1. Exterior Color: As selected from Manufacturer's standard colors by the Architect.
 2. Interior Color: Standard "Decorator Tan".
 - N. Size: Lockers shall be 12" W by 18" D by 36" H each; Full Height for double-tier.
- 2.4 FABRICATION
- A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
 1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
 2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

- B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.
- C. Equipment: Provide each locker with an identification plate and the following equipment:
 - 1. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
 - 2. Coat Rods: For each compartment of each locker.
- D. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site.
- E. Accessible Lockers: Fabricate as follows:
 - 1. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
- F. Continuous Base: Field fabricate wood-framed base. Finish with vinyl cove base in color as selected by the Architect.
- G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

2.5 ACCESSORIES

- A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.
- B. Anchors: Material, type, and size required for secure anchorage to each substrate.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
 - 1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches (910 mm) o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
 - 2. Anchor single rows of metal lockers to walls near top and bottom of lockers.

3. Anchor back-to-back metal lockers to floor.
- B. Knocked-Down Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.
- C. Equipment:
 1. Attach hooks with at least two fasteners.
 2. Attach door locks on doors using security-type fasteners.
 3. Identification Plates: Identify metal lockers.
 - a. Attach plates to each locker door in combination lock recessed pull to match Owner's existing building lockers.
- D. Trim: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.
 1. Attach filler panels with concealed fasteners.

3.3 ADJUSTING

- A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

3.4 PROTECTION

- A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.
- B. Touch up marred finishes or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113

SECTION 113100

RESIDENTIAL APPLIANCES

PART 1 - DESCRIPTION

1.01 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.02 DESCRIPTION

The work in this section consists of furnishing all materials, equipment, supplies, transportation, and performing all operations required to install complete, in-place, kitchen equipment as shown on the drawings, as specified herein and as is additionally required to properly complete the work.

1.03 SHOP DRAWINGS

Submit eight (8) copies of shop drawings showing all details of equipment specified along with installation instructions and operations manuals.

PART 2 - MATERIALS

2.01 KITCHEN EQUIPMENT

- A. Provide the following appliances:
 - 1. Refrigerator with Icemaker: General Electric Model no. GTS18GTNRWW
 - a. Size: 17.5 cu. ft.
 - b. Color: White
 - c. IM4D ready (for Icemaker)
 - 2. Microwave Oven: General Electric Model no. JES1460DSWW
 - a. Size: 1.4 cu. ft.
 - b. Color: White
- B. The Contractor shall provide the Authority with a full one year warranty on the kitchen equipment.

PART 3 – INSTALLATION

3.01 INSTALLATION

- A. General: Comply with manufacturer's instructions and recommendations.
- B. Built-In Equipment: Securely anchor units to supporting cabinetry or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and rough openings are completely concealed.
- C. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate for proper appliance operation.
- D. Utilities: Refer to Divisions 22 and 26 for plumbing and electrical requirements.

3.02 ADJUST AND CLEAN

- A. Testing: Test each item of equipment to verify proper operation. Make any necessary adjustments to ensure proper operations.
- B. Run two (2) cycles of Icemaker prior to Substantial Completion. Provide photographs of ice cube bin with ice cubes.

END OF SECTION

SECTION 123216MANUFACTURED PLASTIC-LAMINATE-FACED CABINETS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. Examine Drawings, Contract Conditions all other Sections of the Specifications for requirements which affect work of this Section whether or not such work is specifically mentioned in this Section.
- B. Coordinate work with that of all other trades affecting, or affected by work of this Section. Cooperate with such trades to assure the steady progress of all Project work.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Plastic-laminate-faced kitchen cabinets.
 - 2. Plastic-laminate countertops.
 - 3. Plastic-laminate worksurfaces and supports.
 - 4. Shelving and supports.

1.3 DEFINITIONS

- A. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including visible surfaces in open cabinets or behind glass doors.
- B. Semiexposed Surfaces of Casework: Surfaces behind opaque doors or drawer fronts, including interior faces of doors and interiors and sides of drawers. Bottoms of wall cabinets are defined as "semiexposed."
- C. Concealed Surfaces of Casework: Surfaces not usually visible after installation, including sleepers, web frames, dust panels, bottoms of drawers, and ends of cabinets installed directly against and completely concealed by walls or other cabinets. Tops of wall cabinets and utility cabinets are defined as "concealed."

1.4 SUBMITTALS

- A. Product Data: For the following:
 - 1. Cabinets.
 - 2. Plastic-laminate countertops and worksurfaces.

3. Shelving.
 4. Cabinet hardware.
 5. Shelving hardware.
 6. Worksurface supports.
- B. Shop Drawings: For cabinets, countertops, worksurfaces, and shelving. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, cutouts for plumbing fixtures, and methods of joining countertops. Show details for worksurface and shelving supports.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available for each type of material exposed to view.
- D. Product Certificates: Signed by manufacturers of casework certifying that products furnished comply with requirements.

1.5 QUALITY ASSURANCE

- A. Source Limitations for Cabinets: Obtain cabinets through one source from a single manufacturer.
- B. Quality Standards: Unless otherwise indicated, comply with the following standards:
1. Cabinets: KCMA A161.1.
 - a. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with the above standard.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install kitchen casework until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Established Dimensions: Where kitchen casework is indicated to fit to other construction, establish dimensions for areas where casework is to fit. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Provide fillers and scribes to allow for trimming and fitting.

- C. Field Measurements: Where kitchen casework is indicated to fit to existing construction, verify dimensions of existing construction by field measurements before fabrication and indicate measurements on Shop Drawings. Provide fillers and scribes if necessary.
- D. Field Measurements for Countertops: Verify dimensions of countertops by field measurements after base cabinets are installed but before countertop fabrication is complete. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.7 COORDINATION

- A. Coordinate layout and installation of blocking and reinforcement in partitions for support of kitchen casework.

PART 2 – PRODUCTS

6.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cabinets: Similar to “Glencoe Square” by Merillat Industries LLC.
 - 2. Plastic Laminate for Countertops:
 - a. Formica Corp.
 - b. Laminart.
 - c. Nevamar Corp.
 - d. Westinghouse Electric Corp.; Specialty Products Div.
 - f. Wilsonart: Ralph Wilson Plastics Co.

6.2 COLORS, TEXTURES, AND PATTERNS

- A. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range for these characteristics.

2.3 CABINET MATERIALS

- A. Exposed Materials: Comply with the following:

1. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3, Grade VGS.

- a. Where edges of solid-color plastic-laminate sheets will be visible after fabrication, provide through-color plastic laminate.

B. Semiexposed Materials: Unless otherwise indicated, provide the following:

1. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3, Grade VGS.

2.4 COUNTERTOP MATERIALS

A. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.

1. Grade: HGS.
2. Grade: HGP.
3. Provide through-color plastic laminate.
4. Grade for Backer Sheet: BKL.

2.5 CASEWORK HARDWARE

A. General: Manufacturer's standard units complying with BHMA A156.9, of type, material, size, and finish as selected from manufacturer's standard choices.

B. Hinges: Concealed European-style hinges.

C. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05091.

D. Pulls: Manufacturer's standard metal wire pulls in brushed satin finish.

2.6 CABINET CONSTRUCTION

A. Face Style: Flush overlay; door and drawer faces cover cabinet body members or face frames with only enough space between faces for operating clearance.

B. Face Frames: Frameless.

C. Door and Drawer Fronts: 1/2-inch-thick particleboard with plastic-laminate faces, backs, and edges. Provide same grade, pattern, color, and texture of plastic laminate for backs and edges as for faces.

D. Exposed Cabinet Ends: Plastic-laminate-faced particleboard.

- E. Cabinet Tops and Bottoms: 5/8-inch-thick particleboard or 1/2-inch-thick plywood, fully supported by and secured in rabbets in end panels, front frame, and back rail.
- F. Back, Top, and Bottom Rails: 3/4-by-2-1/2-inch solid wood, interlocking with end panels and rabbeted to receive top and bottom panels. Back rails secured under pressure with glue and with mechanical fasteners.
- G. Wall-Hung Unit Back Panels: 3/16-inch-thick plywood fastened to rear edge of end panels and to top and bottom rails.
- H. Base Unit Back Panels: 3/16-inch-thick plywood fastened to rear edge of end panels and to top and bottom rails.
- I. Front Frame Drawer Rails: 3/4-by-1-1/4-inch solid wood mortised and fastened into face frame.
- J. Drawers: Fabricate with exposed fronts fastened to subfront with mounting screws from interior of body.
- K. Shelves: 3/4-inch-thick laminate clad particleboard or 5/8-inch-thick laminate clad plywood.
- L. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.
- M. Factory Finishing: To greatest extent possible, finish casework at factory. Defer only final touchup until after installation.

2.7 PLASTIC-LAMINATE COUNTERTOPS AND WORKSURFACES

- A. Configuration: Provide post-formed countertops at kitchen casework locations. Provide square edge countertops at work surface locations.
- B. Plastic-Laminate Substrate: Particleboard not less than 3/4 inch thick.
 - 1. For countertops at sinks and lavatories, use phenolic-resin particleboard or exterior-grade plywood.
 - 2. Build up countertop thickness to 1-1/2 inches at front, back, and ends with additional layers of particleboard laminated to top.
- C. Backer Sheet: Provide plastic-laminate backer sheet on underside of countertop substrate.

2.8 SHELVING

- A. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.
 - 1. Color: White.
- B. Closet and Utility Shelving: Made from the following material, 3/4 inch thick.
 - 1. Melamine-faced particleboard.
- C. Standards for Adjustable Shelf Brackets: BHMA A156.9, B04102; powder-coat-finished steel; similar to Knape & Vogt #85 Series Heavy Duty steel vertical standards. Color shall be white.
- D. Adjustable Shelf Brackets: BHMA A156.9, B04112; powder-coat-finished steel; similar to Knape & Vogt #185 Series Heavy Duty full shelf depth bracket. Color shall be white.

2.9 WORKSURFACE SUPPORTS

- A. Support Brackets for Surfaces: A & M Hardware, Inc pre-finished support bracket; white; size as required to support 300 lbs. per linear foot of worksurface for the depth indicated.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install casework with no variations in flushness of adjoining surfaces; use concealed shims. Where casework abuts other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match casework face.
- B. Install casework without distortion so doors and drawers fit openings and are aligned. Complete installation of hardware and accessories as indicated.
- C. Install casework and countertop level and plumb to a tolerance of 1/8 inch in 8 feet.
- D. Fasten cabinets to adjacent units and to backing.
- E. Fasten plastic-laminate countertops by screwing through corner blocks of base units into underside of countertop. Form seams using splines to align adjacent surfaces, and secure with glue and concealed clamping devices designed for this purpose.
- F. Install shelving, shelving supports, worksurfaces, and surface supports in accordance with the manufacturer's written instructions and as indicated.

3.2 ADJUSTING AND CLEANING

- A. Adjust casework and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.
- B. Clean casework on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas. Protect finishes from damage and other causes during construction.

END OF SECTION

SECTION 220000 - PLUMBING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings, Addenda, General Provisions of Contract, including General and Supplementary conditions and General Requirements apply to work specified in this Section.

1.2 DEFINITIONS

- A. ADA: Designed to meet the requirements of the Americans with Disabilities Act.
- B. Adaptable: Designed so in the future it can be easily adapted to meet most of the essential requirements of the Americans with Disabilities Act with minor additions and adjustments, such as change of height of counter or addition of a lift seat.
- C. Concealed: Shall mean in walls, in chases, above ceilings, within enclosed cabinets, otherwise enclosed.
- D. Equal: Shall mean essentially the same as that product specified, but a model of a different manufacturer
- E. Exposed: Shall mean in finished spaces, in closets, under counters, behind and/or under equipment and/or otherwise visible.
- F. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- G. Materials: Shall mean any product used in the construction, including but not limited to: fixtures, equipment, piping and supplies.
- H. Others: Shall mean provided by sections other than this section. If not purposely assumed by another section, shall be provided by the Contractor.
- I. Piping: Shall mean pipe, fittings, hangers and valves.
- J. Provide: Shall mean the furnishing and installing of materials.
- K. Reviewed equal: Shall mean that the Architect or a designated Consultant, not the contractor, shall make final determination whether materials are an equal to that which is specified.
- L. Substitution: Shall mean of materials of significantly different physical, structural or electrical requirements, performance, dimensions, function, maintenance, quality or durability, than that specified.

1.4 DESCRIPTION OF WORK

A. Work Included

1. Furnish all labor, materials, equipment, transportation, and perform all operations to install complete plumbing systems in the building, in accordance with these specifications and applicable drawings.
2. Provide the following:
 - a. Sanitary, waste and vent systems.
 - b. Domestic hot and cold water system.
 - c. Pipe, valve and fittings
 - d. Water specialties
 - e. Drainage specialties
 - f. Electric water heater
 - g.. Plumbing fixtures and accessories
 - h. Insulation
 - i. Installation and/or connections to fixtures/equipment provided by others.
 - j. Gas piping, drain and vent piping in Tool Booths
3. Specifications and accompanying drawings do not indicate every detail of pipe, valves, fittings, hangers, fixtures and equipment necessary for complete installation; but are provided to show general arrangement and extent of work to be performed.

1.5 PERMITS

- A. This Contractor shall be responsible for providing and filing all Plans, Specifications and other documents, pay all requisite fees and secure all permits, inspections and approvals necessary for the legal installation and operation of the systems and/or equipment furnished under this Section of the Specifications.
- B. The Contractor shall frame under glass/ clear plastic all permits, secured by him, adjacent to the respective system and/or equipment and required to be displayed by Code, law or ordinance. Those permits secured but not required to be displayed shall be laminated in plastic and included in the Owner's maintenance manual.

1.6 CODES AND ORDINANCES

- A. All work performed under this Section of the Specifications shall be done in accordance with applicable Federal Laws, Maine State Laws, Maine State Plumbing Code, Subsurface Wastewater Disposal Rules, and local plumbing codes and ordinances. The following standards are also to be followed when applicable:

ADA	Americans With Disabilities Act
ANSI	American National Standards Institute
ASHRAE Engineers	American Society of Heating, Refrigeration and Air Conditioning
ASTM	American Society for Testing and Materials
NFPA	National Fire Protection Association (a.k.a. NFC, National Fire code)
NEMA	National Electrical Manufacturer's Association

OSHA Occupational Safety and Health Act
 UL Underwriter's Laboratories

- B. If an obsolete code section or standard is specified, the latest replacement issue of each Code or standard for the application, in effect at the time of bidding, shall be used. Code requirements are the minimum quality and/or performance acceptable. Where the Specifications and/or Drawings indicate more stringent requirements, these requirements shall govern.

1.7 QUALITY ASSURANCE

- A. Use sufficient qualified workmen and competent supervisors in execution of this portion of the work to ensure proper and adequate installation of the system throughout. Work performed shall conform to manufacturers' recommendations, good standard practice and industry standards.
- B. Any work deemed unacceptable by the Engineer, Architect or Clerk of the Works shall be redone correctly, at no additional cost to the owner.

1.8 ELECTRONIC DRAWINGS AND FILE SHARING

Plans and specifications may be made available in electronic format on request. Plans may be provided in either Adobe (.pdf) or CAD (.dwg or .dxf) formats and will be compressed using WinZip (.zip format). Recipient is responsible to obtain the necessary software to open the files. Note: CAD drawings will be made available to successful bidders only after a contract is awarded.

CAD drawings are produced with AutoCAD 2006 and may be provided in either the 2000 or 2004 file formats. Upon request for CAD files a release form will be provided which must be signed and returned to the Engineer prior to transmission of electronic files. Physical mailing address, telephone numbers and e-mail address for this office are indicated on each drawing. A signed release will not be required for Adobe based files.

All contract documents are copyrighted material. No portion of materials may be reproduced or duplicated except as indicated in the release form. Where release forms are not required (Adobe based files), materials may be printed for use by the intended recipient only and may not be reproduced or copied in any other manner unless written permission is obtained.

1.9 MATERIALS

All materials and equipment shall be new and of the latest design of respective manufacturers. All materials and equipment of the same classification shall be the product of the same manufacturer, unless specified otherwise.

1.3 SUBSTITUTIONS

See Section 15000, "Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section shall be achieved before reading the PRODUCTS section of this specification.

1.10 PLANS AND SPECIFICATIONS FOR SUPPLIERS

This Contractor shall provide his Suppliers, and any related subcontractors, with a copy of the

specification pages, and letter sized photocopies of equipment details and schedules, that pertain to the item to be supplied.

1.11 SHOP DRAWINGS & SUBMITTALS

- A. As soon as possible after award of Contract (but not longer than 21 calendar days), before any material or equipment is purchased, Plumbing Contractor shall submit to the Architect no less than ten (10) copies of shop drawings for approval. If shop drawings are not submitted within the allotted time frame all substitutions included the late shop drawings will be invalid and the equipment specified must be provided. Any costs resulting from delays in the project schedule due to failure to submit shop drawings related to this section in a timely manner shall be the responsibility of the Plumbing Contractor.
- B. Each item shall be properly identified, preferably by fixture/equipment tag number (such as WC-3), and shall describe in detail the material and equipment to be provided, including all dimensional data, performance data, pump curves, computer selection print-outs, etc. Capacities indicated are minimums. Equipment submitted with capacities below specified parameters will be refused.
- C. Corrections or comments made on the shop drawings do not relieve the contractor from compliance with requirements of the drawings and specifications. Shop drawing review is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions, selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades and performing his work in a safe and satisfactory manner.
- D. Should any materials or products be purchased and/or installed without prior review and comment the contractor shall be required to remove or replace those products and/or materials if directed by the Architect at his own expense. If the materials are not removed (or replaced) or if the project is delayed as a result the Architect reserves the right to order the withholding of payment until the situation is resolved in a manner satisfactory to the Architect.
- E. Shop drawings for sections 15400, 15600 and 15710 shall be submitted under separate cover or they will be refused for re-submittal. In order to maintain consistency, submittals shall be identified by job title, specification section and paragraph number. Electronic files shall be identified in the same manner (Leonardlake-15400-2.01-E.pdf for instance). Items under each paragraph may be combined into one submittal but do not combine items from multiple paragraphs. For instance, do not combine items specified under par 2.01 with items specified under par. 2.02.
- F. It is desirable for shop drawings to be submitted electronically, including all documentation outlined in paragraph "A" above. Hard copies of shop drawings must be original documents or good quality photocopies of original documents (photocopies of color samples are not acceptable). Faxed copies of submittal sheets will be refused.
- G. Review must be obtained on all items specified in Section 2 Products or shown on the drawing, and any significant items implied or otherwise required but not specified.
- H. Format

1. Related items shall be stapled or Bound together as a package. The number of copies of each package shall be as listed above. Examples of packages of related items include:
 - a. Hangers and Supports
 - b. Identification
 - c. Insulation
 - d. Valves
 - e. Piping
 - f. Plumbing Fixtures with accessories
 - g. Drainage Specialties
 - h. Water Specialties

1.12 PRODUCT HANDLING

Use all means necessary to protect materials before, during and after installation, and to protect the installed work and materials of all other trades. In the event of damage, immediately make all repairs and replacements necessary to the approval of the Architect at no additional cost to the Owner.

1.13 AS-BUILT DRAWINGS

Keep in good condition at the job, apart from all other prints used in actual construction, one complete set of all blueprints furnished for this job. On this special set of blueprints, record *completely and accurately* all differences between the work as actually installed and the design as shown on the drawings. These record prints must be kept up to date by recording all changes within one week of the time that the changes are authorized. At the completion of the work, this set of drawings shall be delivered to the Architect for the Owner electronically in the form of CAD drawings. If a complete record of changes is not made and electronic CAD drawings not provided by the Plumbing Contractor, a record shall be made by the Engineers, and *the cost of the record shall be paid by the Plumbing Contractor*. Copies of the plumbing CAD drawings may be made available electronically to the Contractor if desired. Drawings shall be dated accordingly and clearly identified as "AS-BUILT". Contact the Architect directly or the Engineer via e-mail at mechsyst@maine.rr.com. Specify required CAD format when requesting the files. CAD drawings were generated using AutoCAD 2006 and utilize both paper space and model space with external references to various other drawings. Files will be compressed and will require "WinZip" (<http://www.winzip.com>) for extraction. A release form will be provided which must be signed and returned to the Engineer prior to transfer of files.

1.14 MAINTENANCE MANUAL

On completion of this portion of the work, and as a condition of its acceptance, submit for review two copies of a manual describing the system. Plumbing equipment manuals shall be separate from mechanical manuals. All manuals shall be original copies, not photocopies, or they will be refused for resubmittal. Prepare manuals in durable 3-ring binders approximately 8.1/2" by 11" in size with at least the following:

- A. Project name on the spine and front cover, and identification on the front cover stating the project name, general nature of the manual, and name, address and telephone number of the General and Plumbing Contractors.

- B. Neatly typewritten index.
- C. Complete instructions regarding operation and maintenance of all equipment involved.
- D. Complete nomenclature of all frequently replaceable parts and supplies, their part numbers, and name, address and telephone number of the vendor.
- E. Copy of all guarantees and warranties issued, and dates of expiration.
- F. Shop drawings and equipment/fixtures manufacturer's catalog pages. Clearly indicate the precise item included in this installation and delete, cross out or otherwise clearly indicate, all manufacturers' data with which this installation is not concerned.

1.15 OBJECTIONABLE NOISE AND VIBRATION

All equipment shall operate without objectionable noise and vibration. Should objectionable noise or vibration be transmitted to any occupied part of the building by apparatus or piping, as determined by the Architect, the necessary changes eliminating the noise or vibration shall be made by this Contractor at no extra cost to the Owner.

1.16 GUARANTEE

This Contractor shall guarantee all materials and workmanship furnished by him or his sub-contractors to be free from all defects for a period of no less than one (1) year from date of final acceptance of completed system and shall make good, repair or replace any defective work which may develop within that time at his own expense and without expense to the Owner. Any additional costs required to extend manufacturer's guarantee and warranty for the period specified, shall be included in Contractor's base bid.

1.17 DEVIATIONS, DISCREPANCIES AND OMISSIONS

- A. The drawings are intended to indicate only diagrammatically the intent, extent, general character and approximate locations of plumbing work. Work indicated, but having details obviously omitted, shall be furnished complete to perform the functions intended without additional cost to the Owner. This shall include but not be limited to:
 - 1. All items that are required to meet all applicable codes and referenced standards.
 - 2. Piping for cold and hot water supply, drain, vent, gas, etc to each plumbing fixture/equipment shown on the drawings, or scheduled as required.
 - 3. Shut-off valves on lines feeding individual fixtures without integral stops.
 - 4. Minor single phase electrical wiring, or control wiring, between Plumbing provided items that require it, unless indicated on the Electrical Drawings.
 - 5. Plumbing related items indicated on the drawings of other trades.
 - 6. Items indicated on one plumbing drawing but not shown on a corresponding drawing.

7. Items implied on the plumbing drawings but not shown.
 8. All plumbing related items clearly shown in dark print on the Plumbing drawings but not included in the specification, unless it is noted as being provided by the owner or other contractor or unless other sections assume the responsibility.
- B. The drawings and specifications are complimentary to each other and what is called for in one shall be as binding as if called for by both. In the event of conflicting information on the drawings, or in the specifications, or between drawings and specifications, or between trades, that which is better, best or most stringent shall govern.

1.18 WORKPLACE SAFETY

- A. The Trade Contractor alone shall be responsible for the safety, efficiency and adequacy of his plant, appliances and methods, and for any damage, which may result from their failure of their improper construction, maintenance, or operation.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Unless otherwise indicated, the materials to be furnished under this contract shall be new and the standard products of manufacturers regularly engaged in the production of such equipment, and shall be the manufacturer's latest standard design that complies with the specification requirements.
- B. All materials and equipment of the same classification shall be the product of the same manufacturer, unless specified otherwise. An entire product line may be rejected if one, or more, of the products submitted is not an equal to that specified.
- C. Products manufactured within the United States are preferable, and should be supplied locally (within the State) wherever possible.
- D. Unspecified items shall be by the same manufacturer and level of quality and as similar items specified, whenever possible. Whenever items have no similarity to those specified in this section, provide the equivalent item as specified in other Division 15 Sections. When no similarity exists in other sections, the Contractor shall submit for review an appropriate commercial/institutional quality item, complete to perform the functions intended, using his best discretion. The Architect or a designated Consultant, not the contractor, shall make final determination whether materials are of suitable quality and perform the functions intended.

2.2 HANGERS AND SUPPORTS

- A. General
1. All hangers and supports shall be especially manufactured for that purpose and shall be the pattern, design and capacity required for the location of use.

2. Piping specified herein shall not be supported from piping of other trades.
3. All steel hangers shall be factory painted.
4. Hangers shall be heavy-duty steel adjustable clevis type, plain for steel, cast iron and plastic pipe, and copper plated for piping in direct contact with copper tubing (i.e. copper hot water piping) shall be equal to Carpenter & Paterson Inc., Fig. 100 (Fig. 100CT copper plated).
5. Hangers shall go outside of insulation for domestic water piping. Each hanger shall be furnished with metal shield; Fig. 100 SH.
6. Exposed vertical risers $\frac{3}{4}$ inch and smaller shall be supported at 6 foot intervals between floor and ceiling with split ring type hangers; copper plated for piping in direct contact with copper tubing equal to Carpenter & Paterson Inc., Fig.81 (Fig. 81CT copper plated). ALL PIPING DROPS TO FIXTURES SHALL BE ANCHORED SOLID TO WALL WITH A STEEL SUPPORT BRACKET WITH ADJUSTABLE CLIP, ESPECIALLY PIPING TO FLUSH VALVES
7. Piping suspended from walls and partitions shall be supported by steel support bracket with adjustable clips equal to Carpenter & Paterson Inc., Fig. 69. All attachments to bar joists shall be from top chord.

B. Hanger Rods & Attachments

1. Hanger rods shall be galvanized all thread rod. Rod size shall be as follows:

<u>Pipe Size</u>	<u>Rod Size</u>
3/8" to 2"	3/8"
2.1/2" to 3.1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

2. All nuts for hanger rods and hangers to be galvanized steel.
3. Provide lag points with rod couplings for fastening to wood, toggle bolts in concrete blocks and compound anchor shields and bolts in poured concrete.
4. Provide toggle bolts with rod couplings for fastening in the pre-cast concrete plank decks.
5. Provide and install angle iron supports for pipe hangers in locations as required. Angle iron supports shall be adequate size for span and piping or equipment.
6. Hot and cold water piping at each fixture shall be securely fastened in wall with split ring type hanger fastened to studs within wall.

2.3 SEISMIC RESTRAINT

All seismic restraints shall be in accordance with the International Building Code.

2.4 IDENTIFICATION

- A. Tag each new pump /equipment, and switch with 2½ inches x ¾ inch rectangular engraved nameplates with white letters on black, #2060-20 by Seton Name Plate Corp. or reviewed equals. Nameplates shall be mechanically fastened to equipment (adhesives are not acceptable). Embossed labels are not acceptable.
- B. Identify all new water and drain piping with “Set Mark” snap-around pipe markers by Seton Name Plate Corporation or reviewed equal. Markers shall include both identification and arrows indicating direction of flow. Markers shall be placed on pipe segments 5 feet and longer, and spaced no less than 10 feet apart. Heating hot water piping shall be labeled differently from Domestic hot water piping. On parallel runs of piping, plumbing markers shall be grouped together, and grouped with heating markers whenever practical.

<u>Legend</u>	<u>Background/Letter Color</u>
“Cold Water”	Green/ white letters
“Domestic 120°F Water”	Yellow/ black letters
“Plumbing Vent”	Green/ white letters
“Sanitary Drain”	Green/ white letters

- C. Tag all new valves with Seton #M4506 1½ inch square brass tags and #6 bead chains, stamped with the following identification: “CW”, “HW”, “HWR” or “140HW”. Tag shall be consecutively numbered. DO NOT DUPLICATE EXISTING VALVE IDENTIFICATION NUMBERS. Fixture stops, control valves or valves adjacent to equipment, the use of which is obvious, are not to be tagged.
- D. Provide valve charts identifying valve number, valve identification and service (i.e. Apt. 203, HW). Mount charts in Boiler Room and Mechanical Room in 8½ inch x 10 inch and 8½ inch x 11 inch self-closing aluminum frame with plastic windows. Provide additional copies for maintenance manuals.

2.5 INSULATION

See section 23713

2.6 VALVES

A. General

1. Valves shall be provided as shown and as required to make the installation and its apparatus complete in operation; locate to permit easy operation, replacement and repair.
2. All valves must be so constructed that they may be repacked under pressure while open.
3. Check valves shall be installed in all lines where flow may reverse from intended direction.
4. Valves shall have name and/or trademark of manufacturer as well as working pressure stamped or cast on valve body.

5. Valves shall comply with Manufacturer’s Standards Society (MSS) specifications and be so listed.

B. Types and Manufacturers

All valves shall be of one manufacturer and by one of the manufacturers listed. The following list is provided as a means of identifying the quality and type required.

1. Ball valves 1¼ inches in size and smaller

Shall have bronze bodies, Type 316 stainless steel stems and balls, reinforced Teflon seats and seals, blowout proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Ports shall be “full port”. Rated for 400# WOG and 350°F:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	BA-350S	BA-300S
Apollo	82-200	82-100
Watts	B-6081	B-6080
NIBCO	-----	-----
Hammond	8614	8604

2. Ball valves 1½ inches in size and larger

Shall have bronze bodies, Type 316 stainless steel stems and balls, reinforced Teflon seats and seals, blowout proof stems and adjustable stem gland. Shall be equipped with suitable packing for service intended. Ports shall be “conventional port”. Rated for 400# WOG and 350°F:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Apollo	70-200	70-300
Watts	B-6000-SS	B-6001-SS
NIBCO	S-585-66	T-585-66
Hammond	8514	8503

3. Check Valves 2 inches in size and smaller

Shall be horizontal swing type with bronze body, Teflon disc. Rated for 125# WSP, 200# WOG:

	<u>Soldered Ends</u>	<u>Screwed Ends</u>
Milwaukee	1509-T	509-T
Stockham	B-310-T	B-320-T
NIBCO	S-413-Y	T-413-Y
Hammond	IB945	IB904

4. Drain Valves

Shall be conventional ball valves and provided with hose nipples and threaded metal cap on chain. Watts B-6001-CC or reviewed equal.

2.7 DOMESTIC WATER PIPING

A. Interior Exposed, High temperature and Supportive

1. All exposed piping carrying domestic water, all piping with a temperature above 140 deg. F., all piping supporting inline equipment, and piping within 6 ft of the water heaters, shall be hard-drawn type "L" copper tube with cast or wrought fittings and made up with lead-free solder. Care shall be taken not to over flux.

B. Interior Concealed

All concealed hot (below 141) and cold water piping above finish floor (not buried) shall be one or more of the following:

1. Type L Copper and fittings, all sizes
2. Flowguard Gold CPVC pipe and fittings, all sizes.
3. PEX, sizes 1-1/2" and smaller
 - a. Uponor AquaPEX (PEX-a) (cross linked polyethylene tubing) piping and cold expansion fittings, specifically designed for domestic water. ASTM F 876, Fittings for PEX Tube: ASTM F 1960, insert type and matching PEX tube dimensions. Manifold (if used): Uponor multiple-outlet, corrosion-resistant assembly.
 - b. Piping shall be installed in a neat and orderly manner. No wild spaghetti installations will be tolerated. Piping shall be run straight and parallel, and level or sloped slightly to low points with no droops exceeding 1/16". Use PEX bend supports to keep turns tight and steel channel supports to keep piping supported. Any work that in the opinion of the Architect or Engineer of Record that does not meet these standards will be removed and redone at the Contractor's expense.
 - d. All PEX piping shall be insulated as indicated under Insulation. Use Armaflex insulation on piping run outs to individual fixtures to allow bending.
 - e. Provide the correct spacing of hangers (w/ saddles) for PEX; every 3' or as recommended by the Manufacturer. Do not use the spacing designated for CPVC or copper piping unless using steel u-shaped support channels under insulation. Provide a support bracket at rough-ins.
 - f. All work shall be done in accordance with the manufacturer's recommendations.
4. All buried water and trap primer piping shall be AquaPEX or type "K" soft copper tubing. No joints below slab.
5. All buried hot water piping shall be insulated and sealed with 1/2" Armaflex. **Do not direct bury copper hot water piping.**

6. All exposed, uninsulated water piping near fixtures in finished areas shall be chromium plated I.P.S. copper or red brass pipe or tubing and fittings. Valves shall also be chrome plated brass or bronze. Any chrome trim with wrench marks shall be removed and new trim installed.
7. Type of tubing shall be stamped or printed on each length by Manufacturer.

2.8 SANITARY WASTE AND VENT PIPING

- A. All Vent Piping, and Most Sanitary Waste and any Storm Water Piping

Piping and fittings shall be PVC Schedule 40 polyvinyl chloride plastic, as per ASTM-A-2665 or latest standard. Solvent as per ASTM-D-2564. Exposed vent piping above roof shall be **black** PVC or CPVC for appearance and solar heat dissipation of frost.

2.9 FUEL GAS PIPING

- A. Coordinate with General Contractor and contact the Gas Supplier and for installation of tank, site piping and regulators.
- B. Piping after the entrance shall be Schedule 40 black steel pipe, ASTM 120 with 150# fittings.
 - a. Piping 2" and less in diameter shall be screwed pattern malleable iron fittings, shall meet ASTM A-47, ASA B16.3. Pipe joint compound shall be used on all threaded joints.
 - b. Piping shall use welded fittings if over 2" in diameter, or if pressure in excess of 14" W.C.
- C. Provide dirt leg, gas cock and union at each boiler or unit heater.
- D. Or, if using Gastite corrugated stainless steel gas piping and valves, then re-size piping according to tables in the State plumbing Code.
- E. Installation shall meet the requirements of the gas supplier and NFPA 54.
- F. All gas piping shall be painted Rustoleum Brand Yellow. At every 20' mark piping with a Seton (or equal) Pipe Identification labeled "2 psig Natural Gas

2.10 PIPE SLEEVES AND ESCUTCHEONS

- A. Sleeves
 1. Contractor shall set sleeves for all piping penetrating walls and floors. Sleeves through masonry shall be steel pipe sleeves two sizes larger than pipe. Piping passing through walls other than masonry shall be provided with # 24 gauge galvanized steel tubes with wired or hemmed edges.

2. Sleeves set in concrete floors shall finish flush with underside, but extend minimum of 1 inch above finish floor. Weld clips to sleeves for support in concrete pre-cast planks of a size that will be covered by concrete topping. Sleeves set in partitions shall finish flush with each side.
3. Space between sleeves and pipes shall be sealed to make smoke and water tight with 3M Brand Fire Barrier Caulk CP25 or Putty 303.
4. Masonry sleeves shall be Schedule 40 steel pipe.
5. This Contractor has the option to use the Pro-set system on lieu of the above.

B. Exterior Sleeves (if any)

Where piping passes through exterior walls, provide and install a complete pipe sleeve/hydrostatic wall closure system.

1. Wall sleeve shall be schedule 40 steel pipe, two pipe sizes larger than carrier pipe. Sleeve shall be the same length as the thickness of the wall served.
2. The hydrostatic closure device shall consist of identical interlocking links of solid synthetic rubber compounded to resist ozone, water, chemicals and extreme temperature variations. Each link shall be connected by corrosion resistant bolts and nuts to form a belt that is to fit snugly around the pipe. Under each bolt and nut there shall be a metal pressure plate so that when each nut is tightened the rubber links will expand between the pipe and sleeve to form a continuous, air tight and water tight seal.
3. Units to be Link-Seal system Model LS wall seal by Thunderline Corp. or reviewed equal.

C. Escutcheons

Where piping passes through finish walls, floors, ceilings and partitions, provide and set two piece nickel plated steel floor and ceiling plates.

2.11 Fixtures

A. DF Single Drinking Unit with Bottle Filler

1. Halsey Taylor HTHB-HACG8SS-WF
2. Specification

Unit shall include a single water cooler with a bottle filling station. Model HTHB-HAC8GSS-WF shall deliver 8 gph of 50°F drinking water at 90°F ambient air and 80°F inlet water. Lower unit shall have mechanically activated pushbar activation. Bottle filler shall include electronic sensor for no-touch activation with automatic 20-second shut-off timer. Shall include a Green Counter™ displaying the count of plastic bottles saved from the landfill. Shall include WaterSentry® Plus 3000-gallon capacity

filter, certified to NSF/ANSI 42 for Chlorine-Class 1, Particulate-Class 1 and Taste and Odor and NSF/ANSI 53 for lead reduction, with LED visual filter monitor to indicate when filter maintenance is required. Bottle Filler shall provide 1.1-1.5 gpm with laminar flow to minimize splashing. Shall include anti-microbial protected plastic components to prevent mold and mildew. Cooler shall have stainless steel basin with anti-splash ridge and removeable drain strainer. Shall have front and side pushbar activation with raised letters. Shall comply with ADA guidelines for visual and motion disabilities. The manufacturer shall certify the unit to meet the requirements

- B. IM Ice Maker, Water Box
1. Appliance supplied by Owner.
 2. LSP Products Group model OB-504 metal ice maker box with ¼" Comp valve.
 3. Provide 18-24" long, 1/4" Braided S.S. Flex connector.
- C. LV Lavatory – Wall Hung ADA
1. AMERICAN STANDARD 955.01EC Murro Universal Design wall hung lavatory, for concealed arm support, center hole, vitreous china, rear overflow, rear drain, self-draining deck, color "white", 1-1/4" trap. 0059.020 Shroud/Knee Contact Guard, vitreous china. Or reviewed equal. Mount with rim at 34".
 2. Moen Model CA8302 Below-Deck Sensor Operated Faucet or approved equal.
 - a. One piece, chrome plated, cast brass construction above-deck Transitional style matches M•Power™ soap dispenser (model 8558) Single mount Vandal resistant aerator Flexible stainless steel supply line Vandal resistant below-deck box with included mounting hardware
 - b. Touch free" operation for improved hygiene Adjustable sensor activation distance from 3" to 12" (default 5-1/2") Vandal Mode: 30 second time-out feature Maintenance / Cleaning Mode: Allows for a 30 second deactivation for maintenance or cleaning Sentinel Flow: Eliminates stagnant water supply lines every 24 hours (factory setting = off) Metering Mode Feature: Adjustable run time from 10 to 180 seconds (factory setting = off) Battery 4(AA) with AC compatibility For AC connection: Transformer 104630 required for up to 8 devices, and 182538 connector for each device Battery level indicator with low battery warning light Battery life: Up to 8 years* In-line filter included
 - c. 0.5 gpm (1.9 L/min) vandal-resistant multi-stream laminar flow

- d, Third party certified to meet ASME A112.18.1/CSA B-125.1, and all applicable requirements referenced therein including NSF 61/9 & 372
Complies with California Proposition 65 and with the Federal Safe Drinking Water Act
Meets the current requirements of the Buy American Act (BAA)
ADA compliant

- 3. Chrome plated angle supplies, wheel handle stops. Or reviewed equal.
- 4. Provide concealed arm carrier as specified under carriers.

D. MB Mop Basin

- 1. The mop basin shall be Fiat MSB-2424, molded stone or reviewed equal. The molding shall be done in matched metal dies under heat and pressure resulting in a one-piece homogeneous product. Size of unit shall be 24"x24"x10" high.

The drain body shall be cast brass, chrome plated, complete with cast brass lock nut and gaskets. A combination dome strainer and lint basket made from #302, 16 gauge stainless steel attached with tamper proof screws shall be included. The drain body shall provide for a lead caulked joint to be 3" I.P.S.

Provide the following accessories:

- a. Stainless steel wall guard, MSG-2424
- b. Service faucet with vacuum breaker; integral stops and wall brace plate #830-AA.
- c. 30" Hose with 3/4" coupling at one end; Plate #832-AA.
- d. Mop Hanger, stainless steel, 24" long with (3) holders, Plate #889-CC.
- e. Silicone sealant #833-AA.
- f. Vinyl bumper guard #-77-AA.

E. WC Water Closet, Floor, flushvalve - ADA

- 1. AMERICAN STANDARD 3451.001 elongated Madera Flowise, 1.28 GPF, white, vitreous china, 1.1/2" top spud, floor mounted, siphon jet action, bolt caps, rim above finished floor. Or reviewed equal.
- 2. Flush Valve – Sloan G2 8111
 - a. 1.28 gpf, Polished Chrome Finish, Single Flush, Battery, G2 Exposed Sensor Water Closet Flushometer.
 - b. Flush Volume: 1.28 gpf (4.8 Lpf)
Finish: Polished Chrome (CP)
Power Type: Battery
Battery Life: 6 years
Valve: Diaphragm
Valve Body Material: Semi-red Brass
Fixture Type: Water Closet
Fixture Connection: Top spud
Rough-In Dimension: 11 1/2" (292mm)

- Spud Coupling: 1 ½" (38mm)
 - Supply Pipe: 1" (25mm)
 - c. Sweat Solder Adapter with Cover Tube and Cast Set Screw Wall Flange
 - Handle Packing, Main Seat, Stop Seat and Vacuum Breaker Molded from PERMEX® Rubber Compound for Chloramine resistance
 - User friendly three (3) second Flush Delay
 - “Low Battery” Flashing LED
 - Fixed Metering Bypass and No External Volume Adjustment to Ensure Water Conservation
 - Flex Tube Diaphragm designed for improved life and reduced maintenance
 - Engineered Metal Cover with replaceable Lens Window
 - Four (4) Size AA alkaline Batteries included
 - Courtesy Flush® Override Button
 - 1" I.P.S. Screwdriver Bak-Chek® Angle Stop with Vandal Resistant Stop Cap
 - Infrared Sensor with Multiple-focused, Lobular Sensing Fields for high and low target detection
 - PERMEX® Synthetic Rubber Diaphragm with Dual Filtered Fixed
3. Church 3155SSC white, elongated, extra heavy duty, solid plastic open front seat with self-sustaining external checks, antimicrobial, stainless steel posts and hardware. Or reviewed equal.

2.12 UTILITY SUMP PUMP (NORTHBOUND BUILDING ONLY) - SP

Stancor model SE-50 sump pump with oil minder probe and alarm, 1/2 hp 115 V, 1 phase, or reviewed equal. Provide ball and check valve.

2.13 EQUIPMENT OR PLUMBING FIXTURES BY OTHERS

Any equipment and fixtures by other sections will be provided and set in place by those sections. This contractor will connect gas, domestic hot water, waste and vent as required.

2.14 PLUMBING SPECIALTIES, DRAINAGE

A. Carriers

1. Wall hung fixtures including water closets, lavatories, and drinking fountains shall be supported with adjustable floor mounted carriers to fit building conditions, piping system, and fixtures specified. Each carrier shall be provided with a wall finishing frame. All carriers shall be secured to the floor with tie down lugs.
2. Carriers shall be as manufactured by Zurn or reviewed equal.

B. Traps

1. Traps of material and design as approved by the State and shall be furnished and installed at all fixtures and appliances. Trap each fixture separately, keeping all trap screws below water line; vent each trap. Make offsets in vent piping with 45-

degree angle fittings when possible. Pitch horizontal vents toward waste lines, group vents and take through roof as shown. All traps, at fixtures and appliances shall be provided with accessible clean outs.

C. Cleanouts

Provide cleanouts for soil and waste where shown on the drawings and as required by code.

1. Floor Cleanouts (FCO)

All floor cleanouts in concrete or tile shall be flush with finish floor. Zurn ZB-1400 adjustable floor cleanout, cast iron body, with gas and watertight ABS tapered thread plug. Provide size equal to piping served with maximum size of 4". Or reviewed equal.

2. Wall Cleanouts (WCO)

All wall cleanouts shall be Zurn Z-1445 cleanout tee with threaded plug. Polished nickel smooth bronze cover, Zurn ZANB-1462 or reviewed equal.

3. Flashing

Flash each above grade floor clean out with Chloraloy® 240 thermoplastic elastomeric sheet membrane for concealed waterproofing, or other approved flashing material, extending 24" beyond perimeter of clean out and lock into clamping collar.

D. Floor Drains (FD)

1. All floor drains above grade shall be complete and each provided with flashing flange, flange device, and 24"x24", Chloraloy® 240 thermoplastic elastomeric sheet membrane for concealed waterproofing, or other approved flashing material, lock into drain clamping collar.

2. Traps for floor drains shall be deep seal traps.

a. Type FD Finished Floor

Cast iron body, flashing collar, nickel bronze, 5" adjustable strainer head, trap primer connection, backwater valve. Zurn ZN-415 with trap primer or equal by Josam, Wade or Smith.

a. Type "FD1-1" Round, Finished Floor (Floor Drain in Toll Booths)

Zurn ZB-415-6C-Y-V, cast iron body with 3" outlet, combination invertible membrane clamp, adjustable collar, sediment bucket, backwater valve. Or reviewed equal.

E. Roof Drain RD-1 (Roof Drain in Toll Booths)

Roof Drain (RD): Zurn ZRB121-C 12" diameter roof drain with low

silhouette bronze dome with underdeck clamp. Or reviewed equal.

2.15 PLUMBING SPECIALTIES, WATER

A. Trap Primer (TP)

Precision Plumbing Products Inc. Model PR-500 Self-adjusting automatic trap primer. Provide DU-2 distribution unit where indicated. Or reviewed equal. NOTE: As the trap primer may be on a line larger than 1/2", submitting / providing a "flow through" type trap primers smaller than the actual pipe size is not acceptable.

B. Shock Absorbers (SA)

Shock protection shall be provided where shown on drawings and at all quick closing devices. Devices shall be stainless steel shell, welded expansion bellows surrounded by on-toxic mineral oil or gas, pressurized compression chamber charged and factory sealed, all, in-line design, threaded nipple and PDI reviewed. Sized to meet the conditions.

1. Type "1", 'B' P.D.I. units

Zurn Z-1700, #200. Or reviewed equal.

C. Thermometer (T)

Units to be dial type, 4.1/2" with 30° to 180° range; Terice Universal angle or reviewed equal.

D. Vacuum Relief Valve

Watts Model N36 or reviewed equal.

F. Relief Valve

Watts #530 calibrated pressure relief valve. Set at 100 PSI. Or reviewed equal.

G. Braided Stainless Steel Water Connectors

EPDM tubing jacketed by type 304 stainless steel braid, stainless ferrule, brass nuts. By Zurn or reviewed equal.

H. Dielectric Unions

Series 3000 as manufactured by Watts or reviewed equal.

I. Mixing Valves (MV)

1. Type "1" Master Mixer

Leonard valve model 270-LF, 1/2", capacity 3.5 GPM @ 5 psi differential pressure for exposed piping, rough bronze, set at 120°F. Or reviewed equal.

J. Expansion Tank (ET)

Watts Model DET-5-M1. Potable water expansion tank, 2.1 gallon, 0.85 gallon acceptance, 3/4" connection, precharged to 40 psi. One per water heater. Or reviewed equal.

K. Hose Bibs (HB)

1. Type "1" Exterior Hose Bib

Zurn Z-1321 exposed Ecolotrol "Anti-Siphon" automatic draining, non-freeze wall hydrant, integral backflow preventer, all bronze interior parts, operating key. Or reviewed equal.

2.16 WATER HEATERS (WH)

ProMax EJC-10, 10 gallon electric water heater, 4500 KW, top or side connect, magnesium anode, 1 year warranty. Or reviewed equal. Provide shelf, all water piping, valves and accessories required for a complete installation

2.17 VALVE BOXES, ACCESS DOORS AND PANELS

- A. Furnish General Contractor with valve boxes, access doors/ panels for all locations where service access is required behind walls, above sheetrock and masonry ceilings, and below floors for equipment, piping, valves, and specialties furnished under Division 15.
- B. Shall be located in closets, storage rooms and/or other non-public areas whenever possible, in a workmanlike manner, positioned so that junction can be easily reached and the size shall be sufficient for this purpose. When required in corridors, lobbies or other habitable areas, they shall be located as directed by the Architect.
- C. Units shall have 16-gauge steel frame and 14-gauge steel hinged door panel. Door shall have concealed spring hinges allowing door to be opened to 175°.
- D. Units shall be factory primed for field painting by Section 09900.
- E. Provide UL-rated 1-1/2 hour Class B access panels where required to comply with applicable Code requirements.

2.18 DE-ICING CABLE

- A. Provide EasyHeat SR51J self-regulating Roof & Gutter Cable in the roof drains and front and rear gutters and downspouts, 120 V, 8 W per foot. Provide all accessories as required for a complete installation.
- B. Electrical power boxes and toggle switch with pilot light provided by Div 16. Coordinate locations before ordering Cable.

PART 3 – EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection

1. Prior to all work of this section, carefully inspect the installed work of all other trades and verify that all such work is complete to the point where this installation may properly commence.
2. Verify that plumbing may be installed in strict accordance with all pertinent codes and regulations and the reviewed Shop Drawings.

B. Discrepancies

1. In the event of discrepancy, immediately notify the Architect. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.3 INSTALLATION OF PIPING AND EQUIPMENT

A. General

1. Install all piping promptly, making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
2. Provide uniform pitch of at least ¼ inch per foot for all horizontal waste and soil piping 3” or less. For piping 4” and above, slope at 1/8” minimum per foot
3. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions; promptly remove all defective material from the jobs site.
4. Install pipes to clear all beams and obstructions. Do not cut into or reduce the size of load carrying members without the approval of the Architect.
5. Allow room between all piping and other obstructions to allow for the installation of the specified pipe insulation.
6. Plumbing vents
 - a. Back vent all plumbing fixtures.
 - b. Pitch all vents at 1/64” per foot minimum toward waste lines for proper drainage to prevent unintended traps.
 - c. Install vent piping with each bend 45 degrees minimum from the horizontal, wherever structural conditions will permit.
 - d. Group plumbing vents and take through roof as shown.
 - e. Increase vents 3” and smaller one size before going thru roof. Make size transition a minimum of 12” below the surface of flat roofs and 72” (or as structure permits) below sloped roofs.

- f. Terminate 18” to 24” above roof.
 - g. If installing in locations other than as shown on the drawings, line up with other plumbing vents for a neat appearance.
 - h. Do not install plumbing vents within 10 feet of an operable window or door or within 25 feet of a ventilation air intake.
- 6. All risers and off-sets shall be substantially supported.
 - 7. Pipe hangers shall be placed on center as follows:

<u>MATERIAL</u>	<u>HORIZONTAL</u>	<u>VERTICAL</u>
Copper 1-1/4" & less	6'	6'
1-1/2"	6'	10'
2" & up	10'	10'
PVC, DWV	4'	4'
Steel	10'	10'

- 8. Arrange all piping to maintain required grade and pitch to lines to prevent vibration. Expansion loops to anchors shall be provided where shown on drawings.
- 9. Make all changes in pipe size with reducing fittings.
- 10. All low points in water piping shall be drained with 1/2” gate valve with hose nipple and metal cap.
- 11. No piping shall be installed in such a manner to permit back-siphonage or flow of any liquid in water piping under any conditions.
- 12. No water piping shall be installed outside of building or in an exterior wall unless adequate provisions are made to protect such pipe from freezing.
- 13. All piping and drain openings left unattended will be capped, plugged or securely covered to prevent accidental entry of foreign matter. Roof drains in use will be provided with domes.

B. Joints and Connections

- 1. Smoothly ream all cut pipe; cut all threads straight and true; apply best quality Teflon tape to all male pipe threads but not to inside the fittings; use graphite on all clean out plugs. DO NOT use Teflon tape on gas piping.
- 2. Smoothly ream all cut P.V.C. pipe. Clean and use solvent for fitting connection and in strict accordance with the manufacturer’s recommendations.
- 3. Make all joints in copper water tube with solder applied in strict accordance with the manufacturer’s recommendations.

3.4 STERILIZATION AND FLUSHING OF PIPES

- A. After preliminary purging of the system, chlorinate the new potable water system in accordance with the current recommendations of the American Water Works Association,

and in accordance with all pertinent codes and regulations. Chlorinate only when the building is unoccupied.

- B. Upon completion of the sterilization, thoroughly flush the entire potable water system.
- C. After sterilization and flushing are complete, a sample shall be collected from the end of the longest main, or at any other location selected by the Architect, and a water analysis test provided. The test must prove the water acceptable or additional disinfecting of system performed. A copy of the test report shall be submitted to the Architect.

3.5 CLOSING IN UNINSPECTED WORK

Do not cover up or enclose work until it has been properly and completely inspected and approved. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Architect and at no additional cost to the Owner.

3.6 TESTING OF PIPING

Tests shall be applied to the plumbing installation as required by codes and where as directed by the Architect, and in all cases before work is covered by earth fill or pipe covering.

- A. Sanitary piping shall be tested when all underground work is complete (before covering) and again, after all piping is installed, but before it is further closed in. Sanitary systems shall be securely stopped, except at the highest point, and the entire system filled with water to the point of overflow for 24 hours. All leaks shall be repaired. Cracked pipes and fitting shall be removed and replaced. No doping of soil pipe or fittings will be allowed. Plan testing around expected weather and temperature conditions or provide protection so that pipes do not freeze.
- B. New domestic water piping shall be filled and subjected to a hydrostatic pressure test of 150 psi for 8 hours with no leaks. If leaks are detected they shall be repaired and the test repeated until work is tight. NOTE: Testing with compressed air only is NOT ACCEPTABLE.

3.7 CLEANING

Prior to acceptance of the buildings, thoroughly clean all exposed portions of the this installation, removing all labels and all traces of foreign substance, using only a cleaning solution approved by the manufacturer of the plumbing item, being careful to avoid all damage to finished surfaces. Additional attention may be required to thoroughly clean any used, re-used or owner provided fixtures. Clean out all strainers and aerators and adjust or replace washers, cartridges, etc

3.8 INSTRUCTIONS

On completion of the job, this Contractor shall provide a competent technician to thoroughly instruct the Owner's Representative in the care and operation of the system. The time of instruction shall be arranged with the Owner.

3.9 RECYCLING

Discarded materials, both new and removed, shall be recycled whenever practical through metal salvage dealers (piping, etc.), paper salvage (cardboard shipping containers, etc.), wood products, etc. The Plumbing Contractor shall retain the salvage value of discarded materials and may use this value to offset his project bid price if so desired. Toxic materials such as adhesives, coolants, etc. SHALL be disposed of in a manner acceptable to the State of Maine Department of Environmental Protection.

3.10 HAZARDOUS MATERIALS

Mercury or any other material deemed by the Federal Environmental Protection Agency or the State Department of Environmental Protection to be hazardous shall not be used in any components of the plumbing systems.

END OF SECTION 220000

SECTION 230000 - SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions, Special Provisions and Notice to Contractors shall apply to this work. Read these to be familiar with conditions related to the installation of the work.

1.2 WORK SHOWN ON DRAWINGS

- A. The drawings accompanying this specification, as a part thereof, are working drawings indicating the location and arrangement of the increments of the systems of this section of work. Material deviation from this arrangement, process or means of application, shall bear the Engineer's review stamp before the change is made on the job or materials are ordered. Changes made without such review shall be ordered removed and items installed as specified shall be provided at no additional expense to the Owner.
- B. The drawings are not intended to show in minute detail minor items of installation or materials such as specific fittings or findings.

1.3 MATERIALS AND LABOR

- A. Furnish materials and labor necessary to deliver to the Owner a complete and operable system installed in accordance with the contract documents.
- B. Materials shall be of the best quality. Workmanship shall be of highest grade and construction shall be done according to best practices of the trade.
- C. Provide, when required, labeled samples of material or equipment specified herein or proposed to be used in this work.
- D. Where words "furnish", "provide", or "install" are mentioned, either singly or in combination, these words are hereby interpreted to mean "furnish and install" or "provide and install", including materials complete with connections, supplemental devices, accessories and appurtenances, unless specifically otherwise noted. These words are likewise hereby interpreted as being prefixed to materials, equipment, and apparatus hereinafter mentioned, either in abbreviated or scheduled information or in the technical sections of the specifications.

1.4 EQUIPMENT INSTALLATION IN HEATING SEASON

- A. The system shall be installed provided that the construction area will have sufficient heat to maintain temperature above 40°F throughout the construction period.

1.5 COOPERATION BETWEEN TRADES

- A. Provide information sufficiently in advance of this work, so that work by the other trades may be coordinated and installed without delays. Furnish and locate sleeves, supports, anchors and necessary access panels.
- B. Where work is concealed, assure it does not project beyond finished lines of floors, ceilings, or walls.
- C. Equipment or piping requiring access found to be located above sheetrock ceilings shall be brought immediately to the attention of the Architect for resolution.

1.6 VISITING THE PREMISES

- A. Not applicable.

1.7 ORDINANCES, AUTHORITIES, PERMITS, AND FEES

- A. Obtain necessary permits and licenses, give notices and comply with laws, ordinances, rules, regulations or orders affecting the work, and pay fees and charges in connection therewith.
- B. The "authority having jurisdiction" is the organization, office, or individual responsible for "approving" equipment, an installation, or a procedure.

1.8 PROTECTION OF WORK AND MATERIALS

- A. Protect and care for materials delivered and work performed until the completion of the work. Defective equipment or equipment damaged in the course of storage, installation or test shall be replaced or repaired to the satisfaction of the Engineer at no additional cost to the Owner.

1.9 INSURANCE

- A. Purchase and maintain Public Liability and Property Insurance during the progress of the work and until completion and acceptance of the entire project by the Owner in the amounts as specified in the General Conditions.

1.10 APPLICABLE CODES

- A. Work and materials shall conform to the latest rules and regulations listed below and these rules and regulations hereby are made part of this specification. They include, but are not necessarily limited to the following:

American Society for Testing and Materials (ASTM)
Underwriters' Laboratories, Inc. (UL)
Air Moving and Conditioning Assoc. (AMCA)
American Society of Heating, Refrigerating, and Air
Conditioning Engineers (ASHRAE)
American Society of Mechanical Engineers (ASME)
National Electrical Manufacturers Association (NEMA)

Institute of Electrical and Electronics Engineers (IEEE)
American National Standards Institute (ANSI)
National Fire Protection Association (NFPA)
American Water Works Association (AWWA)
Local Fire Code
Local Plumbing Codes
American Welding Society

1.11 SHOP DRAWINGS

- A. Submit shop drawings, manufacturers' data and certificates for equipment, materials and finish, and pertinent details for each system where specified in each individual section, eight (8) copies, to be submitted to the Resident. Shop drawings will be returned "No Exceptions Taken", "Make Corrections Noted", "Amend and Resubmit", "Submit Specified Item", or "Rejected" less two (2) copies. Work shall progress in accordance with "Reviewed" shop drawings (ONLY).
- B. Groups of similar shop drawings shall be submitted as individual bound documents with covers and indexes. Typical similar items would be "Diffusers and Registers", "Valves and Controls". Rejection of individual items shall not be cause for rejection of the entire document.
- C. Clearly indicate item(s) to be reviewed on each submission by highlighting or underlining intended item(s). Submissions not clearly marked shall be returned "Amend and Resubmit".
- D. Shop drawings must bear the Engineer's review stamp. In the event that the Engineer returns shop drawings "Amend and Resubmit" or "Rejected", the shop drawing must be revised and resubmitted for review.
- E. Furnishing of the specified item must still produce the results and performance, dependability and quality reasonably to be expected within the spirit of the specifications, drawings, and the standard of good mechanical performance normal to the trade.

1.12 SUBSTITUTIONS

- A. Where the specifications allow the substitution of a product, still this product is subject to review by the Engineer in accordance with the paragraph entitled "Shop Drawings". Review of a substitute item is an indication only that the substitute item is compatible with the specified item as a claim of the manufacturer. Insure dimensional propriety, performance, and quality of the substitute item.
- B. Reference in the specifications or on the drawings to any product, material, fixture, form or type of construction, by proprietary name, manufacturer, make or catalog number, establishes a standard of quality or design and is not meant to limit competition. Use any equivalent substitute provided favorable written review by the Engineer is first obtained. The (ONLY) notation in the specification is an exception to this and leaves no option.
- C. For materials or equipment which are supplied with integral or factory applied finish, the colors will be considered in evaluating substitutions.

- D. For the purpose of avoiding conflicts with other trades, contracts, and adjoining work where more than one (1) article, device, material, fixture, form or proprietary name, manufacturer, make or catalog number, the first named shall be used as the basis of design and details. The cost of any changes because of substituted item shall be borne by the Contractor requesting such change.

PART – 2

NOT USED

PART 3 – EXECUTION

3.1 GRADES AND ELEVATIONS

- A. Establish and maintain grades and elevations in connection with this work.

3.2 EQUIPMENT SUPPORTS

- A. Furnish and install equipment supports for mechanical equipment as required. Supports shall be subject to review by the Engineer.

3.3 SLEEVES AND PREPARED OPENINGS

- A. Coordinate core-drilling, cutting, patching and setting of sleeves, frames, framing and lintels for openings with other trades. Sleeves shall be furnished by the Contractor. Pipe sleeves shall be provided at all floor and wall penetrations. Sleeves shall be Schedule 40 steel pipe for iron pipe, Type “L” copper for copper pipe and Schedule 40 PVC for plastic pipe. Sleeves shall be firestopped, as specified.
- B. Failure to give timely notice of and to locate openings and furnish sleeves shall cause no additional expense to the Owner.

3.4 CONNECTION TO EQUIPMENT

- A. Provide piping connections, supports, brackets, compensators or flexible connections to prevent application of excessive stresses to equipment.
- B. Equipment shall be installed with flanges or unions in such a manner as to permit disconnecting for removal of tubes, coils, elements and other equipment for inspection, service and repairs.

3.5 ACCESS TO EQUIPMENT

- A. The installation of work performed shall provide reasonable accessibility for operation, inspection, and maintenance of equipment and accessories. The Engineer shall determine the adequacy of such accessibility.

3.6 ACCESS PANELS

- A. Access panels shall be provided where indicated on the drawings and as required for access to valves and other serviceable components. Access doors shall be Milcor, Zurn or approved equal hinged with primed finish and with allen wrench operated latch.
- B. Access panels installed in fire-rated assemblies shall have the same fire rating as the assembly.

3.7 PAINTING OF EQUIPMENT

- A. Exposed ironwork, including steel supports and hangers in unfinished spaces, mechanical rooms, pits, and trenches shall be properly cleaned, prepared and painted with two (2) coats of black asphaltum varnish.

3.8 GUARDS

- A. Exposed moving and rotating elements of mechanical equipment items shall be protected with suitable guards for personnel protection. Guards shall be of rigid construction, firmly positioned. Holes shall be provided in guards at shaft centers to facilitate tachometer readings.

3.9 LUBRICATION

- A. Furnish and install grease fittings for points requiring lubrication. Furnish extension type fittings as required to provide easy access for maintenance lubrication.
- B. Furnish initial charges of lubricants for equipment. Lubricants shall be in conformance with the manufacturer's requirements and recommendations.

3.10 ELECTRIC MOTORS AND MOTOR CONTROLS

- A. Unless otherwise noted, motors, motor starters and other electrical accessories, which are specified under Mechanical specifications shall be selected with characteristics as follows:

1/2 Horsepower and less - 120 volt, 1 phase, 60 Hz.
3/4 Horsepower and larger - 230 volt, 1 phase, 60 Hz.
- B. Motors shall be built in accordance with the latest applicable NEMA, IEEE and ANSI Standards. Motors shall be manufactured by Baldor, Magnetek or Toshiba, of the latest type and quality specified under individual items of equipment. Motor efficiencies shall be premium high efficiency type per the Consortium for Energy Efficiency Standard and/or be "Energy Star" compliant.
- C. Magnetic motor starters for mechanical items of equipment shall be furnished under Division 16 unless the starter is an integral part of a factory packaged item of equipment. Each starter furnished as an integral item of equipment shall be provided with overload heater elements. Starters shall have single phase protection or shall have relays installed to provide this feature. Starters shall be equipped with suitable step-down transformers to provide required control voltage.

- D. Motors shall have a minimum continuous duty service factor of 1.15. Minimum motor efficiency shall be:

MOTOR HORSEPOWER	PERCENTAGE EFFICIENCY		
	(1200RPM)	(1800 RPM)	(3600 RPM)
1,1-1/2,2,3	----	86.5	85.5
5	89.5	89.5	86.5
7.5	90.2	91.0	88.5
10	91.7	91.7	89.5
15	91.7	93.0	90.2
20	92.4	93.0	91.0
25	93.0	93.6	91.7
30	93.6	94.1	91.7
40	94.1	94.1	92.4
50	94.1	94.5	93.0
60	94.5	95.0	93.6
75 & UP	94.5	95.0	93.6

3.11 CLEANING OF SYSTEMS

- A. Piping and duct systems shall be thoroughly cleaned and flushed prior to initial operation.
- B. Thoroughly clean exposed portions of the mechanical installation, removing labels and foreign substance.
- C. Furnish detergents, solvents, cleaning compounds, and tools required for cleaning operations.
- D. Keep the premises free from accumulation of waste material or rubbish and at the completion of the work, remove from the job site tools, scaffolding, surplus materials, and rubbish, leaving the work areas "broom" clean.

3.12 INSTALLATION OF PIPING AND EQUIPMENT

- A. General
 - 1. Install all piping promptly, making pipe generally level and plumb, free from traps, and in a manner to conserve space for other work.
 - 2. Provide uniform pitch of at least ¼ inch per foot for all horizontal waste and soil piping 3” or less. For piping 4” and above, slope at 1/8” minimum per foot
 - 3. Inspect each piece of pipe, tubing, fittings, and equipment for defects and obstructions; promptly remove all defective material from the jobs site.
 - 4. Install pipes to clear all beams and obstructions. Do not cut into or reduce the size of load carrying members without the approval of the Architect.

5. Allow room between all piping and other obstructions to allow for the installation of the specified pipe insulation.
6. Plumbing vents
 - a. Back vent all plumbing fixtures.
 - b. Pitch all vents at 1/64" per foot minimum toward waste lines for proper drainage to prevent unintended traps.
 - c. Install vent piping with each bend 45 degrees minimum from the horizontal, wherever structural conditions will permit.
 - d. Group plumbing vents and take through roof as shown.
 - e. Increase vents 3" and smaller one size before going thru roof. Make size transition a minimum of 12" below the surface of flat roofs and 72" (or as structure permits) below sloped roofs.
 - f. Terminate 18" to 24" above roof.
 - g. If installing in locations other than as shown on the drawings, line up with other plumbing vents for a neat appearance.
 - h. Do not install plumbing vents within 10 feet of an operable window or door or within 25 feet of a ventilation air intake.
6. All risers and off-sets shall be substantially supported.
7. Pipe hangers shall be placed on center as follows:

MATERIAL	HORIZONTAL	VERTICAL
Copper 1-1/4" & less	6'	6'
1-1/2"	6'	10'
2" & up	10'	10'
PVC, DWV	4'	4'
Steel	10'	10'
8. Arrange all piping to maintain required grade and pitch to lines to prevent vibration. Expansion loops to anchors shall be provided where shown on drawings.
9. Make all changes in pipe size with reducing fittings.
10. All low points in water piping shall be drained with 1/2" gate valve with hose nipple and metal cap.
11. No piping shall be installed in such a manner to permit back-siphonage or flow of any liquid in water piping under any conditions.
12. No water piping shall be installed outside of building or in an exterior wall unless adequate provisions are made to protect such pipe from freezing.
13. All piping and drain openings left unattended will be capped, plugged or securely covered to prevent accidental entry of foreign matter. Roof drains in use will be provided with domes.

B. Joints and Connections

1. Smoothly ream all cut pipe; cut all threads straight and true; apply best quality Teflon tape to all male pipe threads but not to inside the fittings; use graphite on all clean out plugs. DO NOT use Teflon tape on gas piping.
2. Smoothly ream all cut P.V.C. pipe. Clean and use solvent for fitting connection and in strict accordance with the manufacturer's recommendations.
3. Make all joints in copper water tube with solder applied in strict accordance with the manufacturer's recommendations.

C. Coordinate with the concrete contractor to depress the finished floor where indicated on drawings. Install floor drains at low points of surface areas to be drained. Adjust grates of drains 1/32" below finished floor, unless otherwise indicated. Finished floor shall be depressed according to the following drainage area radii:

1. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
2. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
3. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3.12 STERILIZATION AND FLUSHING OF PIPES

- A. After preliminary purging of the system, chlorinate the new potable water system in accordance with the current recommendations of the American Water Works Association, and in accordance with all pertinent codes and regulations. Chlorinate only when the building is unoccupied.
- B. Upon completion of the sterilization, thoroughly flush the entire potable water system.
- C. After sterilization and flushing are complete, a sample shall be collected from the end of the longest main, or at any other location selected by the Architect, and a water analysis test provided. The test must prove the water acceptable or additional disinfecting of system performed. A copy of the test report shall be submitted to the Architect.

3.13 CLOSING IN UNINSPECTED WORK

Do not cover up or enclose work until it has been properly and completely inspected and approved. Should any of the work be covered up or enclosed prior to all required inspections and approvals, uncover the work as required and after it has been completely inspected and approved, make all repairs and replacements with such materials as are necessary to the approval of the Architect and at no additional cost to the Owner.

3.14 TESTING OF PIPING

Tests shall be applied to the plumbing installation as required by codes and where as directed by the Architect, and in all cases before work is covered by earth fill or pipe covering.

- A. Sanitary piping shall be tested when all underground work is complete (before covering) and again, after all piping is installed, but before it is further closed in. Sanitary systems shall be securely stopped, except at the highest point, and the entire system filled with water to the point of overflow for 24 hours. All leaks shall be repaired. Cracked pipes and fitting shall be removed and replaced. No doping of soil pipe or fittings will be allowed. Plan testing around expected weather and temperature conditions or provide protection so that pipes do not freeze.
- B. New domestic water piping shall be filled and subjected to a hydrostatic pressure test of 150 psi for 8 hours with no leaks. If leaks are detected they shall be repaired and the test repeated until work is tight. NOTE: Testing with compressed air only is NOT ACCEPTABLE.

3.15 STARTING OF EQUIPMENT

- A. Testing or starting of equipment shall be done in collaboration with trades concerned to insure safe and proper operation of the equipment.
- B. Prior to starting equipment, provide lubrication at required points. Before starting any electrical or electric motor driven equipment, a check must be made to insure that proper heater coils are installed in the starters and that the equipment is rotating in the proper direction.

3.16 OPERATIONAL TESTING

- A. Operate systems until successful operation is demonstrated to the Engineer. This initial operation shall be in addition to the testing of the system and shall be done after the system is cleaned and finished.
- B.

3.17 RECORD DRAWINGS

- A. During construction, keep an accurate record of deviations to the installation of the work as indicated on the drawings. Upon completion of the work, furnish a copy of this record to the Engineer. **Submit record drawings before requesting final payment.**

3.18 MANUFACTURER'S REPRESENTATIVE

- A. As indicated in the Technical Sections of this specification or as directed by the Engineer, provide the services of a factory trained Engineer or Technician to inspect, adjust, and place in proper operating condition the equipment or item involved. No additional compensation will be allowed for such service.

3.19 MANUFACTURER'S INSTRUCTIONS, OPERATION AND MAINTENANCE DATA

- A. Provide for each item of equipment or apparatus furnished, a complete set of printed instructions obtained from the manufacturer covering proper operation, maintenance, lubrication, cleaning, servicing, adjustment, and safety instructions.
- B. Manufacturer's data shall include performance data (curves are preferred where applicable) complete parts lists, recommended spare parts lists, piping, and wiring diagrams.
- C. Arrange data in complete sets, properly indexed and marked.
- D. Data shall include a complete set of shop drawings.
- E. Material shall first be submitted in preliminary form for review by the Engineer. After review, submit three (3) copies in bound volumes to the Engineer for distribution.

3.20 GUARANTEES

- A. An item becomes "defective" when it ceases to conform to the Contract Documents. Guarantees begin on the date of issuance of a certificate authorizing final payment or certificate of substantial completion with the Owner taking occupancy or beneficial use thereafter.
- B. Upon completion of the work and before applying for final payment, furnish a written guarantee, stating that the work complies with the provisions of codes listed herein and the local enforcing authorities, and that it will be free from defects of material and workmanship for not less than one (1) year. Guarantee shall further state that the Contractor will, at his own expense, repair or replace any of his material and work which may become defective during the time of guarantee, together with other work damaged as a consequence of such defects.
- C. Where special guarantees, covering installation, operation or performance of any systems, or equipment furnished under are indicated, the full responsibility for the fulfillment of such guarantees must be assumed by the Contractor who shall obtain written guarantees in triplicate, two (2) copies of which shall be filed with the Engineer before final acceptance.
- D. Repeated malfunctioning or failure in service of any item or work of the system is sufficient cause for the Engineer to order the removal of the item, and its replacement with new item at the expense of the Contractor.

3.21 EXISTING UTILITIES AND EQUIPMENT

- A. Care shall be taken to protect or replace damaged existing utilities. Information indicated in the contract documents is the best information available as to the location of underground and concealed utilities and equipment.

3.22 FIRESTOPPING

- A. Firestopping shall be performed in accordance with Specification Section 07270 "Firestopping". All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as

specified. Coordinate size, location and type of pipe and duct sleeves as required by firestopping systems.

END OF SECTION 230000

SECTION 230713 – INSULATION (PLUMBING AND MECHANICAL)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The drawings and the specifications including the project manual are hereby made a part of the work of this section.

1.2 DESCRIPTION

- A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to insulate the heating, ventilating, air conditioning, and plumbing systems.

1.3 SUBMITTALS

- A. Substitutions: Your attention is directed to Section 230000-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section shall be achieved before reading the PRODUCTS section of this specification.
- B. The items for which the submittals paragraph in Section 230000 Supplemental General Mechanical Requirements, apply are as follows:
 - 1. Piping insulation.
 - 2. Ductwork insulation
 - 3. Equipment insulation.
 - 4. Insulation application schedule.

1.4 DEFINITIONS

- A. Finished Spaces: Spaces other than furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels, unless specifically listed below as an unfinished space.
- B. Unfinished Spaces: Mechanical rooms.
- C. Unconditioned Spaces: Spaces exposed to near outside ambient temperatures, such as unheated attic spaces or non-air conditioned areas.
- D. Outside: Areas beyond the exterior side of walls or above the roof, unexcavated spaces, and crawl spaces.
- E. Concealed: Not visible in finished or unfinished spaces. For example, above ceilings, below floors, between double walls, furred-in areas, pipe and duct shafts, and similar spaces.
- F. Exposed: Visible from a finished or unfinished space.

1.5 MANUFACTURER'S STAMP OR LABEL

- A. Packages or standard containers of insulation, jackets, cements, adhesives, and coatings delivered to the project site for use must have the manufacturer's stamp or label attached giving name of manufacturer, brand, and description of material. Insulation shall be asbestos-free.

1.6 FLAME SPREAD AND SMOKE DEVELOPED RATINGS

- A. Materials shall have a flame-spread rating of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with NFPA 255, ASTM E84, or UL 723.
- B. Provide materials with flame resistant treatments not subject to deterioration due to aging, moisture, high humidity, oxygen, ozone, or heat.
- C. Materials Exempt From Fire-Resistant Rating: Nylon anchors for securing insulation to ducts or equipment.

PART 2 - PRODUCTS

2.1 PIPING INSULATION

- A. Fiberglass: Heavy density preformed fiberglass with thermal conductivity of 0.29 Btu-in/hr-ft²-°F at 150°F mean temperature. Insulation shall conform to ASTM C547 Class I and shall be suitable for 450°F service. Fitting insulation shall be of same material used for pipe.
 - 1. Insulation Jacket: All service (ASJ) type conforming to Fed. Spec. HH-B-100B Type I. Jacket permeability shall not exceed 0.02 perms (ASTM E96). Pipe fitting jacket shall be factory premolded, one-piece, PVC covers with pressure sensitive taped joints. Jackets in exposed locations shall have a white surface suitable for field painting. Provide vapor barrier as required by service.
 - 2. Aluminum Jackets: ASTM B 209M (ASTM B 209), Temper H14, minimum thickness of 27 gage (0.016 inch), with factory-applied polyethylene and kraft paper moisture barrier on inside surface. Provide smooth surface jackets for jacket outside diameters less than 8 inches. Provide corrugated surface jackets for jacket outside diameters 8 inches and larger. Provide 1/2" wide stainless steel bands. Provide factory prefabricated aluminum covers for insulation on fittings, valves, and flanges.
- C. Fittings, Flanges, and Valves: Provide insulation for fittings, flanges, and valves premolded, precut, or job fabricated of the same thickness and conductivity as used on adjacent piping.

2.3 EQUIPMENT INSULATION

- A. Fiberglass (Hot Equipment): Semi-rigid fiberglass board conforming to Fed. Spec. HH-I-558B, Form B, Type I. Thermal conductivity shall be 0.32 Btu-in/hr-ft²-°F at 150°F mean temperature (ASTM C177), insulation shall be suitable for 650°F service. Insulation jacket shall be "all service" type conforming to Fed. Spec. HH-I-100B Type I or II. Jacket permeability shall not exceed 0.02 perms (ASTM E96).

- B. Flexible Unicellular (Cold Equipment): Flexible unicellular with thermal conductivity of 0.27 Btu-in/hr-ft²-°F at 75°F mean temperature. Insulation shall conform to ASTM C534, Type II, sheet and shall be suitable for 200°F service. Permeability shall not exceed 0.10 perms (ASTM E96). Insulation adhesive shall conform to Mil. Spec. MIL-A-24179A, Type II, Class 1.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Inspection:
 - 1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
 - 2. Verify that the insulation systems may be installed in accordance with pertinent codes and regulations and the reviewed Submittals.

3.2 GENERAL

- A. Insulate after system tests have been completed and surfaces to be insulated have been cleaned of dirt, rust, and scale and are dry.
- B. Install insulation with jackets drawn tight and cement down longitudinal and end laps. Do not use scrap pieces where a full length section will fit. Insulation shall be continuous through sleeves, wall and ceiling openings, except at fire dampers in duct systems and pipe penetrations through fire rated assemblies. Extend surface finishes to protect ends, and raw edges of insulation. Apply coatings and adhesives at the manufacturer's recommended coverage per gallon. Individually insulate piping and ductwork. Keep insulation dry during the application of the finish. Bevel and seal the edges of exposed insulation.
- C. Unless otherwise indicated, do not insulate the following:
 - 1. Factory preinsulated flexible ductwork.
 - 2. Factory pre-insulated ductwork, plenums, casings, mixing boxes, and filter boxes.
 - 3. Chrome plated pipes and fire protection pipes.
 - 4. Vibration isolating connections
 - 5. Adjacent insulation
 - 6. ASME stamps, nameplates, access plates
 - 7. Ductwork exposed to view in a normally occupied space.
 - 8. Hydronic specialties: Low water cutoff, relief valves, relief valve discharge piping, pressure reducing valves, and expansion tanks.
 - 9. Unions and flanges at equipment required for frequent service.

3.3 PIPING INSULATION

- A. Pipe Insulation (Fiberglass): Place sections of insulation around the pipe and joints, tightly butt into place. Draw jacket laps tight and smooth. Secure jacket with fire resistant adhesive,

or factory applied self sealing lap. Cover circumferential joints with butt strips, not less than 3-inches wide, of material identical to the jacket material. Overlap longitudinal laps of jacket material not less than 1-1/2 inches. Adhesive used to secure the butt strip shall be the same as used to secure the jacket laps.

- B. Flanges, Unions, Valves and Fittings Insulation (Fiberglass): Factory fabricated removable and reusable insulation covers. Place factory premolded, precut or field-fabricated segmented insulation of the same thickness and conductivity as the adjoining pipe insulation around the flange, union, valve, and fitting abutting the adjoining pipe insulation. Install factory premolded one-piece PVC fitting covers over the insulation and secure by stapling or with metal or plastic tacks made for securing PVC fitting covers and secure with PVC vapor barrier tape.
- C. Pipe Insulation (Flexible Unicellular): Bond cuts, butt joints, ends, and longitudinal joints with adhesive. Miter 90-degree turns and elbows, tees, and valve insulation. Insulate flanges, unions, valves, and fittings.
- D. Where penetrating roofs and exterior walls, insulate piping to a point flush with the underside of the deck or wall and seal with a vapor barrier coating.
- E. Hangers and Anchors: Pipe insulation shall be continuous through pipe hangers. Where pipe is supported by the insulation, provide MSS SP-58, Type 40 galvanized steel shields (16 gage maximum). For fiberglass insulation systems on pipe sizes 2 inches through 3", provide insulation inserts at points of hangers and supports. Insulation inserts shall be of molded glass fiber (minimum 12 pcf). Insulation inserts shall cover the bottom half of the pipe circumference, 180 degrees, and be not less than 4" long. Vapor-barrier facing of the insert shall be of the same material as the facing on the adjacent insulation. Seal inserts into the insulation. Insulation inserts for pipe sizes 4" and larger shall be welded pipe saddles. Install insulation in void area of saddle of same material used on adjacent insulation. For pipe sizes 2" and smaller, insulation inserts for flexible unicellular insulation systems shall be wooden doweling set on end of length equal to insulation thickness. Seal dowel to insulation with adhesive.
- F. PVC or Metal Jackets: Provide over insulation. Machine cut jacket to smooth edge of circumferential joints. Overlap metal jacket not less than 2 inches at longitudinal and circumferential joints and secure with metal bands at not more than 9 inch centers. Overlap longitudinal joints down to shed water. Seal circumferential joints with a coating recommended by insulation manufacturer for weatherproofing. Solvent weld PVC jacket system to provide continuous watertight seal.

3.4 EQUIPMENT INSULATION

- A. General Procedures: Apply equipment insulation suitable for temperature and service to fit as closely as possible to equipment. Join sections of insulation with adhesive. Bevel insulation around nameplates, ASME Stamp, and access plates. For insulation on equipment that must be opened periodically for inspection, cleaning, or repair, construct insulation to be removable and replaceable without damage. Provide vapor barrier seal at joints and seams for "cold" equipment.

- B. Heating Equipment: Provide semi-rigid mineral fiberboard insulation. Seal longitudinal and lateral seams with FSK tape. Bond cuts, ends, and mitered sections with adhesive. Provide a vinyl-acrylic mastic coating on exposed fiberglass ends.
- C. Cold Equipment: Provide flexible unicellular sheet insulation, bond cuts, butt joints, longitudinal joints and ends with vapor barrier adhesive. Vapor seal exposed edges to equipment.

3.5 INSULATION APPLICATION SCHEDULE

<u>SERVICE</u>	<u>THICKNESS</u>	<u>MATERIAL/JACKET</u>
PIPING:		
Domestic Cold Water Piping 1" and smaller	1/2"	Fiberglass w/ASJ or Flexible Unicellular
1-1/4" and larger	1"	Fiberglass w/ASJ or Flexible Unicellular
Domestic Hot Water Piping and Domestic Hot Water Recirculation Piping 2" and smaller	1"	Fiberglass w/ASJ or Flexible Unicellular
Domestic Water Branch Piping Less than 10 ft in Stud Walls	1/2"	Fiberglass w/ASJ or Flexible Unicellular
Toll Booth Roof Drain Piping	1'	Flexible Unicellular w/ PVC Jacket

DUCTWORK:

Insulate the following ducts with 1½ inches installed thickness fiberglass duct wrap:

- a. ERV-1 Outside air ductwork
- b. ERV-1 Fresh air ductwork

3.8 FIELD INSPECTION

- A. Visually inspect to ensure that materials used conform to specifications. Inspect installations progressively for compliance with requirements.

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END OF SECTION 230713

SECTION 233113 – DUCTWORK & ACCESORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The drawings and the specifications including SECTION 230000 "SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS" are hereby made a part of the work of this section.

1.2 DESCRIPTION OF WORK

- A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the ductwork systems indicated.

1.3 SUBMITTALS

- A. Substitutions: Your attention is directed to Section 15000-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section should be achieved before reading the PRODUCTS section of this specification.
- B. The items for which the submittals paragraph in Section 230000, Supplemental General Mechanical Requirements, apply are as follows:
 - 1. Ductwork.
 - 2. Ductwork accessories.
 - 3. Firestopping materials and methods.
 - 4. Louvers and dampers.
 - 5. Ductwork sealing products.
 - 6. Registers and Grilles

PART 2 - PRODUCTS

2.1 DUCTWORK

- A. Classification of Ductwork: Low pressure ductwork: up to 2" W.G. static pressure. The duct pressure class shall be determined by multiplying the total static pressure scheduled in the fan schedules by 1.2.
- B. Materials: Unless otherwise indicated low pressure ductwork shall be galvanized steel. Galvanized sheet metal shall be new galvanized steel sheets of lock forming quality with zinc coating that will not flake or peel under forming operation.
- C. Construction for Low Pressure Round and Rectangular Ductwork:
 - 1. Material: Galvanized steel conforming to ASTM A527, weight of galvanized coating shall be not less than 1-1/4 ounces total for both sides of one sq.ft. of a sheet.

Construction, metal gage, and reinforcements shall conform with SMACNA "Duct Construction Standards" and NFPA 90A for 2" W.G. pressure class.

2. Fittings: Shall be constructed in accordance with SMACNA Standards and shall be of the types indicated (ONLY).
3. Longitudinal joints shall be Pittsburgh lockseam (ONLY). Button punch snap locks are not acceptable.
4. Joints shall be sealed to SMACNA seal class B.

2.2 DUCTWORK ACCESSORIES

A. Access Doors:

1. Low Pressure Duct Systems: Ruskin Model ADC2, 12"x12" size, 24 gauge galvanized steel, steel on both sides of door, foam gasket seals, 1" insulation, 2 cam locks, no hinge.

B. Counter Balanced Dampers (CBD): Aluminum frame and blades, extruded vinyl edge seals, 2-1/4" deep, set 0.06" WG.

C. Backdraft Dampers (BDD): Ruskin Model CBD2 or American Warming and Ventilating aluminum frame and blades, extruded vinyl edge seals, field set at 0.10" W.G. pressure differential for full open operation.

D. Flexible Duct Connections: Ventfabrics, Inc. neoprene coated glass fabric.

E. Drawbands for Flexible Ducts: Clinch type stainless steel with screwdriver adjustment, or nylon with lever action tightening tool provided by the drawband manufacturer.

F. Turning Vanes: (Low Pressure):

1. Solid blade, mounted with the long edge down stream in accordance with duct construction details indicated. Submit a 12"x12" sample elbow for review prior to fabrication.

G. Joint Sealer:

1. Hardcast DT tape and FTA-20 activator.
2. Provide waterproof sealer where watertight seal is specified.

H. Louvers (L): Ruskin model ELF6375DX. Extruded aluminum construction, 0.081" thick, aluminum extrusions, drainable blade, 1/2" expanded metal bird screen, size and performance as scheduled. AMCA certified leakage rate shall be a maximum of 0.01 ounces of water per square foot of free area at 1250 FPM free area velocity. Provide Kynar 500 finish, color selected by Architect. Provide frame styles compatible with building construction, see architectural details. Provide concealed architectural or standard visible

mullions in multi-panel louver assemblies as indicated on the drawings. Inactive / blanked-off louvers shall have a double wall, insulated sheetmetal closure on the interior face of the louver. The closure shall have a 2" thickness of 1.5 pcf rigid fiberglass board insulation with a foil face. Both sides of the sheetmetal shall be painted flat black.

I. Diffusers, Grilles and Registers

1. Grilles and/or registers shall be installed at all air supply, relief, return and exhaust openings as shown. All units to be steel, except as noted, and provided with baked enamel finish to match color of grille or register and countersunk screw holes. Mounting screws shall be oval head type with head painted to match finish. Unless stated otherwise, the following list is based on model numbers of Price to establish a standard of quality (if substituting, certified sound criteria shall be included with submittals indicating CFM and NC levels of each register and grille). Anemostat, Krueger, Metalaire and Tituis only will also be considered for review.
 - a. Supply Registers: Double deflection; with opposed blade damper and $\frac{3}{4}$ inch front blade spacing; front blades set horizontal.
 - b. Exhaust and Return Registers: with opposed blade damper and $\frac{3}{4}$ inch blade spacing, 35° front blade angle, front blades set horizontal.
 - c. Exhaust, Return and Transfer Grilles: without damper, $\frac{3}{4}$ inch blade spacing, 35° front blade angle, front blades set horizontal.

PART 3 - EXECUTION

3.1 SURFACE CONDITION

A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
3. Verify that the duct system
4. s may be installed in accordance with pertinent codes and regulations and the reviewed Submittals.

3.2 INSTALLATION OF DUCTWORK AND AIR DEVICES

- A. Provide and erect in accordance with the best practice of the trade ductwork shown on the drawings and as required to complete the intended installation. Make offsets as shown or required to place ductwork in proper position to avoid conflicts with other work and to allow the application of insulation and finish painting to the satisfaction of the Architect. Sizes given are "inside - clear" dimensions and not necessarily that of sheet metal. Ducts shall be arranged to adjust to "field conditions". The Sheet Metal trades shall coordinate his work

with other trades. Work shall conform to ASHRAE duct construction recommendations, SMACNA "Duct Construction Standards", NFPA, and the requirements of BOCA code.

- B. Joint Sealing: See PRODUCTS section.
- C. Longitudinal joints: See PRODUCTS section.
- D. Turns shall be made with long radius elbows or, if physically impossible to use long radius elbows, shall be square turns with specified turning vanes. CAUTION: Turns not conforming to this requirement shall be ordered removed and replaced with properly built turns.
- E. Access Doors: Provide access doors for concealed apparatus requiring service and inspection in the duct system including but not limited to dampers, sensors and motors, and upstream and downstream from duct coils.
- F. Duct Sleeves and Prepared Openings: Install duct sleeves and prepared openings for duct mains, duct branches, and ducts passing through walls, roofs, and ceilings. Insure the proper size and location of sleeves and prepared openings. Allow one-inch clearance between duct and sleeve or one-inch clearance between insulation and sleeve for insulated ducts, except at grilles, registers, and diffusers.
- G. Duct Supports: Unless otherwise indicated, provide one-inch wide by 16 gage galvanized steel sheet metal strips on each side of ducts. Anchor risers in the center of the vertical run to allow ends or riser free vertical movements. Attach supports only to structural framing members. Do not anchor supports to metal decking unless a means is provided (architectural review required) for preventing the anchors from puncturing the metal decking. Where supports are required between structural framing members, provide suitable intermediate metal framing. Where C clamps are used, use retainer clips.
- H. Flexible Collars and Connections: Provide flexible collars between fans and ducts or casings and where ducts are of dissimilar metals, as indicated or required. For round ducts, securely fasten flexible connections using stainless steel clinch-type draw-band. Nylon drawbands may be used if installed using the drawband manufacturer's lever-action tightening tool. For rectangular ducts, lock flexible connections to metal collars.
- I. Any deviation in the duct system must be submitted as a shop drawing and stamped. CAUTION: Any deviation not submitted and favorably reviewed will be ordered removed from the system and replaced with that which is shown on the Drawings.
- J. Discrepancies between actual field conditions and the Contract Documents shall be brought to the attention of the Architect prior to fabrication.
- K. Field Changes to Ductwork: Field changes of ducts such as those required to suit the sizes of factory-fabricated equipment actually furnished shall be designed to minimize expansion and contraction. Use 4:1 transitions in field changes as well as modifications to connecting ducts.

- L. Transitions with a slope greater than 4 to 1 shall be ordered removed from the system and replaced with a transition, which meets this criteria.
- M. Joints and seams at intake and exhaust plenums and joints on intake and exhaust ductwork for a distance of 3 feet from the plenum shall be sealed watertight on the bottom and side joints and seams.
- N. Isolation dampers at intake and exhaust louvers and vent hoods shall be sealed to the ductwork to provide an airtight assembly with similar performance characteristics to the isolation damper.

3.3 CLOSING IN WORK

- A. Cover up or enclose work after it has been properly and completely tested and reviewed.
- B. No additional cost to the Owner will be allowed for uncovering or recovering any work that is covered or enclosed prior to required test and review.

3.4 TEST AND ADJUST

- A. Ductwork shall be leak tested in accordance with Section 15990 "Testing and Balancing Air and Water Systems". Provide end cap and closure pieces. Close off and seal openings in ductwork to be tested. Ductwork shall be tested before it is insulated.
- B. Before operating any system, the system shall be cleaned out to remove dust and foreign materials.
- C. After the installation is complete and ready for operation, test the system under normal operating conditions in the presence of the Architect and demonstrate that the system functions as designed.
- D. Correct defects, which develop during the test period, conduct additional testing until defect free operation is achieved.

3.5 CLEANUP AND CORROSION PREVENTION

- A. Ductwork and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.
- B. Before covering is applied to duct systems, clips, rods, clevises and other hanger attachments, and before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces.

3.6 INSTRUCTIONS

- A. On completion of the project, instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours. The time of instruction shall be arranged with the Owner. In addition to the prime Mechanical

Contractor, the control system Contractor, Balancing Contractor, and Owner's representative shall be present and participate in the Owner's instruction.

3.7 FIRESTOPPING

- A. All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

END OF SECTION

SPECIFICATION SECTION 236000 – HVAC SYSTEMS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the heating, ventilating and air conditioning systems indicated.

1.2 RELATED DOCUMENTS

- A. The drawings and the specifications including SECTION 230000 "SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS" are hereby made a part of the work of this section.

1.3 SUBMITTALS

- A. Substitutions: Your attention is directed to Section 230000-"Substitutions", relative to competition and the (ONLY) notation. Familiarity with this section should be achieved before reading the PRODUCTS section of this specification.
- B. The items for which the submittals paragraph in Section 230000, Supplemental Mechanical General Requirements, apply are as follows:
 - 1. Energy Recovery Unit ERV-1
 - 2. Electric Baseboard EBB -1,2,3
 - 3. Electric Wall Heater EWH-1,2
 - 4. Variable Refrigerant Flow OU-1,2
 - 5. Variable Refrigerant Flow IU-1,2
 - 6. Cabinet Unit Heaters CUH-1 in Toll Booths
 - 7. Split System Heat Pump HP-1&A H-1 in Toll Booths

PART 2 - PRODUCTS

2.1 CENTRAL HEAT PUMP SYSTEM (OU-1.2 & IU 1&2)

- A. Provide and install variable refrigerant flow, split system, central heat pump systems where indicated on drawings. All components and controls must be of the same manufacturer and intended to function together as a unified system. Capacities shall be as scheduled on sheet M2 Installing contractor must be certified by the equipment manufacturer to properly install the system as specified. Evidence of certification must be included with shop drawing submittals.
- B. The systems (outdoor units and air handling units) and equipment described herein are based on a Mitsubishi City-Multi system consisting of PKA and PCA series indoor (air

handling) units, PUZ inverter driven outdoor (Compressor/Condenser) unit and M-NET DDC (Direct Digital Controls).

The outdoor Compressor/Condenser unit shall be horizontal air flow, 208/230 volt, single phase. Equivalent equipment meeting the features and performance requirements of this equipment will be considered.

- C. Units shall be listed by Electrical Laboratories (ETL) and bear the ETL label. All wiring shall be in accordance with the National Electrical Code (N.E.C.). Units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

Provide a full diagrammatic drawing of the dehumidification system showing all components (including equipment tags), refrigerant piping (including lengths and sizes) and control wiring with the shop drawings.

- D. Outdoor (Compressor/Condenser) Units

1. The outdoor units shall be intended specifically for use with other system components. They shall have a powder coated finish and be completely factory assembled, piped and wired. Units shall be run tested at the factory.
2. The PUZ outdoor units shall be equipped with circuit boards that interface to the Mitsubishi M-NET control system and shall perform all functions necessary for operation.
3. Unit electrical power shall be 208/230 volts, 1-phase, 60 hertz and shall be capable of satisfactory operation within voltage limits of 187-228 volts.

- E. Air Handling Units

1. Units shall be models PKA, high-performance indoor fan coils for wall mounted units and model PCA for ceiling suspended units and shall have a modulating linear expansion device. Units shall support individual control using M-NET DDC controllers.
2. Units shall be factory assembled, wired and run tested. Contained within each unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. Units shall have a self-diagnostic function and an auto restart function. Air handling units and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
3. Coils
 - a. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
 - b. The tubing shall have inner grooves for high efficiency heat exchange.

- c. All tube joints shall be brazed with phos-copper or silver alloy.
- d. The coils shall be pressure tested at the factory.
- e. A condensate pan and drain shall be provided under the coil.
- f. Each unit shall include a condensate lift mechanism that will be able to raise drain water not less than 12 inches above the condensate pan.
- g. Both refrigerant lines to the PKFY indoor units shall be insulated.

4. Electrical

- a. Unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.
- b. System shall be capable of satisfactory operation within voltage limits of 187-228.

5. Controls:

- a. Air handling units shall cycle in response to their own electronic wall mounted thermostats. Controls shall be a product of this manufacturer and installed by the ATC Contractor.
- b. In the dehumidification mode the air handler fans shall cycle on demand for cooling and signal the outdoor unit to activate. There shall be no heating associated with the systems.

F. Warranty

All units shall be covered by the manufacturer's limited warranty for a period of one (1) year from date of Substantial Completion. In addition, the compressors shall have a manufacturer's limited warranty for a period of six (6) years from date of Substantial Completion.

If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty shall not include labor.

G. Options to include

- 1. 18" High Equipment Stands
- 2. Side and End Snow & Hail Guards.
- 3. Sea Coast Protection

2.2 ENERGY RECOVERY UNIT (ERV-1)

A. Product Specification

1. Energy Recovery Ventilator (ERV) shall be a packaged unit as manufactured by RenewAire or reviewed equal and shall transfer both heat and humidity using static plate core technology.

RenewAire Model EV130 or reviewed equal.

B. Quality Assurance

1. The energy recovery ventilator shall be Certified by the Home Ventilating Institute (HVI) under CSA 439. Both a heating and a cooling test must be run to demonstrate year round energy recovery.
2. Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA 90A and NFPA 90B requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.
3. Unit shall be Listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers. The unit must pass commercial flammability requirements and shall not be labeled "For Residential Use Only".
4. The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of five years from the date of purchase.

C. Energy Transfer

The ERV shall be capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.

D. Passive Frost Control

The ERV core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%). Occasional more extreme conditions shall not affect the usual function, performance or durability of the core. No condensate drains will be allowed.

E. Continuous Ventilation

Unit shall have the capacity to operate continuously without the need for bypass, recirculation, pre-heaters or defrost cycles under normal operating conditions.

F. Positive Airstream Separation

Water vapor transfer shall be through molecular transport by hydroscopic resin and shall not be accomplished by "porous plate" mechanisms. Exhaust and fresh airstreams shall travel at all times in separate passages and airstreams shall not mix.

G. Laminar Flow

Airflow through the ERV core shall be laminar over the products entire operating airflow range, avoiding deposition of particulates on the interior of the energy exchange plate material.

A. Construction

1. The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.

2. No condensate drain pans or drains shall be allowed and unit shall be capable of operating in both winter and summer conditions without generating condensate.
3. The unit case shall be constructed of 24-gauge steel, with lapped corners and zinc plated screw fasteners. The case shall be finished with textured, powder coat paint (GR90 case shall be constructed of G90 galvanized steel).
4. Access doors shall provide easy access to blowers, ERV cores and filters. Doors shall have an airtight compression seal using closed cell foam gaskets.
5. Case walls and doors shall be fully insulated with 1 inch, expanded polystyrene foam insulation faced with a cleanable foil face on all exposed surfaces.
6. The ERV cores shall be protected by a MERV-8 rated, spun polyester, disposable filter in both airstreams.
7. The unit shall have a line cord power connection and be supplied with an internal 24 VAC transformer and relay. (G90 shall have hardwired line voltage connection and be controlled by line voltage controls provided by others.)
8. Standby power draw shall not exceed 1 Watt for the unit along with an optional automatic control.

2.3 CABINET UNIT HEATER CUH-1 (In Each Toll Booth)

- A. Furnish and install where shown on the drawings Rinnai Model EX38CTP Direct Vent Wall Furnace.
 - 13,200 to 36,500 BTUH output LP gas heat
 - 263 CFM
 - 80% AFUE
- B. Furnish and install the Rinnai Vent and Vent Extension Kit through the Toll Booth roofs.
- C. Furnish and install the Extension Pipe Cover Kits for pipe exposed in the Toll Booths.
- D. Installation to be per Manufacturer Installation Requirements and Recommendations..

2.4 ROOF-MOUNTED SPLIT SYSTEM HEAT PUMP (In Each Toll Booth) HP-1 & AH-1

- A. Indoor Unit to be Mitsubishi SLZ-KA15NA or reviewed equal
 - Ceiling-recessed cassette (24"x24") ductless heat pump
 - Wide airflow pattern for excellent air distribution
 - Built-in drain condensate lift mechanism
 - Multiple control options available:
 - Third-party interface options
 - Long-life air filter included
- B. Outdoor Unit to be Mitsubishi SUZ=KA15NAA or reviewed equal.
 - Variable speed INVERTER-driven compressor
 - Innovative Joint Lap DC Motor leads to high efficiency and reliability
 - Pulse Amplitude Modulation technology
 - High-performance grooved piping for increased heat exchange efficiency
- C. Options to be included
 - a. Wired MA wall-mounted controller
 - b. 12" High Mounting Stand

c. Refrigerant Line Set.

2.5 ELECTRIC BASEBOARD HEAT

- A. Furnish and install where shown on the drawings Architectural Style Electric Baseboard Heat. Markel 3700 Series or approved equal.
- B. Baseboard to have the Standard features:
 - 1. White powder coated finish
 - 2. 12 Gauge heavy duty extruded Aluminum housing
 - 3. Stainless steel heating element and Aluminum fins.
 - 4. Automatic thermal linear limit along the entire heated length.
 - 5. Junction Boxes on both ends.
 - 6. Wire guards along entire outlet area.
- C. Include the following optional features on all baseboard.
 - 1. Factory Disconnect mounted in baseboard cover.
 - 2. Factory low-voltage relay in each unit.

2.6 ELECTRIC WALL HEATERS

- A. Furnish and install where shown on the drawings an Electric Heavy-Duty Wall Heaters. Markel Series 3420 or approved equal.
- B. Wall Heaters to have the Standard features:
 - 1. Power coated bar stock steel tamper proof grille
 - 2. Extruded Aluminum frame and 16 GA housing.
 - 3. In-Built double pole tamper-proof thermostat.

2.7 REFRIGERANT PIPING

- A. Line Test Pressure for Refrigerant R-410A:
 - 1. Suction Lines for Air-Conditioning Applications: 300 psig.
 - 2. Suction Lines for Heat-Pump Applications: 535 psig.
 - 3. Hot-Gas and Liquid Lines: 535 psig.
- B. Copper Tube: ASTM B 280, Type ACR.
- g. Wrought-Copper Fittings: ASME B16.22.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Inspection:
 1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
 2. Verify that the heating system may be installed in accordance with pertinent codes and regulations and the reviewed Submittals.

3.2 INSTALLATION OF REFRIGERANT & CONDENSATE PIPING

- A. In general, piping shall be run concealed above ceilings in occupied areas. Piping in other areas may be run exposed. Piping shall not be exposed in occupied spaces unless written authorization is given by the Architect.
- B. Provide and erect in accordance with the best practice of the trade piping shown on the Drawings and as required to complete the intended installation. Make offsets as shown or required to place piping in proper position to avoid other work and to allow the application of insulation and finish painting to the satisfaction of the Architect.
- C. All joints to be a mechanical connection or Brazed. Clean surfaces to be Brazed and flow Nitrogen through the system during the brazing process.
- D. PVC piping shall have solvent welded joints except at connections to equipment and valves which shall be screwed for sizes 2" and smaller and flanged for sizes 2-1/2" and larger. Solvent welded joints: Pipe ends deburred, and beveled. Pipe end and fitting: Cleaned and dried, primed to soften bonding surfaces. Pipe end: Apply even full layer of solvent cement after priming. Before cement starts to set, insert pipe end into fitting and turn 1/4 turn to evenly distribute cement. Hold joint together until cement sets-up, wipe excess cement off joint.
- E. Pipe penetrations through walls, floors and ceilings shall have pipe sleeves of the same material as the pipe and in accordance with Section 15000 "Supplemental Mechanical General Requirements" and BOCA. Pipe sleeves shall be suitable for firestopping in accordance with the firestopping manufacturers recommendations. Traverse points of piping shall be escutcheoned with split chrome floor and ceiling plates and spring anchors, where visible to occupancy.

3.3 PIPE HANGERS

- A. Impact driven studs are not acceptable.
- B. Pipes (copper or steel) shall be supported at intervals and rod sizes as follows, double nuts on hangers and on beam clips.

Pipe Size	Hanger Intervals	Rod Sizes
1/2"	5'	3/8"
3/4"	6'	3/8"
1"	7'	3/8"
1-1/4"	8'	3/8"
1-1/2"	9'	3/8"

2"	10'	3/8"
2-1/2"	11'	1/2"
3"	12'	1/2"

- C. Verticals: Supported at the base and at intervals as follows by use of clamp hangers:

Steel Pipe: Not more than 16 ft.

Copper Pipe and Tubing:

1-1/2" and larger - Not more than 12 ft.

1-1/4" and smaller - Not more than 6 ft.

- D. Provide welded steel saddles at each hanger on steel piping systems 4" and larger.
- E. PVC Piping: Supported at 4' intervals.

3.4 CLOSING IN WORK

- A. Cover up or enclose work after it has been properly and completely tested and reviewed.
- B. No additional cost to the Owner will be allowed for uncovering or recovering any work that is covered or enclosed prior to required test and review.

3.5 TEST AND ADJUST

- A. Piping Systems: Test with water to a pressure of 75 psi and hold for a period of two hours. Repair any leaks and retest the piping system; repeat process until systems are leak-free. Test piping before it is insulated.
- B. Before operating any system, flush the piping to remove oil and foreign materials.
- C. After the installation is complete and ready for operation, test the system under normal operating conditions in the presence of the Architect and demonstrate that the system functions as designed.
- D. Demonstrate that the HVAC systems have free and noiseless circulation of water, that all air has been purged, and that systems are watertight.
- E. Correct defects, which develop in operational testing, conduct additional testing until defect free operation is achieved.

3.7 CLEANUP AND CORROSION PREVENTION

- A. Piping and equipment shall be thoroughly cleaned. Dirt, dust, and debris shall be removed and the premises left in a clean and neat condition.
- B. Before covering is applied to piping systems, clips, rods, clevises and other hanger attachments, and before uncovered piping is permitted to be concealed, corrosion and rust shall be wire brushed and cleaned and in the case of iron products, a coat of approved protective paint applied to these surfaces. When corrosion is from the effects of hot solder

paste, the areas shall be cleaned and polished and a wash of bicarbonate of soda and water used to neutralize the acid condition.

3.8 INSTRUCTIONS

- A. On completion of the project, instruct the Owner's representative in the care and operation of the system. The total period of instruction shall not exceed four (4) hours per building. The time of instruction shall be arranged with the Owner. In addition to the prime Mechanical Contractor, the control system Contractor, Balancing Contractor, and Owner's representative shall be present and participate in the Owner's instruction.

3.9 FIRESTOPPING

- A. All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

END OF SECTION 236000

SECTION 250000 – AUTOMATIC TEMPERATURE CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. The work covered by this Section of the specifications includes the furnishing of labor, materials, equipment, transportation, permits, inspections and incidentals and the performing of operations required to install the automatic temperature control system indicated. The system shall be a electric/electronic (not DDC) system to provide the sequences as described in these specifications. The ATC system shall be complete including required components including, low voltage and line voltage wiring. The system shall function as a completely independent system and shall include a wall mounted interface panel for adjusting system settings. The system shall not require a computer terminal or laptop be present to adjust any systems settings.

1.2 RELATED DOCUMENTS

- A. The drawings and the specifications including SECTION 230000 "SUPPLEMENTAL MECHANICAL GENERAL REQUIREMENTS" are hereby made a part of the work of this section.

1.3 QUALIFICATIONS: The ATC system shall be one of the following: Honeywell, Siemens, Trane, JCI, IB Controls, BASIX or Maine Controls.

1.4 SUBMITTALS

- A. Substitutions: Your attention is directed to Section 230000 relative to competition and the (ONLY) notation. Familiarity with this section should be achieved before reading the PRODUCTS section of this specification.
- B. The items for which the shop drawings paragraph in Section 230000, Supplemental General Mechanical Requirements, apply are as follows:
 - 1. Temperature control system schematic including variables, flow diagrams, ladder diagrams, and point to point wiring diagrams, indicating set points, reset ranges, throttling ranges, controller gains, differentials, operating ranges, normal positions, controller action, dial ranges, voltages, currents, mounting locations, indicators, and terminal strip points.
 - 2. Sequence of operation for each system and function.
 - 3. Generic, functional description of each control component indicated.
 - 4. Equipment interlocks required by sequence of operation.
 - 5. Manufacturer's Data:
 - a. Dampers, valves and operators.

- b. Controllers, including wiring and connection diagrams.
- c. Thermostats, temperature sensors, including wiring and connection diagrams.
- d. Temperature and pressure indicators.
- e. Pressure sensors, including wiring and connection diagrams.
- f. Switches, relays, transmitters, transformers, including wiring and connection diagrams.

PART 2 - PRODUCTS

2.1 CONTROL PANELS

- A. In general, relays, transformers, or other control devices (not including room thermostats or duct-mounted instruments) shall be grouped and mounted in a factory-built cabinet enclosure.
- B.

2.2 SEQUENCE OF CONTROL

- A. Provide and install electronic/electric components to enable the mechanical system to operate in the following sequences:
 - 1. Energy Recovery Ventilator ERV-1 shall run continuously. System to run on the internal controls provided with the ERV unit
 - 2. Electric Wall Heaters EWH-1&2 to operate off the built-in thermostat in the units.
 - 3. Electric Baseboard EBB-1,2,3 to be supplied with a built-in relay. Energize the relays on a 12v signal from the external heat relay supplied with IU-1.
 - 4. Heat Pumps systems OU-1/IU-1 and OU-2/IU-2 to operate off the thermostats supplied by the equipment manufacturer. Install, wire and test the entire heat pump systems.
 - 5. For the Cabinet Unit Heaters in the Toll Booths provide and install low voltage control and a remote thermostat provided with the Unit Heater.
 - 6. The Spilt System Heat Pumps in the Toll Booths provide and install low voltage control wiring for the remote thermostat provided with the Manufacturer.

PART 3 - EXECUTION

3.1 SURFACE CONDITIONS

- A. Inspection:

1. Prior to work of this Section, carefully inspect the installed work of other trades and verify that such work is complete to the point where this installation may properly commence.
2. Verify that the automatic temperature control and system may be installed in strict accordance with pertinent codes and regulations and the reviewed Shop Drawings.

3.2 INSTALLATION

- A. Provide wiring, and conduit to connect the ATC components for an operational ATC system. Wiring and installation shall conform to NFPA 70.
- B. Identification: Label or code each field wire at each end. Permanently label or code each point of field terminal strips to show the instrument or item served. Color-coded cable with annotated cable diagrams may be used to accomplish cable identification.

3.3 ADJUSTMENTS

- A. Adjust controls and equipment to maintain the conditions indicated, to perform the functions indicated, and to operate in the sequence specified.

3.4 INSTRUCTING OPERATING PERSONNEL

- A. Upon completion of the work and when designated by the Architect, furnish the services of a competent technician regularly employed by the temperature control manufacturer for the instruction of Owner in the operation and maintenance of each automatic space temperature control system. The period of instruction shall be for not less than two 8-hour working days and shall include videotape demonstration of controllers.

3.5 FIELD INSPECTION AND TESTS

- A. Tests shall be performed or supervised by employees of the ATC system or manufacturer of the ATC system, or by an authorized representative of the ATC manufacturer. Give Architect 14 calendar days advance written notice prior to the date of the field acceptance testing. If the Architect witnesses tests, such tests shall be subject to approval. If the Architect does not witness tests, provide performance certification.
- B. Plan for Inspections and Tests: Furnish a written inspections and tests plan at least 60 days prior to the field acceptance test date. This plan shall be developed by the manufacturer of the ATC system. The plan shall delineate the inspections and testing procedures required for the ATC system to demonstrate compliance with the requirements specified. Additionally, the test plan shall indicate how ATC system is to be tested, what variables will be monitored during test, names of individuals performing tests, and what criteria for acceptance should be used. Indicate how operation of H&V system and ATC system in each seasonal condition will be simulated.
- C. Field Acceptance Testing: Upon completion of 72 hours of continuous H&V and ATC systems operation and before final acceptance of work, test the automatic temperature control systems in service with the heating, ventilating and air conditioning systems to demonstrate compliance with contract requirements. Test controls through each cycle of

operation, including simulation of each season insofar as possible. Test safety controls to demonstrate performance of required function. Adjust or repair defective or malfunctioning automatic space temperature control equipment or replace with new equipment. Repeat tests to demonstrate compliance with contract requirements.

3.6 FIRESTOPPING

- A. All penetrations of fire-rated assemblies including walls and floors by mechanical system components (piping, ductwork, conduits, etc.) shall be firestopped as specified.

END OF SECTION 250000

SECTION 26000

ELECTRICAL

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. Provide required electrical work associated with electrical systems for a new administration building. Work shall include the following:
 - 1. Provide a 120/208 volt, 3-phase, 4-wire underground secondary electrical service from a new utility pole service transformer bank.
 - 2. Provide electrical circuit breaker panelboards.
 - 3. Provide electrical branch circuit connections to mechanical systems equipment.
 - 4. Provide interior and exterior lighting and associated wiring
 - 5. Provide wiring devices and associated wiring.
 - 6. Provide a fire alarm system.
 - 7. Provide network wiring outlets and associated wiring.
 - 8. Provide network optical fiber patch panel.
 - 9. Provide a lightning protection system.
- B. Furnish all materials, labor, tools, transportation, incidentals, and appurtenances to complete in every detail and leave in working order all items of work called for herein or shown on the accompanying drawings.
- C. Include any minor items of work necessary to provide a complete and fully operative electrical system.

1.02 REFERENCES

- A. ANSI C80.3 - Electrical Metallic Tubing, Zinc-Coated.
- B. ANSI / NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- C. ANSI / NFPA 70 - National Electrical Code.
- D. ANSI/NFPA 72 – National Fire Alarm Code
- E. ANSI / NFPA 101 - Life Safety Code.
- F. NEMA OS-1 – Sheet Steel Outlet Boxes, Device Boxes, Covers and Box Supports.
- G. NEMA WD 1 – General Purpose Wiring Devices.
- H. NEMA TC 2 – Schedule 40 PVC conduit

- I. NFPA 780 – Standard for the Installation of Lightning Protection Systems
- J. UL 38 – Manually Actuated Signaling Boxes
- K. UL 50 – Cabinets and Boxes
- L. UL 96A – Installation Requirements for Lightning Protection Systems
- M. UL 864 – Control Units for Fire Protective Signaling Systems
- N. UL 268 – Smoke Detectors for Fire Protective Signaling Systems
- O. UL 346 – Waterflow Indicators for Fire Protective Signaling Systems
- P. UL 464 – Audible Signaling Appliances
- Q. UL 521 – Heat Detectors for Fire Protective Signaling Systems
- R. UL 1971 – Visual Notification Appliances

1.03 GENERAL REQUIREMENTS

- A. Contractor shall read the entire specifications covering other branches of work. He is responsible for coordination of his work with work performed by other trades.
- B. Consult all Contract drawings which may affect the location of any equipment or apparatus furnished under this work and make minor adjustments in location as necessary to secure coordination.
- C. System layout is schematic and exact locations shall be determined by structural and other conditions. This shall not be construed to mean that the design of the system may be arbitrarily changed. The equipment layout is to fit into the building as constructed and to coordinate with equipment included under other Divisions of work.
- D. Contractor shall contact the Owner's Representative immediately if he notices any discrepancies or omissions in either the drawings or the specifications, or if there are any questions regarding the meaning or intent thereof.
- E. Submit all changes, other than minor adjustments, to the Architect for approval before proceeding with the work.
- F. Contractor shall meet with Architect on site prior to rough-in of electrical to verify

location of lighting fixtures, wiring devices, fire alarm devices, telephone and cable.

- G. Route wire and cable as required to meet Project Conditions. Include wire and cable lengths within 10 feet of length shown for all local data outlets.
- H. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.

1.04 SUBMITTALS

- A. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in single submittals.
- B. Mark dimensions and values in units to match those specified.
- C. Contractor shall check all shop drawings for dimensional correctness, interferences and conformance to specifications and plans. Stamp drawings “approved” and indicate when stipulated check has been made before forwarding them. Identify submittal data by project name and equipment identification number.
- D. Submit lightning protection air terminals and mounting accessories, grounding conductors, grounding electrodes, and ground connection equipment
- E. Submit lightning protection system details, including air-terminal locations, conductor routing and connections, and bonding and grounding provisions. Include indications for use of raceway, data on how concealment requirements will be met, and calculations required by NFPA 780 for bonding of grounded and isolated metal
- F. Submit lightning protection qualification data for firms and persons. Include data on listing or certification by an NRTL or LPI.
- G. Submit lightning protection field inspection reports indicating compliance with UL Master Label Certification.

1.05 REGULATORY REQUIREMENTS

- A. Complete installation shall conform with all applicable Federal, State and Local laws, Codes and Ordinances, included but not limited to latest approved editions of the following:
 - 1. State Building Codes.
 - 2. Specific Construction Safety Requirements, State Industrial Commission.
 - 3. National Electrical Code (NFPA 70).
 - 4. Life Safety Code, NFPA 101.
 - 5. Occupational Safety and Health Act (OSHA) of 1971 and all amendments thereto.

6. Local Building Code(s).
 7. Maine Turnpike Authority Standards
 8. National Fire Alarm Code (NFPA 72)
 9. Americans with Disabilities Act (ADA)
- B. Nothing contained in the drawings and specifications shall be construed to conflict with these laws, codes, and ordinances and they are thereby included in these specifications.
- C. The Contractor shall visit the site to become familiar with all existing conditions affecting this work. No claim will be recognized for extra compensation due to failure of contractor to familiarize himself/herself with the conditions and extent of proposed work.
- D. The Contractor shall obtain state electrical permits. Request inspections from authority having jurisdiction.
- E. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for Local Protected Premises Signaling Systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.
- F. The fire alarm system shall comply with requirements of NFPA Standard No. 72 for Auxiliary Protected Premises Signaling Systems except as modified and supplemented by this specification. The system field wiring shall be supervised either electrically or by software-directed polling of field devices.
- G. The fire alarm system shall be manufactured by an ISO 9001 certified company and meet the requirements of BS EN9001: ANSI/ASQC Q9001-1994.

1.06 LIGHTNING PROTECTION QUALITY ASSURANCE

- A. Engage an experienced installer who is an NRTL or who is certified by LPI as a Master Installer/Designer. Installer shall be UL listed as a lighting protection installer.
- B. All system components utilized in the installation shall comply with the Standard for Lightning Protection Components, UL 96A.

1.07 RECORD DRAWINGS

- A. Record any changes in location of boxes, service runs, and similar construction on a set of prints and deliver them to the Owner's Representative upon completion of the work.

1.08 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. Provide a Complete Instruction and Maintenance Manual: Prepare in the form of an instructional manual for use by Owner's personnel. Provide one (1) draft copy and two (2) final copies.
 - 1. Format:
 - 2. Size: 8-1/2" x 11", 20 lb. minimum weight white paper for typed pages, either manufacturer's printed data, or neatly typewritten.
 - 3. Single-sheet product literature and contractor-prepared pages: Provide reinforced punched binder tab.
 - 4. Cover: Identify each volume with typed or printed title "ELECTRICAL SYSTEMS OPERATING AND MAINTENANCE INSTRUCTIONS".

1.09 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Owner and Architect before proceeding

1.10 ELECTRICAL MOTORS

- A. In general, motors will be furnished and installed under other Divisions of work as a factory-installed item. Unless they are factory installed on the unit, all wiring, safety switches and motor starters shall be furnished and installed by the Electrical Contractor, field coordinate prior to bids.
- B. Electrical Contractor shall obtain all wiring diagrams necessary to connect and control equipment requiring electrical energy.

1.11 TEMPORARY POWER AND LIGHTING

- A. The Contractor shall be responsible for provision of temporary electrical power and lighting as required to facilitate construction work.
 - 1. Temporary electrical power shall be obtained from the serving electrical utility company.
 - 2. The Contractor shall provide temporary electrical power distribution as required to facilitate construction activities including:
 - a. Wire/conduit
 - b. Over-current protection
 - c. Receptacle outlets
 - d. Motor disconnect means
 - e. Grounding

3. The Contractor shall provide temporary lighting as required to facilitate construction activities.
4. All temporary electrical power and lighting shall be completely removed prior to substantial completion of the project.

1.12 WARRANTIES

- A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of Substantial Completion.

PART 2 - PRODUCTS

2.01 CONDUIT AND FITTINGS

- A. Electrical Metallic Tubing (EMT): ANSI C80.3 galvanized tubing, $\frac{3}{4}$ " minimum size.
 1. Fittings: Set screw-type ANSI/NEMA FB1.
- B. Flexible Metal Conduit: Steel, $\frac{3}{4}$ " minimum size.
 1. Fittings: ANSI/NEMA FB1.
- C. Liquid-Type Flexible Metal Conduit: Flexible metal conduit with PVC jacket.
 1. Fittings: ANSI/NEMA FB1.
- D. Rigid steel conduit (RGS): Galvanized rigid steel, ANSI C80.1.
 1. Fittings: ANSI/NEMA FB1, threaded-type.
- E. Plastic Conduit: NEMA TC-2 Schedule 40 PVC and Schedule 80 PVC.
 1. Fittings: NEMA TC-3.

2.02 BUILDING WIRE

- A. Description: Single conductor insulated wire, #12 AWG minimum size.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation Type: THHW or XHHW with 75°C insulation.

2.03 METAL CLAD CABLE

- A. Description: NFPA 70 Type MC.
- B. Conductor: Copper only, #12 AWG minimum size.

- C. Insulation Voltage Rating: 600 volts.
- D. Insulation Temperature Rating: THHW 75°C.
- E. Insulation Material: Thermoplastic.
- F. Armor Material: Steel or Aluminum, interlocking tape.

2.04 BOXES

- A. Outlet boxes: NEMA OS 1, galvanized steel.

2.05 WIRING DEVICES

- A. Manufacturers: *Pass & Seymour* model numbers are listed below to establish configuration and type. Equal devices by the following other approved manufacturers will be accepted.
 - 1. *Leviton*
 - 2. *Hubbell*
- B. Wall Switches
 - 1. Description: NEMA WD1, specification grade, AC only general-use snap-switch.
 - 2. Voltage Rating: 120-277 volts, AC.
 - 3. Current Rating: 20 Amperes.
 - 4. Color: White.
 - 5. SPST: *CS20AC1-W*
 - 6. 3-Way: *CS20AC3-W*
- C. Standard Receptacles
 - 1. Description: NEMA WD1; Heavy-duty type, 125-volt grounded duplex receptacle.
 - 2. Device Body: Ivory nylon (normal power circuits); Orange or White nylon (clean power circuits)
 - 3. Configuration: NEMA 5-20.
 - 4. Color: See C2 above.
 - 5. Model: *CR20-W*
- D. Ground Fault Receptacles:
 - 1. Description: UL 498, 544, 943; 125 volt, ground fault interrupt type duplex receptacle with TEST and RESET.
 - 2. Device Body: White, Thermoplastic.
 - 3. Configuration: NEMA 5-20.
 - 4. Model Number: *2095-W*

- E. Isolated Ground Receptacles:
 - 1. Description: UL 39121406; 125 volt, isolated ground type duplex receptacle.
 - 2. Device Body: White, Thermoplastic.
 - 3. Configuration: NEMA 5-20.
 - 4. Model Number: *IG5362WSP*

- F. Server Isolated Ground, Twist-Lock Receptacle:
 - 1. Description: UL 1449; 125 volt, isolated ground twist-lock type single receptacle.
 - 2. Device Body: Orange, Thermoplastic.
 - 3. Configuration: NEMA L5-20R.
 - 4. Model Number: *IGL520-R*

- G. Wall Plates
 - 1. Description: Stainless Steel.

2.06 DISCONNECT SWITCHES

- A. Acceptable Manufacturers:
 - 1. *Square D*
 - 2. *General Electric*
 - 3. *Cutler-Hammer*
 - 4. *Siemens*
 - 5. Substitutions: None Permitted.

- B. Nonfusible Switch Assemblies: NEMA KS 1; Type HD; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle interlocked to prevent opening front with switch in ON position. Handle lockable in OFF position.

2.07 GROUNDING MATERIALS

- A. Branch Circuit Ground Conductors: Insulated (green) copper conductors, #12 AWG, minimum.

- B. Grounding Electrodes: 3/4-inch diameter by 10-foot long copper clad ground rod.

2.08 PANELBOARDS AND CIRCUIT BREAKERS

- A. Acceptable Manufacturers.
 - 1. *Square D.*
 - 2. *General Electric*
 - 3. *Siemens*
 - 4. *Cutler-Hammer*
 - 5. Substitutions: None Permitted.

B. Description:

1. Panelboards: NEMA PB 1; circuit breaker type. Type I, Class 1.
2. Enclosure: NEMA PB 1; Type 1. Cabinet size: 5 ¾ inches deep; 20 inches wide (branch circuit panelboards).
3. Provide surface-mounted and recessed cabinets with screw covers as indicated on the plans. Finish in manufacturer's standard gray enamel.
4. Provide panelboards with copper bus, ratings as scheduled. Provide copper ground bus in all panelboards.
5. Minimum Integrated Short Circuit Rating: 22,000 amperes symmetrical for 120/208 volt panelboards.
6. Molded Case Circuit Breakers: NEMA AB 1; provide bolt-on circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits.
7. Panelboard ratings and branch circuit breaker quantities shall be as listed below.

C. Panelboard DP1:

1. 120/208 volts, 3-phase, 4-wire, 400-ampere bus; 300-ampere, 3-pole main circuit breaker.
2. Branch Circuit Breakers: (3) 150-ampere, 3-pole; (9) 100-ampere, 3-pole; (6) 30-ampere, 3-pole; (4) 30-ampere, 2-pole; (1) 30-ampere, 1-pole; (6) 20-ampere, 2-pole; (40) 20-ampere, 1-pole; (2) 15-ampere, 2-pole; (1) 10-ampere, 1-pole.

D. Panelboard CP1:

1. 120/208 volts, 3-phase, 4-wire, 100-ampere bus; 3-pole main circuit breaker.
2. Branch Circuit Breakers: (24) 20-ampere, 1-pole.

E. Panelboard HP1:

1. 120/208 volts, 3-phase, 4-wire, 100-ampere bus; main lugs only.
2. Branch Circuit Breakers: (24) 20-ampere, 1-pole.

F. Main Circuit Breaker (located in Toll Utility Room 104)

1. 120/208 volts, 3-phase, 4-wire, 400-ampere frame, 300-ampere trip.

G. Emergency Main Circuit Breaker (located in Toll Utility Room 104)

1. 120/208 volts, 3-phase, 4-wire, 400-ampere frame, 300-ampere trip.

H. Distribution Feeders:

1. Feeder sizes shall be as indicated on Sheet E-02 in the Contract Drawings.
2. Provide and install an emergency power feeder between the Emergency Main Circuit Breaker MCB-E1 and the Automatic Transfer Switch.
3. Provide and install an emergency power feeder between the Automatic Transfer Switch and Panelboard DP1.

4. Provide and install an emergency power feeder between Panelboard DP1 and the UPS Bypass Switch that is being provided by the Maine Turnpike Authority.
5. Provide and install an emergency power feeder between the UPS Bypass Switch being provided by the Maine Turnpike Authority and the UPS being provided by the Maine Turnpike Authority.
6. Provide and install an emergency power feeder between the UPS being provided by the Maine Turnpike Authority and Panelboard CP1 (clean power).
7. Provide and install a normal power feeder as service entrance conductors between the Utility Service Meter and the Maine Circuit Breaker MCB.
8. Provide and install a normal power feeder between the Main Circuit Breaker MCB and the Automatic Transfer Switch.
9. Provide and install a normal power feeder between the Automatic Transfer Switch and Panelboard DP1.
10. Provide and install a normal power feeder between Panelboard DP1 and the UPS Bypass Switch that is being provided by the Maine Turnpike Authority.
11. Provide and install a normal power feeder between the UPS Bypass Switch being provided by the Maine Turnpike Authority and the UPS being provided by the Maine Turnpike Authority.
12. Provide and install a normal power feeder between Panelboard DP1 and Panelboard HP1 (dirty power).
13. Provide and install two normal power feeders between Panelboard DP1 and the Booth Power Panelboards (dirty power).

I. Service Grounding:

1. Provide and install a new copper service ground bar at the Toll Utility Room 104 in the Administration Building. Connect the ground bar with service grounding to both a ¾ inch diameter by 10 foot long copper-clad steel ground rod, as well as the water service entrance pipe.

2.09 LIGHTING FIXTURES

A. Furnish products as specified in the attached Lighting Fixture Schedule.

B. LED Luminaires:

1. Luminaires shall be tested according to IESNA LM-79 and LM-80
2. Luminaires shall be provided with a full 5-year warranty, starting from the date of substantial completion.

2.10 FIRESTOP

A. Fire stopping materials shall be NRTL listed to UL 1479 (ASTM E814). Installation methods shall conform to a UL fire stopping system. Submit specifications and installation drawings for the type of material to be used. Fire stopping materials shall be as manufactured by *3M, International Protective*

Coatings Corp., Specified Technologies, Inc., Carborundum Company, RayChem, Nelson Fire Stop or approved equal.

2.11. LIGHTNING PROTECTION PRODUCTS

- A. Subject to compliance with requirements, provide products by one of the following manufacturers or approved equal:
1. *Automatic Lightning Protection.*
 2. *ERICO International Corporation.*
 3. *Harger Lightning Protection, Inc.*
 4. *Heary Bros. Lightning Protection Co. Inc.*
 5. *Independent Protection Co.*
 6. *Robbins Lightning Inc.*
 7. *Thompson Lightning Protection, Inc.*
- B. Air Terminals shall be NFPA Class I, solid copper, 3/8" diameter, by 24" tall or 10" tall, as indicated on the Contract Drawings. Main roof conductors as down conductors shall be bare copper in sizes as indicated on the Contract Drawings. Grounding electrodes shall be copper-clad steel, 3/4" diameter by 10'-0" long.

2.12. CABLE TRAY

- A. Description:
1. Aluminum ventilated trough type cable tray attached to the wall and ceiling.
 2. Wall Height: 4-inches
 3. Width: 12-inches
- B. Manufacturers:
1. *Cooper B-Line* model 24-A-09-VT, or approved equal.

2.13. OPTICAL FIBER PATCH PANEL

- A. Description: Provide a wall-mounted optical fiber patch panel to receive network system optical fiber cable.
1. Patch panel shall be capable of terminating 12 pair (24 strands) of a fiber optic cable.
 2. Patch panel wall mounted with an aluminum 32cm by 25cm by 5.5cm enclosure for communication and a rack mounted panel for toll equipment. Both with integral cable management, pre-loaded with duplex ST couplings.
- B. Manufacturers:
1. *UnitekFiber*, or approved equal.

2.14. FIRE ALARM SYSTEM

A. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B), Style 6 (Class A) or Style 7 (Class A) Signaling Line Circuits (SLC).
2. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style B) or Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y) or Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
4. All circuits shall be power-limited, per UL864 9th edition requirements.
5. A single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm when wire NFPA Style 6/7.
6. Alarm signals arriving at the main FACP shall not be lost following a primary power failure or outage of any kind until the alarm signal is processed and recorded.

B. SYSTEM OPERATION

1. The Secondary Power Source of the fire alarm control panel will be capable of providing at least 24 hours of backup power with the ability to sustain 5 minutes in alarm at the end of the backup period.
2. When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
 - a. The system Alarm LED on the FACP shall flash.
 - b. A local sounder with the control panel shall sound.
 - c. A backlit 80-character LCD display on the FACP shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
 - d. In response to a fire alarm condition, the system will process all control programming and activate all system outputs (alarm notification appliances and/or relays) associated with the point(s) in alarm.

C. EQUIPMENT AND MATERIALS

1. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.
2. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.

3. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.
4. Wire:
 - a. All fire alarm system wiring shall be new.
 - b. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
 - c. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
 - d. Wire and cable shall have a fire resistance rating suitable for the installation as indicated in NEC 760 (e.g., FPLR).
 - e. Wiring used for the multiplex communication circuit (SLC) shall be twisted and support a minimum wiring distance of 10,000 feet. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit. Shielded wire shall not be required.
 - f. All field wiring shall be electrically supervised for open circuit and ground fault.
 - g. The fire alarm control panel shall be capable of T-tapping Class B (NFPA Style 4) Signaling Line Circuits (SLCs). Systems which do not allow or have restrictions in, for example, the amount of T-taps, length of T-taps etc., are not acceptable.
5. Terminal Boxes, Junction Boxes and Cabinets:
 - a. All boxes and cabinets shall be UL listed for their use and purpose.
 - b. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod. The control panel enclosure shall feature a quick removal chassis to facilitate rapid replacement of the FACP electronics.
 - c. The FACP shall be capable of coding Notification Appliance Circuits in March Time Code (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Main panel notification circuits (NACs 1 & 2) shall also automatically synchronize any of the following manufacturer's notification appliances connected to them: System Sensor, Wheelock, or Gentex with no need for additional synchronization modules.
6. Fire Alarm Control Panel

- a. Manufacturers:
 - (1) *Notifier* NFW-50 (Fire Warden-50)
 - (2) Substitutions: Or Approved Equal.
- b. The FACP shall contain a microprocessor-based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system controlled devices.
- c. Operator Control
 - (1) Acknowledge Switch:
 - i. Activation of the control panel Acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
 - ii. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
 - (2) Alarm Silence Switch:
 - i. Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.
 - (3) Alarm Activate (Drill) Switch:
 - i. The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
 - (4) System Reset Switch:
 - i. Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
 - (5) Lamp Test:
 - i. The Lamp Test switch shall activate all system LEDs and light each segment of the liquid crystal display.
- 7. System Capacity and General Operation
 - a. The control panel shall provide, or be capable of, expansion to 50 intelligent/addressable devices.

- b. The control panel shall include two Form-C programmable relays which can be used for Alarm, Supervisory, and a fixed Trouble relay rated at a minimum of 2.0 amps @ 30 VDC and 0.5 amps @ 30 VAC. It shall also include two programmable Notification Appliance Circuits (NACs) capable of being wired as Class B (NFPA Style Y) or Class A (NFPA Style Z).
- c. The fire alarm control panel shall include an operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color-coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
- d. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel. The system shall be fully programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes. The control unit will support the ability to upgrade its operating program using FLASH memory technology. The unit shall provide the user with the ability to program from either the included keypad, a standard PS2-style PC keyboard or from a computer running upload/download software.
- e. The system shall allow the programming of any input to activate any output or group of outputs. Systems which have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or REQUIRE a laptop personal computer are not considered suitable substitutes.
- f. The FACP shall provide the following features:
 - (1) Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
 - (2) Detector sensitivity test, meeting requirements of NFPA 72, Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
 - (3) The ability to display or print system reports.
 - (4) Alarm Verification.
 - (5) Positive Alarm Sequence (PAS pre-signal), meeting NFPA 72 (2019 Edition) 6.8.1.3 requirements.
 - (6) Rapid manual station reporting.
 - (7) Non-alarm points for general (non-fire) control.
 - (8) Periodic detector test conducted automatically by the software.
 - (9) Walk test, with a check for two detectors set to same address.

- g. The FACP shall be capable of coding Notification Appliance Circuits in March Time Code (120 PPM), Temporal (NFPA 72 A-2-2.2.2), and California Code. Main panel notification circuits (NACs 1 & 2) shall also automatically synchronize and be programmable for any of the following manufacturer's notification appliances connected to them: System Sensor, Wheelock or Gentex with no need for additional synchronization modules.
8. Central Microprocessor
- a. The microprocessor shall be a state-of-the-art, high speed, 16-bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
 - b. The microprocessor shall contain and execute all specific actions to be taken in the condition of an alarm. Control programming shall be held in non-volatile programmable memory and shall not be lost even if system primary and secondary power failure occurs.
 - c. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file.
 - d. A special program check function shall be provided to detect common operator errors.
 - e. An auto-programming capability (self-learn) shall be provided to quickly identify devices connected on the SLC and make the system operational.
 - f. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download. This program shall also have a verification utility which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in compliance with the NFPA 72 requirements for testing after system modification.
9. Local Keyboard Interface
- a. In addition to an integral keypad, the fire alarm control panel will accept a standard PS2-style keyboard for programming, testing, and control of the system. The keyboard will be able to execute the system functions ACKNOWLEDGE, SIGNALS SILENCED, DRILL and RESET.
10. Display
- a. The display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.

- b. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.
 - c. The display shall contain an alphanumeric, text-type display and dedicated LEDs for the annunciation of AC POWER, FIRE ALARM, SUPERVISORY, TROUBLE, and ALARM SILENCED conditions.
 - d. The display keypad shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
 - e. The display shall include the following operator control switches: ACKNOWLEDGE/STEP, ALARM SILENCE, DRILL (alarm activate), and SYSTEM RESET.
11. Signaling Line Circuit (SLC)
- a. The SLC interface shall provide power to and communicate with up to 50 devices of any type including: intelligent detectors (ionization, photoelectric or thermal), addressable pull stations, intelligent modules (monitor or control). Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.
 - b. The CPU shall receive information from all intelligent detectors to be processed to determine whether normal, alarm or trouble conditions exist for each detector. The software shall automatically compensate for the accumulation of dust in each detector up to allowable limits. The information shall also be used for automatic detector testing and for the determination of detector maintenance conditions.
 - c. The detector software shall meet NFPA 72 (2019 Edition), Chapter 10 requirements and be certified by UL as a calibrated sensitivity test instrument.
12. Serial Interfaces
- a. The system shall provide a means of interfacing to UL Listed Electronic Data Processing (EDP) peripherals using the EIA-232 communications standard.
 - b. An annunciator RS-485 (ANN-Bus) bus shall be used to connect an UL-Listed 80-column printer anywhere within the 6,000 range of the serial bus connection. The printer shall communicate with the control panel using an RS-485 converter/interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz. The interface shall contain both a 9-pin serial and standard centronics parallel connector. Either shall be capable of connection to a serial or parallel printer.
 - c. The annunciator RS-485 (ANN-Bus) bus shall also provide connection to additional addressable modules supporting remote 80 character LCD text annunciators that mimic the standard panel

- display and controls. Said annunciators shall support remote acknowledge, silence, drill and reset functions and shall be enabled via a keyswitch. The bus shall also provide connection to addressable modules supporting up to 40 LEDs for use with a graphic annunciator.
13. The control panel will have the capability of Reverse Polarity Transmission or connection to a Municipal Fire Alarm Box for compliance with applicable NFPA standards.
 14. Digital Alarm Communicator Transmitter (DACT). The DACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.
 - a. The DACT shall be an integral component of the fire alarm control panel requiring no interconnecting wiring or supervisory circuitry.
 - b. The DACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to two different telephone numbers.
 - c. The DACT shall be completely field programmable locally from the control panel keypad or remotely over a phone line using upload/download PC software.
 - d. The DACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.
 - e. Communication shall include vital system status such as:
 - (1) Independent Zone (Alarm, trouble, non-alarm, supervisory)
 - (2) Independent Addressable Device Status
 - (3) AC (Mains) Power Loss
 - (4) Low Battery and Earth Fault
 - (5) System Off Normal
 - (6) 12 and 24-Hour Test Signal
 - (7) Abnormal Test Signal (per UL requirements)
 - (8) EIA-485 Communications Failure
 - (9) Phone Line Failure
 - f. The DACT shall support independent zone/point reporting when used in the Contact ID format. In this format, the DACT shall support the transmission of up to 50 addressable points with the system. This enables the central station to have exact details concerning the location of the fire for emergency response.
 15. Enclosures:
 - a. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
 - b. The back box and door shall be constructed of steel with provisions for electrical conduit connections into the sides and top.

- c. The door shall provide a key lock and shall provide for the viewing of all indicators.
 - d. The cabinet shall accept a chassis containing the PCB and to assist in quick replacement of all the electronics, including power supply, shall require no more than two bolts to secure the panel to the enclosure back box.
 - e. The cabinet shall also support a mechanical secured optional dress panel limiting access to the internals of the panel.
 - f. One EIA-232 interface shall be used to connect an UL-Listed 80-column printer. The printer shall communicate with the control panel using an interface complying with Electrical Industries Association standard EIA-232D. Power to the printer shall be 120 VAC @ 60 Hz.
16. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24-volt power supply or as a booster for powering Notification Appliances.
- a. The FCPS shall offer up to 8.0 amps (6.0 amps continuous) of regulated 24-volt power. It shall include an integral charger designed to charge 18.0 amp hour batteries.
 - b. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a control relay. Four NAC outputs, wired NFPA Style Y or Z, shall be available for connection to the Notification devices.
 - c. The FCPS shall optionally provide synchronization of all connected strobes or horn strobe combinations when System Sensor, Wheelock, or Gentex devices are installed.
 - d. The FCPS shall function as a sync follower as well as a sync generator.
 - e. The FCPS shall include a surface mount backbox.
 - f. The Field Charging Power Supply shall include the ability to delay the reporting of an AC fail condition per NFPA requirements.
 - g. The FCPS shall provide 24 VDC regulated and power-limited circuitry per UL 864 9th edition standards.
17. Power Supply:
- a. The main power supply for the fire alarm control panel shall provide 3.7 amps of available power for the control panel and peripheral devices.
 - b. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
 - c. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery

- charger or may be used with an external battery and charger systems. Battery arrangement may be configured in the field.
- d. The main power supply shall continuously monitor all field wires for earth ground conditions.
 - e. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
18. Wall Combination Horn/Strobes:
- a. Operating voltage: 24 VDC.
 - b. Strobe Intensity: Selectable 15, 17/75, 30, 70, 110 candela.
 - c. Horns: Field programmable to provide slow whoop, continuous, temporal or interrupted tones with an output sound level of at least 90dBA at 10 feet from the device
 - d. Mounting: Flush.
19. Wall Visual Only Devices: Shall meet the requirements of Section 18b listed above for visibility.
20. Specific System Operations
- a. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently programmed for verification of alarm signals. The alarm verification time period shall not exceed 2 minutes.
 - b. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.
 - c. Point Read: The system shall be able to display the following point status diagnostic functions:
 - (1) Device status
 - (2) Device type
 - (3) Custom device label
 - (4) Device zone assignments
 - d. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.
 - e. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 500 events. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety.
 - (1) The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.
 - f. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display. This feature shall in no way inhibit the receipt of alarm

- conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
- g. The fire alarm control panel shall include Silent and Audible Walk Test functions - Silent and Audible. It shall include the ability to test initiating device circuits and Notification Appliance Circuits from the field without returning to the panel to reset the system. The operation shall be as follows:
 - (1) The Silent Walk Test will not sound NACs but will store the Walk Test information in History for later viewing.
 - (2) Alarming an initiating device shall activate programmed outputs, which are selected to participate in Walk Test.
 - (3) Introducing a trouble into the initiating device shall activate the programmed outputs.
 - (4) Walk Test shall be selectable on a per device/circuit basis. All devices and circuits which are not selected for Walk Test shall continue to provide fire protection and if an alarm is detected, will exit Walk Test and activate all programmed alarm functions.
 - (5) All devices tested in walk test shall be recorded in the history buffer.
 - h. Supervisory Operation
 - (1) An alarm from a supervisory device shall cause the appropriate indication on the control panel display, light a common supervisory LED, but will not cause the system to enter the trouble mode.
 - i. Signal Silence Operation
 - (1) The FACP shall have the ability to program each output circuit (notification circuit or relay) to deactivate upon depression of the Signal Silence switch.
 - j. Non-Alarm Input Operation
 - (1) Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.
21. Addressable Pull Box (manual station)
- a. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock, and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
 - b. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
 - c. Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.
22. Intelligent Photoelectric Smoke Detector

- a. The detectors shall use the photoelectric (light-scattering) principle to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
 - b. The detectors shall be ceiling-mounted and available in an alternate model with an integral fixed 135-degree heat-sensing element.
 - c. Each detector shall contain a remote LED output and a built-in test switch.
 - d. Detector shall be provided on a twist-lock base.
 - e. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.
 - f. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall periodically flash to indicate that the detector is in communication with the control panel.
 - g. The detector shall not go into alarm when exposed to air velocities of up to 1500 feet per minute (fpm).
 - h. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
 - i. All field wire connections shall be made to the base through the use of a clamping plate and screw.
23. Intelligent Thermal Detectors
- a. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.
24. Addressable Dry Contact Monitor Module
- a. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any normally open dry contact device) to one of the fire alarm control panel SLCs.
 - b. The monitor module shall mount in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box.
 - c. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
 - d. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch (70 mm) x 1-1/4 inch (31.7 mm) x 1/2 inch (12.7 mm). This version need not include Style D or an LED.
25. Two-Wire Detector Monitoring

- a. Means shall be provided for the monitoring of conventional Initiating Device Circuits populated with 2-wire smoke detectors as well as normally open contact alarm initiating devices (pull stations, heat detectors, etc).
 - b. Each IDC of conventional devices will be monitored as a distinct address on the polling circuit by an addressable module. The module will supervise the IDC for alarms and circuit integrity (opens).
 - c. The monitoring module will be compatible, and listed as such, with all devices on the supervised circuit.
 - d. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
 - e. The monitoring module shall be capable of mounting in a 4-inch square (101.6 mm square), 2-1/8 inch (54 mm) deep electrical box or in a surface mount backbox.
26. Addressable Control Relay Module
- a. Addressable control relay modules shall be provided to control the operation of fan shutdown and other auxiliary control functions.
 - b. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
 - c. The control relay module will provide two dry contact, Form-C relays. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to insure that 100% of all auxiliary relays may be energized at the same time on the same pair of wires.
 - d. The control relay module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.
27. Isolator Module
- a. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Style 6 (Class A) or Style 4 (Class B branch). The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.
 - b. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
 - c. The isolator module shall not require any address setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
 - d. The isolator module shall mount in a standard 4-inch (101.6 mm) deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is

operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

28. Addressable Devices - General

- a. Addressable devices shall employ the simple-to-set decade addressing scheme. Addressable devices which use a binary-coded address setting method, such as a DIP switch, are not an allowable substitute.
- b. Detectors shall be addressable and intelligent, and shall connect with two wires to the fire alarm control panel signaling line circuits.
- c. Addressable smoke and thermal (heat) detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.
- d. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 10.
- e. Detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a base with a built-in (local) sounder rated for a minimum of 85 DBA, a relay base and an isolator base designed for Style 7 applications.
- f. Detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel.
- g. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
- h. Detectors shall provide address-setting means using decimal switches.

29. Batteries

- a. Upon loss of Primary (AC) power to the control panel, the batteries shall have sufficient capacity to power the fire alarm system for required standby time (24 or 60 hours) followed by 5 minutes of alarm.
- b. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
- c. If necessary to meet standby requirements, external battery/charger systems may be used.

30. Remote Annunciator

- a. Provide an LCD flush-mounted remote annunciator *Notifier* LCD-80 or equal. Annunciator shall include an 80-character back-lit

liquid Crystal Display (20 characters times 4 lines). Annunciator shall include control switches for system acknowledge, signal silence, and system re-set.

2.15. NETWORK WIRING SYSTEM

- A. The network system components shall be provided by a single source from one of the following:
1. *Amp*
 2. *Panduit*
 3. *Hubbell*
 4. *Hitachi / Superior Modular*
 5. Substitutions: Or Approved Equal
- B. Integrated network system components shall include:
1. Patch panels
 2. Telecommunications outlet jacks
 3. Intra-building telecommunications cable
 4. Patch cords
- C. Network Rack: Maine Turnpike Authority will be providing Network Racks.
- D. Patch Panels – CAT6: EIA nineteen inch, 48-port, rack-mounted UL listed patch panel for cross-connect of Category 6 cables, including 8-position modular wiring jacks and color-coded, high-density IDC type terminations.
- E. Network Outlet Jacks
1. Jack Outlet: 8-position duplex modular type jack suitable to accept multi-position modular plugs (quick connect terminals). Jacks shall be suitable for back wiring and mounting in a standard electrical box. Jacks shall conform to UL 1863 and ANSI/TIA/EIA 568A. Jacks shall include a plastic gray faceplate and mounting lugs.
 - a. Standard Jack Outlets: Duplex outlet with one RJ45 jacks (grey)
 2. PIN/ PAIR assignment - Wiring shall be terminated on the 8 position modular jack to PIN/ PAIR assignment for UTP cabling. Confirm PIN/PAIR assignment with Owner's Network Coordinator prior to beginning any work.
 3. Network Outlet Jack
 - a. *AMP*
 - b. *Hubbell*
 - c. *Panduit*
 - d. Substitutions: Or Approved Equal
- F. Network Cable
1. Description: Category 6 unshielded twisted 4 pair wiring (UTP), 24 AWG. Category 6 cable shall meet the physical requirements of ANSI/ICEA publication

S-80-576 (ref. B1.6). Cable shall be tested to minimum 350 MHz. Exterior jacket color shall be blue.

2. Characteristics at 20 °C:
 - a. Nominal Impedance: 100 $\frac{1}{2}$ \pm 15% (from 1MHz to 100 MHz)
 - b. Maximum DC Resistance: 9.38 $\frac{1}{2}$ / 100m
 - c. Mutual Capacitance (max.): 5.25 nF/100m
3. Network Cable Manufacturer:
 - a. *AMP*
 - b. *Mohawk GigaLAN Cat 6. +*
 - c. *Superior*
 - d. Substitutions: Or Approved Equal

G. Patch Cords

1. Description: Category 6 unshielded, twisted pair (UTP) modular line cords with No 24 AWG thermoplastic insulated solid conductors formed into 4 individually twisted pairs and enclosed in a thermoplastic jacket. Line cord shall be terminated with 8-position modular plugs at both ends, conforming to ANSI/TIA/EIA 568A. Line cords shall not exceed 3m in length. Patch cords shall be factory assembled and tested. Provide one (1) patch cord for data network outlet.
2. PIN/ PAIR assignment - Wiring shall be terminated on the 8-position modular jack to PIN/ PAIR assignment directed by OWNERS Network Coordinator.
3. Characteristics at 20 °C: Match manufacturer and characteristics requirements for intra-building telecommunications cable.

H. Network System Grounding

1. Manufacturer: Provide products meeting the requirements of the Drawings and Specifications from one of the following manufacturers:
 - a. *Belden* (No. 8669)
 - b. Substitutions: Or Approved Equal
2. Jumper cable shall be hollow braided, 60 amp capacity, copper.
3. Jumpers shall have compression or exothermic type terminals on both ends of cables. Terminals shall be compatible with jumper cable material and equipment material in order to not have any degenerative reaction.

I. Network Equipment/Cable Identification

1. All equipment and cabling shall be properly identified by means of clear and concise labels. All identification shall meet or exceed the minimum requirements of EIA/TIA568A, 606 and BICSI standards.
2. Permanently label, using pre-printed labels, all cables and terminations. Handwritten or embossed type labels are specifically prohibited
 - a. Label all equipment racks, panels and cross connect blocks uniquely.
 - b. Label patch panels and cross connect blocks numerically, top-to-bottom.
 - c. Label cable segments by designated incoming cable.
3. Provide color-coded labels with CODED identifiers as follows:
 - a. Conduits and other pathways shall be labeled at all end points including equipment rooms, telecommunications closets, pull boxes and the like. Provide adhesive labels on the conduit with at least one label within each space that the conduit passes through. Labels shall be attached by means

- of the label adhesive and color-coded pressure-sensitive tape wrapped around conduit at least one and one half times.
- b. Cables shall have double lapped adhesive labels at all end points including Work Area Outlets, telecommunication closets and equipment rooms. Cables shall also have factory imprinted manufacturer's name, part number and the NRTL certified UL EIA/TIA category rating designation at a minimum of two foot (610mm) intervals along the entire length of the cable.
 - c. Termination hardware shall have adhesive labels on both the front and rear (if accessible) of the hardware.
 - d. Insert Labels shall be provided in each Work Area Outlet patch panel termination hardware (top of jack) cross connect blocks (edge of block) and the like.
 - e. Outlet boxes, junction boxes and the like shall have adhesive labels attached on the inside and located where visible from the outlet opening.
 - f. Grounding and bonding system shall have engraved labels at each ground bar and backbone grounding cable as it passes through each room. Each bonding jumper shall have heat shrink labels at all end points.
4. Labels shall be constructed of approved material in order to meet the legibility, defacement, adhesion (adhesive labels only), and exposure requirements of UL 969. All labels shall be mounted horizontally in order to be read from left to right.
- a. Adhesive Labels shall be constructed of color-coded paper with a clear polyester over laminate, Brady USA, Inc. PermaShield, RayChem TMS or approved equal. Adhesive material used shall be approved for material being attached to, typeface shall be medium density, Helvetica, 1/8 inch (3mm) high black characters unless indicated otherwise.
 - b. Heat-Shrink Labels shall be constructed of color-coded flame retardant, heat shrinkable polyolefin, Brady USA, Inc, RayChem TMS or approved equal. Typeface shall be medium density, Helvetica 1/8 inch (3mm) high black characters unless indicated otherwise.
 - c. Insert Labels shall be constructed of color-coded paper inserted behind clear plastic label holder. Work Area Outlets shall have white color labels inserted behind a flush mounted (recessed) plastic window. Patch panels and cross connect block may have continuous clear plastic insertion strips label holders with label strips. Label strips shall have distinct markings to indicate where one jack or cross connect ends and the adjacent one starts. Typeface shall be medium density, Helvetica 1/8 inch (3mm) high black characters unless indicated otherwise.
 - d. Each Network Interface Outlet shall have each of its eight-position modular jacks provided with a color-coded, embossed modular ICON. The telephone jack icon shall be red and shall have either the word "VOICE" or a telephone logo. The data jack icon shall be blue and shall have either the word "DATA" or a computer logo. The Network Interface Outlet jack provided shall also be able to have additional ICON types such as but not limited to "LAN1 " or "LAN2" and the like available for use. Coordinate with the Owner through the Architect-Engineer, the specific icon's required for this project.
 - e. Handwritten or embossed labels are not allowed.

PART 3 - EXECUTION

3.01 RACEWAY INSTALLATION

- A. Provide exposed EMT conduit with building wire exposed on walls and ceilings only where approved by the engineer.
 - 1. Arrange exposed conduit to maintain headroom and present a neat appearance. Route exposed conduit parallel and perpendicular to walls, building structure and adjacent piping.
 - 2. Maintain minimum 6-inch clearance between conduit and piping. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
 - 3. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.
 - 4. Cut conduit square using a saw or pipecutter; de-burr cut ends.
 - 5. Bring conduit to the shoulder of fittings and couplings and fasten securely.
 - 6. Install no more than the equivalent of three 90-degree bends between boxes.
 - 7. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.

- B. Flexible conduit:
 - 1. Flexible conduit shall not exceed 3 feet in length.
 - 2. Provide flexible conduit for connections to transformers.
 - 3. Provide liquid-type flexible conduit for connections to outside HVAC condensing units.

- C. Provide PVC schedule 40 conduit for all exterior underground locations.

3.02 WIRING INSTALLATION

- A. Provide type MC cable where concealed in partitions and/or above accessible ceiling.
 - 1. Install wiring in accordance with manufacturers' instructions.
 - 2. Neatly train and lace wiring inside boxes, equipment, and panelboards.
 - 3. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor. Use insulated spring wire connectors with plastic caps for conductor splices and taps, 10 AWG and smaller.
 - 4. Use 10 AWG conductors for 20-ampere, 120-volt branch circuits longer than 75 feet.
 - 5. Verify continuity of each branch circuit conductor after installation.

3.03 OUTLET, JUNCTION & PULL BOX INSTALLATION

- A. Install electrical boxes as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- B. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
- C. Support boxes independently of conduit.
- D. Use flush mounting outlet boxes in finished areas.
- E. Do not install flush mounting boxes back-to-back in walls; provide minimum 24 inches separation in walls.
- F. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- G. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- H. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- I. Use gang boxes where more than one device is mounted together. Do not use sectional box. Provide 2-gang plaster rings for 2-gang boxes.
- J. Align adjacent wall-mounted outlet boxes for fire alarm devices, switches, receptacle outlets, intercom call stations, telecommunications outlets, thermostats, and similar devices with each other.
- K. Mounting Heights:
 - 1. Light Switch Boxes: 48" AFF.
 - 2. Receptacle Outlet Boxes: 18" AFF, except for receptacles above countertop work stations: 42" AFF.

3.04 WIRING DEVICE INSTALLATION

- A. Verify wall openings are neatly cut and will be completely covered by wall plates.
- B. Provide extension rings to bring outlet boxes flush with finished surface.
- C. Install products in accordance with manufacturer's instructions.
- D. Install devices plumb and level.

- E. Install switches with OFF position down.
- F. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- G. Adjust devices and wall plates to be flush and level.

3.05 DISCONNECT SWITCH INSTALLATION

- A. Provide disconnect switches for all mechanical systems motorized equipment that is not furnished with an integral means of disconnect. Mount disconnect switch within sight of motors being served.

3.06 GROUNDING

- A. Install all ground system components in conformance with Article 250 of NFPA 70.
- B. Provide insulated ground conductors with all branch circuits.
- C. Terminate each ground conductor end on a grounding lug, bus, or bushing.

3.07 PANELBOARD INSTALLATION

- A. Install panelboards plumb in conformance with NEMA PB 1.1.
- B. Height: 6 feet to top of panelboard.
- C. Clearance: 3 feet in front of panelboard, floor to ceiling.
- D. Provide filler plates for unused spaces in panelboards.
- E. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- F. Measure state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.
- G. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

3.08 LIGHTING INSTALLATION

- A. Install in accordance with manufacturers' instructions.
- B. Install lighting fixtures at locations indicated.
- C. Install lamps in each luminaire.
- D. Bond luminaires and metal poles to branch circuit equipment grounding conductor.

3.09 SMOKE AND FIRE STOPPING SEALS

- A. Penetrations through fire-resistant-rated walls, partitions, floors or ceilings shall be fire stopped using approved methods and NRTL listed products to maintain the fire resistance rating.
- B. Installation restrictions of the listing agencies shall be strictly adhered to (e.g. 24 inch (610 mm) minimum horizontal separation between boxes on opposite sides of the wall, maximum square inch opening in wall).
- C. Fire stopping in sleeves or in areas having small openings that may require the addition or modification of installed cables or raceways shall be soft, pliable, non-hardening fire stop putty. Putty shall be water resistant and intumescent.
- D. Fire stopping in locations not likely to require frequent modification shall be a NRTL listed putty or caulk to meet the required fire resistance rating.
- E. Where conduit penetrates smoke partitions, seal opening around conduit with dry-wall joint compound or fire stop material.

3.10 FIRE ALARM SYSTEM INSTALLATION

A. General Installation

- 1. Install system components and all associated devices in accordance with applicable NFPA Standards and manufacturer's recommendations.
- 2. Installation personnel shall be supervised by persons who are qualified and experienced in the installation, inspection, and testing of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:
 - a. Factory trained and certified personnel.
 - b. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
 - c. Personnel licensed or certified by state or local authority.

B. Equipment Installation

- 1. Furnish and install new devices as described herein and as shown on the plans. Include all necessary wiring, terminations, electrical boxes, and all other

necessary material to provide a complete and operational fire alarm system.

2. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
3. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
4. Manual pull stations shall be suitable for surface mounting or semi flush mounting as shown on the plans, and shall be installed 48 inches (122 mm) above the finished floor.
5. Indicating stations shall be installed 80 inches (315 mm) above finished floor.

C. Wiring Installation

1. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
2. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
3. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.
4. All wiring shall be run in conduit.

D. Testing

1. The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 7.
2. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
3. Open initiating device circuits and verify that the trouble signal actuates.
4. Open and short signaling line circuits and verify that the trouble signal actuates.
5. Open and short notification appliance circuits and verify that trouble signal actuates.
6. Ground all circuits and verify response of trouble signals.
7. Check presence and audibility of tone at all alarm notification devices.
8. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
9. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
10. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed

or grouped devices, sensitivity monitoring, verification functionality and similar.

- E. Final Inspection
 - 1. At the final inspection, a minimum NICET Level II technician shall demonstrate that the system functions properly in every respect.
- F. Instructions
 - 1. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided,
 - 2. The contractor or installing dealer shall provide a user manual indicating "Sequence of Operation."

3.11 LIGHTNING PROTECTION INSTALLATION

- A. All work shall conform to the requirements contained in the latest edition of UL 96A, Installation Requirements for Lightning Protection Systems, and in the latest edition of NFPA 780 Standard for the Installation of Lightning Protection Systems.
- B. Install conductors with direct paths from air terminals to ground connections. Conductors shall be supported for their entire length without travel through free air. No bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches.
- C. Conductors shall not be directly attached to aluminum or galvanized steel. Do not combine materials that can form an electrolytic couple that will accelerate corrosion in the presence of moisture unless moisture is permanently excluded from junction of such materials.
- D. Main conductors shall be fastened at intervals not exceeding 3 feet.
- E. Down conductors shall be installed within Schedule 80 PVC conduit for physical protection.
- F. Use UL listed connectors or approved exothermic-welded connections for all conductor splices and grounding connections.
- G. Provide inspections as required to obtain a UL Master Label Certification for the system.
- H. Provide an inspection by an inspector certified by LPI to obtain an LPI certification.

3.12 NETWORK WIRING SYSTEM INSTALLATION

- A. Do not install equipment and materials that have not been reviewed by the Engineer.
- B. Obtain detailed information on installation requirements from the manufacturers of all equipment to be furnished, installed or provided. At the start of construction, check all

Contract Documents, including all Drawings and all Sections of the specifications for equipment requiring electrical connections and service and verify electrical characteristics of equipment prior to roughing.

- C. Equipment and systems shall not be installed without first coordinating the location and installation of equipment and systems with the General Contractor and all other Trades.
- D. Refer to all Drawings associated with the project, prior to the installation or roughing-in of the electrical outlets, conduit and equipment, to determine the exact location of all outlets.
- E. After installation, equipment shall be protected to prevent damage during the construction period. Openings in boxes shall be closed to prevent the entrance of foreign materials.
- F. Home runs indicated are not to be combined or reduced without written consent from the Engineer.
- G. All connections to equipment shall be made as required, and in accordance with the approved submittal and setting drawings.
- H. Any ceilings, walls, floors, furniture, equipment, furnishings, etc., damaged by the work of this Section shall be replaced, or at the Owner's option, repaired with similar materials, workmanship and quality.
- I. Equipment rack will be provided, installed and secured by the Maine Turnpike Authority.
- J. Position racks in order to have minimum 3-foot clearance for easy access.
- K. Patch Panels:
 - 1. Mount rack mounted patch panels onto the rack at the top of the rack.
 - 2. Install the optical fiber cable patch panel on the wall at the fiber service entrance.
- L. Cable Management: Secure the cable bundle(s) to the rack strain relief and wire management behind the patch panel. Install horizontal and side-mounted vertical cable management panels and brackets for routing and management of patch cables. Maintain EIA/TIA and BICSI standards on bundling, supporting and bend radii.
- M. Once the cabling system has been installed and terminated, install all active components and surge protected power strips into the rack.
- N. MTA provided Surge Protected Outlet Strips: Mount UPS and surge protected outlet strips per Manufacturer's directions.
- O. Outlets shall be seated properly and shall be installed level on walls and parallel to building elements as required.
- P. All conductors of every cable shall be completely terminated at both ends.

- Q. Cable bending radius shall not be less than minimum required by EIA/TIA and BICSI.
- R. Cabling installed concealed shall be supported from the building structure (e.g. J-Hooks, etc.).
- S. Cables shall be installed no closer than 12 inches (305mm) to electrical equipment and wiring. When cables are required to cross power wiring, they shall only do so perpendicular to the power wiring. Telecommunications cabling and power wiring shall only cross each other the minimal number of times as required due to building design limitations.
- T. Clearances: Clearances between cabling and other building systems as required by EIA/TIA 569 and BICSI shall be maintained throughout the building.
- U. All cables shall be installed in a neat and workman-like manner. Cables shall be installed parallel and perpendicular to building elements.
- V. Cable ties for horizontal cables shall be secured with minimum required compression in order to secure the cables properly without impeding the signal transmission rating (geometry) of the cable. Hook and loop (Velcro) cable wraps may be used in lieu of cable ties for copper cables only.
- W. When pathways are not provided or specified, provide strap supports from the building structure as required for cable runs to the cable drop location. Maximum distance between supports shall be five feet (1 500mm) depending on the structural elements of the building. Maximum number of cables per support shall be fourteen. Provide additional supports as to maintain required bending radius of cables.
- X. All cables shall be supported directly from building structure. Under no circumstance shall cable be installed using cross bracing, plumbing/sprinkler pipes, ceiling systems or any other system that is not a specifically approved method to independently support cables. Cables shall not be allowed to rest on ceiling tiles, ductwork, piping, etc. Supports shall be provided as required in order for cables to avoid contact with any other building system. Bundle cables in groups by Room.
- Y. Protect all cables during construction. Cables damaged during installation shall not be repaired. They shall be completely replaced with new cable.
- Z. All cabling shall be concealed within partitions or above ceilings.
- AA. Permanently label, using pre-printed labels, all cables and terminations exactly as defined herein:
 - 1. Label patch ports numerically, top-to-bottom.
 - 2. Label the cable segments as indicated on Drawing Schedules. Each outlet shall be designated by the incoming cable and shall be labeled accordingly.

- BB. The general topology shall be a "hierarchical star" configuration. All segments shall originate in NRTL listed patch panels located in the telecommunication equipment racks/cabinets and end at the Work Area Outlet.
- CC. Routing
1. Route cables (minimum of 12 inches (305mm) away) to avoid light ballasts, transformers, power wiring and other electrical devices so that there is no EMI or RFI interference with data transmission.
 2. Cable routes shall be with 90 degree angles whenever possible. Cables shall not be installed randomly or diagonally through the building.
- DD. All cables shall have both ends completely terminated at their respective patch panel and Outlet Jacks. Individual conductors shall be trimmed flush with IDC block. Cables indicated to be "spare" shall have one end terminated at their respective patch panel or cross-connect block and the other end shall be hermetically sealed with a polyolefin heat-shrinkable cap. Provide *RayChem Co.* or approved equivalent after testing. Tape shall not be approved.
- EE. The total length of permanently installed cable for any complete segment shall not exceed 295 feet (90m). Do not splice or otherwise re-terminate any cable used, terminate only at the patch panels, cross connect blocks and Outlet Jacks. Route cables (minimum of 12 inches (305mm) away) to avoid light ballasts, transformers, power wiring and other electrical devices so that there is no EMI or RFI interference with data transmission. Permanently label all cables six inches from the connector at each end, according to the numbering convention outlined in the section on labeling. All cables shall be terminated at outlets, patch panels or cross connect blocks Only.
- FF. Maximum pulling tension shall not exceed 25 lbs/ft. when installing cables.
- GG. Modular Jacks: Each Category 6 jack shall have a Category 6 home cable run back to its associated patch panel.
- HH. General:
1. The Telecommunications systems comprising of equipment cabinet, rack and non-current carrying metallic parts shall be grounded according to the Electrical Code.
 2. In general, the grounding shall be as specified, as specified and as required by the Electrical Code and Local Authorities.
 3. Ground equipment, conductor, and cable shields to eliminate shock hazard and to minimize to the greatest extent possible, ground loops, common mode returns, noise pickup, cross talk, and other impairments. Provide 5-ohm ground at main equipment location. Measure, record, and report ground resistance.
 4. The installer shall furnish and install a dedicated, isolated earth ground from the central equipment rack and bond to the incoming electrical service ground bus bar.
- II. Cabling systems shall meet or exceed the electrical and transmission characteristics of the systems specified.

- JJ. Cable segments and links shall be tested from both ends of the cable for each of the construction phases. (Verify that cable labeling matches at both ends).

- KK. Test Reports: Upon completion and testing of the installed system for each of the construction phases, test reports shall be submitted in booklet form showing all factory and field tests performed. Organize test reports by each telecommunication closet. Test reports shall be typewritten. Provide documentation and a copy of the standards being tested to. Indicate where test is in compliance, and acceptable limits for the test, measured value of the test and application involved. Submit test report formats for approval during shop drawing review.

- LL. The system shall not be considered certified until the tester has acknowledged, in writing, that the performance of the physical layer of the system has been fully tested and is operational at the completion of the installation phase.

- MM. Equipment Manufacturer's Factory Test
 - 1. Each cable and equipment manufacturer shall factory test their respective products being installed on this project and provide test reports at time of delivery. Provide separate respective test reports indicating that they meet or exceed the latest applicable TIA/EIA Standards and technical bulletins.
 - 2. All other products relative to this specification shall be tested to its respective industry strictest standards.
 - 3. Each manufacturer shall factory test their respective cable or equipment provided to this project at several lower frequency levels, including the minimum and maximum frequency level indicated herein. The test reports shall indicate test results for at least five equal incremental frequency levels including the maximum required.

- NN. Field Testing Equipment: Submit during shop drawing review on the testing equipment to be utilized on this project. The installer shall test all cables installed under this Section. Provide a hard copy of all field-testing.
 - 1. Unshielded and Shielded twisted pair Testing Equipment:
 - a. The cable tester shall have a wide variety of preprogrammed cable types as an integral part of its testing system and have the ability to test cables less than 6 feet (6ft.) from the test point.
 - b. Cable tester shall be NRTL certified for EIA/TIA TSB95.

- OO. UTP Cabling Systems
 - 1. Test each UTP cable and passive components. Provide certification that entire installation of UTP cabling, equipment and jacks are NRTL certified meeting or exceeding a minimum of category performance specified on all four pairs of conductors. Tests shall indicate each cable segment performance as well as each cable overall channel performance (includes patch cables at both ends of cable segments).
 - 2. Tests shall be based on each pair of conductors and not the aggregate multiple pair results.
 - 3. UTP Cable: Test all installed cable segments end-to-end, from the horizontal patch panel to each Work Area Outlet with a Signal Injector, Graphical Link Testing Meter and Time Domain Reflectometer (TDR) for compliance to latest

EIA/TIA performance requirements, as well as NEXT, ELFEXT, structural return loss, alternating power sum, opens, shorts, continuity, cable length, and Characteristic Impedance.

4. Test results shall include:
 - a. Wire Map
 - b. Length
 - c. Attenuation
 - d. Near-end Crosswalk (NEXT) Loss
 - e. NEXT (Near End Cross Talk)
 - f. PS-NEXT (Power Sum Near End Cross Talk)
 - g. ELFEXT (Equal Level Far End Cross Talk)
 - h. PS-ELFEXT (Power Sum Equal Level Far End Cross Talk)
 - i. Propagation Delay
 - j. Delay Skew
 - k. Impedance
 - l. Return Loss
 - m. Wire map will determine the following:
 - 1) Continuity to the remote end
 - 2) Shorts between any two or more conductors
 - 3) Crossed pairs
 - 4) Reversed pairs
 - 5) Split pairs
 - 6) Any other mis-wiring
 - n. Below are the current testing requirements in addition to the basic wire-map and length tests for Category 5E cables and the respected limits for each test parameter.
5. Length is determined by the propagation of delay of signals and depends on the twist helix and dielectric materials. Note: Calibration of nominal velocity of Propagation (NVP) is critical to the accuracy of the length measurements when estimating from either frequency or time domain methods.
 - a. The maximum physical lengths for:
 - 1) Basic link = 94 meters including test equipment cords.
 - 2) Channel = 100 meters including equipment cords and patch cords.
 - 3) Test results shall be reported in feet.
6. Attenuation: Link attenuation shall include all connection hardware.
7. Near end Cross Talk (NEXT) Loss: Next and PS-NEXT shall be measured form both ends of the cable or link under test. For accurate measurements, at least 380 linearly spaced sample points in a 100 MHZ sweep are required.
8. When a test result is closer to the test limit than the accuracy of the field tester, the result shall be marked with an asterisk (*). Provide documentation to interpret results marked by an asterisk.
9. The Link test shall include all patch cables and line cords.
10. Any reconfiguration of link components after testing may change the performance of the link and thus invalidate the previous test result. These links shall be re-tested.
11. In general, provide certification that all cabling and equipment installed has been tested for wire mapping, cable length, NEXT, PS-NEXT, attenuation, ELFEXT, PS-ELFEXT, Return Loss, Prop. Delay and Delay Skew, shorts, opens, polarity, split pairs and that

the pin configuration is consistent throughout the entire systems. (Category 5E backbone testing shall include testing for Powersum.)

- PP. Upon completion of all work, and testing, thoroughly inspect all exposed portions of the installation and completely remove all exposed labels, markings, and foreign material.
- QQ. Repair damage to finish surfaces resulting from work under this Section. Touch up all damaged pre-finished equipment using materials and methods recommended by the Manufacturer.

END OF SECTION 26000

MAINE TURNPIKE AUTHORITY

SPECIFICATIONS

PART IV – APPENDICES

APPENDIX A

LEAD PAINT ASSESSMENT
AND
ASBESTOS DETERMINATION REPORT

August 28, 2020

R. Bruce Munger, PE, PTOE
Traffic Department Manager
HNBT Corporation
340 County Road Suite 6-C
Westbrook, Maine 04092

Re: Asbestos/Lead Demolition Impact Assessment, Exit 45 South Portland, Maine

Dear Mr. Munger:

Abatement Professionals Corporation (APC) is providing you with the asbestos/Lead bulk testing results for the samples collected from readily accessible building materials that may be impacted by demolition/renovations activities at the Exit 45 renovation/demolition, South Portland, Maine.

I inspected the Toll Plaza on August 20, 2020. During the inspection process there were a total of thirteen (13) samples of suspect building materials. The building materials collected include: roofing materials, caulking materials around tool booths, and other suspect materials within the boundaries of the complex. The MDEP Chapter 425 and USEPA have minimum sampling requirements for asbestos building material investigations. The requirements are as follows: if any of the asbestos materials test positive, then they must be removed and properly disposed of in accordance with the Maine DEP rules and regulations as outlined in their standard Chapter 425. I also checked the Toll Booth for Lead based paint using Lead Check Swabs.

Surfacing materials: sprayed or applied by trowel and include fireproofing materials and various plasters. At least three bulk samples of surfacing materials were collected from each homogeneous area that was less than 1,000-square feet. Five bulk samples were collected for areas 1,000 to 5,000-square feet, and seven bulk samples were collected for area greater than 5,000-square feet.

Thermal system insulation: including boiler cover, pipe cover, and duct insulation were assessed. These materials were either assumed to be asbestos containing or were sampled as follows; At least three bulk samples of thermal system insulation from each homogenous area or at least one bulk sample from each homogeneous patched area if the section is less than six linear or square feet.

Miscellaneous ACM: includes a variety of ceiling tiles, floor tiles, and gypsum board. Sample quantities for miscellaneous ACM follow the same requirements as for the two previously mentioned ACM types.

The bulk samples were collected with standard sampling protocols, properly packaged, maintained and shipped to Northeast Laboratory Services in Westbrook, Maine for analysis by Polarized Light Microscopy (PLM) specific to asbestos content by volume.

APC collected 2 sample groups of suspect homogenous building materials from the structures at the site that will likely be impacted by demolition/renovation activities. **The bulk sample analysis indicates that the structure has regulated asbestos containing building materials in the following forms;**

MTA Exit 44 Asbestos report and findings

Asbestos Materials	Location	% Asbestos	Regulated
Caulking	Plaza booths, between CMU and steel beams Approximately 20 SF.	1.85% Chrysotile	YES OSHA
Lab tops	In all toll booths Approximately 144 SF.	37% Chrysotile	YES
Water tank covering	In the Utility room of toll booth office Approximately 50 SF.	1.75% Chrysotile	Yes

(See attached bulk sampling summary for more detailed information)

The Inspection and bulk sample analysis indicates that there are Materials that do contain asbestos within the toll plaza booths tested and must be removed by a State of Maine certified asbestos abatement contractor. Should any additional suspect building materials be found during any of the demolition/renovation work, the work should immediately stop until additional sampling can be conducted.

MTA Exit 44 Lead Based Paints

Lead Materials	Location	Lead Paints	Regulated
Structural Steel	Light Blue Painted	Yes	Yes EPA
Steel frame of booths	White	Yes	Yes EPA
Structural steel	Red Paint Under Blue	Yes	Yes EPA

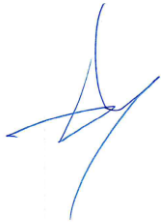
A Lead based paint Determination study was conducted was performed by Northeast Test Consultants of Westbrook, Maine. All testing was performed utilizing an XRF Lead Paint Analyzer, all Steel or painted surfaces were checked for the presents of Lead paint, Structural Steel on Plaza tested positive, service support building tested negative for lead based paints. The complete report for Northeast test is attached as part of this inspection report.

MTA Exit 44 Universal Waste,

Universal Materials	Location	Blubs, battery's thermostats, cleaning agents	Regulated
LED light tubes	Throughout	Light tubes	Yes EPA
Possible PCB Ballast	Within the old light fixtures under roof	Ballast	Yes DEP
Light bulbs and ballast	Exit and emergency lighting	Exit signs and emergency lighting	Yes DEP
Cleaning agents	Service building	Cleaning agents	Yes DEP

We recommend that you carry a cost estimate of \$ 9,750.00 for the permitting, Removal and disposal of the asbestos lab tops materials and a cost of \$ 1,750.00 for universal waste. We appreciate the opportunity to service your asbestos testing needs, should you require further bulk or air quality sampling please feel free to contact us at any time.

Very truly,



Dana Codrey
Operations Manager DC-0284, AS-1787, AI-0661, AM-0536



Figure 1: Roof Sampling



Figure 2: Roof Support beams Asbestos caulking



Figure 3: Asbestos containing Lab Tops



Figure 4: Lead based paint on Structure



Figure 3: Presumed PCB ballast in old Lights



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION



JANET T. MILLS
GOVERNOR

GERALD D. REID
COMMISSIONER

January 19, 2020

Abatement Professionals Corp.
590 County Road, Suite 2
Westbrook, Maine 04092

Dear Licensee:

Asbestos application(s) for individual certification of the **one** employee(s) listed below have been received and **approved**. Individual certification numbers are listed below and wallet card(s) are enclosed. Card(s) are property of the individual to whom each is issued. Your responsibility as a licensee is to ensure delivery of the cards to persons in your employment. This letter should be retained for your company files as record of certification. **Please attach 1 updated passport size photo with every application.**

Remember, in Maine all **certified employees** working on an asbestos abatement project, whether conducting removal/repair, air monitoring, design, inspection, or analysis functions, **must work for a State of Maine licensed asbestos firm** and carry his/her wallet card(s) on the job site.

As a reminder, prior to renewing your asbestos certification, the State of Maine **requires** an annual refresher course to be taken before submitting a renewal application. A certificate shall expire one year from the last day of the month from the date of issuance, **or on the last day of the month that the training certificate expires**, whichever is sooner.

All our asbestos forms can be found at <https://www.maine.gov/dep/waste/asbestos/forms.html>
Thank you for your cooperation and your completed application(s).

<u>Name</u>	<u>Category</u>	<u>Certification #</u>	<u>Exp. Date</u>
Dana Codrey	Design Consultant	DC-0284	01/31/2021

Sincerely,

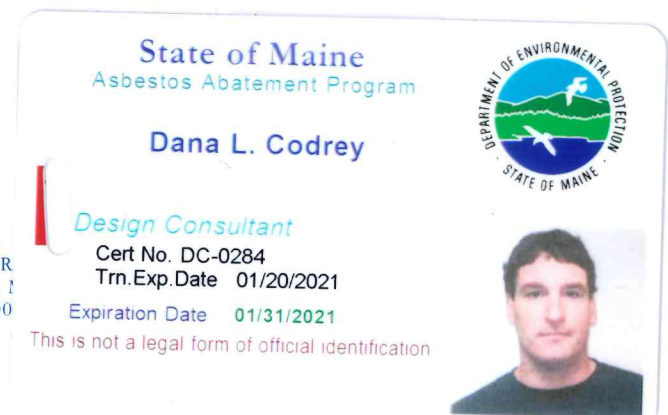
Sandra J. Moody, Environmental Specialist
Division of Remediation
Bureau of Remediation and Waste Management

AUGUSTA
17 STATE HOUSE STATION
AUGUSTA, MAINE 04333-0017
(207) 287-7688 FAX: (207) 287-7826

BANGOR
106 HOGAN ROAD, SUITE 6
BANGOR, MAINE 04401
(207) 941-4570 FAX: (207) 941-4584

PORTLAND
312 CANCO R
PORTLAND, I
(207) 822-6300

website: www.maine.gov/dep





State of Maine
Department of Environmental Protection

LICENSE

Abatement Professionals Corp.

Asbestos Consultant
(Full)

License Number: SF-0028

Expiration Date: 06/30/2021

APPENDIX B

MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP)
NATURAL RESOURCES PROTECTION ACT
INDIVIDUAL PERMIT

**MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP)
NATURAL RESOURCES PROTECTION ACT
INDIVIDUAL PERMIT**

EXIT 45



DEPARTMENT ORDER

IN THE MATTER OF

MAINE TURNPIKE AUTHORITY	)	NATURAL RESOURCES PROTECTION ACT
Scarborough and South Portland	)	FRESHWATER WETLAND ALTERATION
Cumberland County	)	WATER QUALITY CERTIFICATION
EXIT 45 RECONFIGURATION)	
L-28275-TG-A-N (approval)	)	FINDINGS OF FACT AND ORDER

Pursuant to the provisions of 38 M.R.S. §§ 480-A–480-JJ, Section 401 of the Federal Water Pollution Control Act (33 U.S.C. § 1341), and Chapters 310, 315, and 335 of Department rules, the Department of Environmental Protection has considered the application of the MAINE TURNPIKE AUTHORITY with the supportive data, agency review comments, and other related materials on file and FINDS THE FOLLOWING FACTS:

1. PROJECT DESCRIPTION:

A. Summary: To correct several deficiencies with the Exit 45 interchange, the applicant proposes to reconstruct and reconfigure the existing interchange. The project site is located at mile marker 45 on the Maine Turnpike in the Town of Scarborough and the City of South Portland.

The proposed project will consist of a new, reconfigured interchange, including new four new on- and off-ramps; replacement of the Exit 45 Underpass Bridge; removal of unused impervious surfaces from retired ramps, which will otherwise remain in place; construction of new toll plazas (two cash lanes and one electronic tolling lane) for northbound and southbound traffic, with related infrastructure; a new employee access drive from Cummings Road; relocation of Central Maine Power’s (CMP) 115kV and 34.5kV lines that cross the Turnpike north of the existing Exit 45 interchange; and construction of stormwater management measures within the Turnpike right-of-way. The proposed project will require preloading to improve soil stability and minimize post-construction settlement and is expected to take four construction seasons to complete. Approximately 5.86 acres of freshwater wetlands will be permanently altered as a result of the proposed project.

The proposed project is shown on a set of plans, the first of which is titled “Exit 45 Interchange Reconfiguration Project, Wetland Impacts, Index Plan”, prepared by HNTB Corporation and dated March 2019.

B. Current Use of the Site: The project site is located within the right-of-way of the Turnpike travel corridor, which includes northbound and southbound travel lanes and the Exit 45 interchange.

2. EXISTING SCENIC, AESTHETIC, RECREATIONAL OR NAVIGATIONAL USES:

The Natural Resources Protection Act (NRPA), in 38 M.R.S. §480-D(1), requires the applicant to demonstrate that the proposed project will not unreasonably interfere with existing scenic, aesthetic, recreational and navigational uses.

In accordance with Chapter 315, *Assessing and Mitigating Impacts to Scenic and Aesthetic Uses* (06-096 C.M.R. ch. 315, effective June 29, 2003), the applicant submitted a copy of the Department's Visual Evaluation Field Survey Checklist as Appendix 14 to the application along with a description of the property and the proposed project. The applicant also submitted several photographs of the proposed project site and surroundings, including an aerial photograph of the project site.

The proposed project is located in the portions of the Red Brook and Long Creek watersheds, which are not scenic resources visited by the general public, in part, for the use, observation, enjoyment and appreciation of its natural and cultural visual qualities.

The Department finds that the proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational or navigational uses of the freshwater wetlands that will altered.

3. SOIL EROSION:

The NRPA, in 38 M.R.S. §480-D(2), requires the applicant to demonstrate that the proposed project will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.

In order to minimize sedimentation into protected natural resources, construction will be performed using a number of erosion and sedimentation control measures based on the latest version of the *Maine Department of Transportation Best Management Practices for Erosion and Sediment Control (BMPs)* and the applicant's standards and specifications (Supplemental Specification Section 656, Temporary Soil Erosion and Water Pollution Control). The applicant stated that each construction project implements a Construction Project Environmental Compliance Program, which assigns a Resident Engineer and Compliance Officer whose roles include inspection of the construction project and weekly reports of erosion and sedimentation control devices. In addition, Supplemental Specification Section 656 requires each contractor to certify that its on-site responsible party has been trained and is knowledgeable in erosion and sediment control. Supplemental Specification Section 656 also establishes an overview of preparatory activities, excavation activities, construction activities (including spill prevention and control), a post-construction work plan, and a schedule of construction activity. Periodic inspections of the overall project, including the effectiveness and condition of erosion and sediment control devices are conducted by the applicant's Permitting Coordinator/Environmental Liaison.

The Department finds that the activity will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.

4. HABITAT CONSIDERATIONS:

The NRPA, in 38 M.R.S. §480-D(3), requires the applicant to demonstrate that the proposed project will not unreasonably harm significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life.

According to the Department's Geographic Information System database there are no mapped Essential or Significant Wildlife Habitats located at the site.

The Maine Department of Inland Fisheries and Wildlife (MDIFW) reviewed the proposed project, and in its comments, dated January 4, 2019, stated that no records of any Essential or Significant Wildlife Habitats were found within the project site. In its comments, MDIFW noted that the Maine Endangered Species Act lists several species of bats as endangered or threatened. **Because bats are likely to be found on the project site during migration and/or breeding season, MDIFW recommended that tree clearing be limited to the period when bats are not present. The applicant agreed to limit tree clearing outside of the months of June and July, the recognized pupping season for tree-roosting bats.**

No fisheries and stream protection issues were identified.

The Department finds that the activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life **provided that no tree cutting is conducted during the period of June 1 and July 31.**

5. WATER QUALITY CONSIDERATIONS:

The waters that may be affected by the proposed project are currently classified as Class C waters (38 M.R.S. §468(1)). Class C waters must be of such quality that they are suitable for the designated uses of drinking water supply after treatment, fishing, aquaculture, recreation in and on the water, industrial process and cooling water supply, hydroelectric power generation, navigation and as habitat for fish and other aquatic life (38 M.R.S. §465(4)(A)).

As discussed in Finding 3, the applicant proposes to use erosion and sediment control during construction to minimize impacts to water quality from siltation.

Prior to filing the application, the applicant and its consultants met with the Department to discuss treatment of stormwater from the proposed project. In accordance with the June 2017 Memorandum of Agreement (MOA) for Stormwater Management Between

the Maine Department of Transportation, Maine Turnpike Authority, and the Department of Environmental Protection, the applicant proposes to construct three underdrained soil filters and four meadow buffers associated with the proposed project. These stormwater BMPs are designed to be consistent with the treatment standards set forth in the Department's Chapter 500, *Stormwater Management* (06-096 C.M.R. ch.500, last amended August 12, 2015), and are expected to remove pollutants and provide some cooling of stormwater runoff, prior to discharge to Red Brook or Long Creek.

Based on the location of the proposed project, the construction methods proposed, and project's design and the Findings above, the Department finds that the proposed project will maintain and protect existing uses and the level of water quality necessary to protect those existing uses, will protect the existing water quality of affected waters, and will not significantly impair the viability of the existing fish populations.

6. WETLANDS AND WATERBODIES PROTECTION RULES:

The proposed project will permanently alter 255,061 square feet (5.86 acres), and temporarily impact an additional 93,507 square feet (2.15 acres) of freshwater wetlands within the overall project site. The permanently impacted wetlands include approximately 20,234 square feet (0.46 acres) of forested wetlands, 18,953 (0.44 acres) of scrub shrub wetlands, and 215,874 square feet (4.95 acres) of wet meadow/emergent marsh vegetation, of which 129,957 square feet (2.98 acres) are currently routinely mowed to ensure highway safety.

The CMP transmission line replacement will require the placement of five steel monopoles (one of which will be a self-supporting structure on a foundation), three wood monopoles, and six steel three-pole structures. Installation of the transmission line poles will result in the permanent fill of 847 square feet of freshwater wetlands. Access to utility poles would be gained using temporary wooden construction mats, with a mat road width of 16 feet and with a 25-foot working area around each transmission line support structure, resulting in temporary impacts to 50,445 square feet of freshwater wetlands.

The applicant also identified temporary wetland impacts as the area between the edge of project disturbance and the placement of silt fencing and stated that any wetlands disturbed in these areas will be restored to pre-disturbance conditions and revegetated with wetland vegetation and will result in temporary impacts to 43,062 square feet of freshwater wetlands.

The *Wetlands and Waterbodies Protection Rules*, 06-096 C.M.R. ch. 310 (last amended January 26, 2009), interpret and elaborate on the NRPA criteria for obtaining a permit. The rules guide the Department in its determination of whether a project's impacts would be unreasonable. A proposed project would generally be found to be unreasonable if it would cause a loss in wetland area, functions and values and there is a practicable alternative to the project that would be less damaging to the environment. Each application for a NRPA permit that involves a freshwater wetland alteration must provide an analysis of alternatives in order to demonstrate that a practicable alternative does not exist.

A. Avoidance. An applicant must submit an analysis of whether there is a practicable alternative to the project that would be less damaging to the environment and this analysis is considered by the Department in its assessment of the reasonableness of any impacts. The applicant submitted an alternatives analysis for the proposed project, dated March 29, 2019. The purpose of the project is to reconstruct the Exit 45 interchange of the Maine Turnpike to resolve deficiencies with the ramp bridge, toll plaza/system, and road geometrics to enhance safety and operational efficiency for current and future traffic.

The applicant examined seven alternatives, including the no-action alternative, in its initial (Phase 1) determination for the most practicable alternative that would meet the project purpose. Several interchange alternatives (trumpet, diamond, and cloverleaf configurations, a stacked configuration, and two variations that use a rotary) were evaluated in the Phase 1 review based on eight criteria that included: costs, right-of-way impacts, level of service, crash potential, construction complexity, and environmental impacts. Two alternatives, trumpet and diamond configurations, were selected for Phase 2, refined Alternatives Analysis, review. Phase 2 review was conducted based on refined geotechnical data, resource mapping, and constraints from existing infrastructure and adjacent development. The evaluation criteria for these two alternatives, after including these refined factors, were similar to Phase 1 review, but with additional emphasis on environmental impacts.

The selected alternative was determined to best meet the project purpose, would meet the safety, engineering, and impact minimization desired by the applicant. Given the location of the protected natural resources on the project site, impacts to freshwater wetlands cannot be avoided.

B. Minimal Alteration. In support of an application and to address the analysis of the reasonableness of any impacts of a proposed project, an applicant must demonstrate that the amount of freshwater wetland to be altered will be kept to the minimum amount necessary for meeting the overall purpose of the project. Freshwater wetlands are found immediately adjacent to the southbound travel lanes on the entire western side of the project site and adjacent to northbound travel lanes immediately north of the existing interchange on the eastern side of the project site. Geotechnical investigations have documented poor soil conditions throughout the site, such that preloading will be required prior to construction of the road surfaces. Because of the poor soils, the applicant determined that use of 4H:1V road side slopes would be preferable to 2H:1V road side slopes with guard rails for their stability and highway design advantages. The steeper slopes would require use of stability berms at the toe of slope to ensure subsurface soil failure would not occur, which would require additional wetland fill. The applicant sought to minimize impacts to adjacent wetlands by “hugging” ramps to existing roadways and by maintaining the necessary vertical clearance of the Exit 45 Underpass bridge, which would then limit height of road embankments, and encroachment into adjacent wetlands.

The Department finds that the road design and the angle of the side slopes in and adjacent to the wetland edges resulted in the minimum amount of wetland impacts necessary for the project.

C. Compensation. In accordance with Chapter 310, compensation is required for the proposed project to achieve the goal of no net loss of freshwater wetland functions and values.

The applicant submitted a functional assessment, dated March 2019, that described the wetlands to be altered by the proposed project. The functional assessment documented that the primary functions and values of these wetlands are sediment toxicant retention and floodflow alteration. The functional assessment noted that additional wetland functions for wetlands in the project area were generally low due to the periodic mowing and road safety maintenance programs performed by the applicant in the travel corridor. The functional assessment also noted that while these wetlands are effective at capturing sediment and pollutants that runoff the road surface and from adjacent commercial development, the elevated pollutant loading is contributing to degradation of the wetlands.

The application included a table that identified the wetland type, their functions and values, the type of impact, and a calculation of an In-Lieu Fee payment amount for the wetland impacts from the proposed project. Wetlands identified as wet meadow/emergent marsh vegetation wetlands were not subject to a resource multiplier because these areas are either located in artificial impoundments or are routinely altered (mowed) as part of the applicant's management program to maintain highway clear zones. A resource multiplier was applied to 48,615 square feet of emergent marsh vegetation wetlands that are not routinely maintained. **The applicant proposes to make a contribution into the In-Lieu Fee program of the Maine Natural Resource Conservation Program in the amount of \$1,302,164.70. Prior to the start of construction, the applicant must submit a payment in the amount of \$1,302,164.70, payable to "Treasurer, State of Maine", and directed to the attention of the In-Lieu Fee Program Administrator at 17 State House Station, Augusta, Maine 04333.**

The Department finds that the applicant has avoided and minimized stream and wetland impacts to the greatest extent practicable, and that the proposed project represents the least environmentally damaging alternative that meets the overall purpose of the project **provided that prior to project construction, the applicant submits the In-Lieu Fee payment as described above.**

The Department further finds that the activity will not unreasonably harm any freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life.

7. OTHER CONSIDERATIONS:

The proposed project is not located in a coastal sand dune system, is not a crossing of an outstanding river segment, and does not involve dredge spoils disposal or the transport of

dredge spoils by water. The Department finds, based on the project's design, the proposed construction methods, and project location, the proposed project will not inhibit the natural transfer of soil from the terrestrial to the marine environment, will not interfere with the natural flow of any surface or subsurface waters, and will not cause or increase flooding.

The proposed project is exempt from review under the Site Location of Development Act pursuant to 38 M.R.S. § 488(10).

The proposed project is also exempt from review under the Stormwater Management Law pursuant to 38 M.R.S. § 420-D(7)(G), as long as the project is constructed in accordance with the MOA referenced in Finding 5. The MOA requires that projects developed by the applicant located within watersheds of urban impaired streams must meet the General Standards contained in Chapter 500 *Stormwater Management Rules* (06-096 C.M.R. ch. 500, effective August 12, 2015) to the extent practicable. The applicant and the Department met several times to discuss stormwater treatment of the proposed project. The proposed project includes three underdrained soil filters and four stormwater meadow buffers.

Given the nature of the project and the limitations for constructing stormwater treatment devices along the Turnpike, the Department is satisfied that the proposed project complies with the General Standards of Chapter 500 to the extent practicable.

BASED on the above findings of fact, and subject to the conditions listed below, the Department makes the following conclusions pursuant to 38 M.R.S. §§ 480-A–480-JJ and Section 401 of the Federal Water Pollution Control Act:

- A. The proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational, or navigational uses.
- B. The proposed activity will not cause unreasonable erosion of soil or sediment.
- C. The proposed activity will not unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.
- D. The proposed activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine, or marine fisheries or other aquatic life **provided that prior to construction the applicant makes a contribution to the In-Lieu Fee program as described in Finding 6.**
- E. The proposed activity will not unreasonably interfere with the natural flow of any surface or subsurface waters.
- F. The proposed activity will not violate any state water quality law including those governing the classifications of the State's waters.

- G. The proposed activity will not unreasonably cause or increase the flooding of the alteration area or adjacent properties.
- H. The proposed activity is not on or adjacent to a sand dune.
- I. The proposed activity is not on an outstanding river segment as noted in 38 M.R.S. § 480-P.

THEREFORE, the Department APPROVES the above noted application of the MAINE TURNPIKE AUTHORITY to reconstruct Exit 45 of the Maine Turnpike as described in Finding 1, SUBJECT TO THE ATTACHED CONDITIONS, and all applicable standards and regulations:

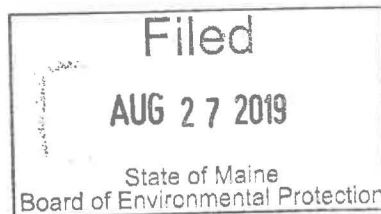
- 1. Standard Conditions of Approval, a copy attached.
- 2. The applicant shall take all necessary measures to ensure that its activities or those of its agents do not result in measurable erosion of soil on the site during the construction of the project covered by this approval.
- 3. Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.
- 5. Prior to the start of construction, the applicant shall submit a payment in the amount of \$1,302,164.70, payable to "Treasurer, State of Maine", to the attention of the In-Lieu Fee Program Administrator at 17 State House Station, Augusta, Maine 04333.

THIS APPROVAL DOES NOT CONSTITUTE OR SUBSTITUTE FOR ANY OTHER REQUIRED STATE, FEDERAL OR LOCAL APPROVALS NOR DOES IT VERIFY COMPLIANCE WITH ANY APPLICABLE SHORELAND ZONING ORDINANCES.

DONE AND DATED IN AUGUSTA, MAINE, THIS 27th DAY OF August, 2019.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Melanie B. for
For: Gerald D. Reid, Commissioner



PLEASE NOTE THE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES. RLG/L28275AN/ATS#84345



Natural Resources Protection Act (NRPA) Standard Conditions

THE FOLLOWING STANDARD CONDITIONS SHALL APPLY TO ALL PERMITS GRANTED UNDER THE NATURAL RESOURCES PROTECTION ACT, 38 M.R.S. § 480-A ET SEQ., UNLESS OTHERWISE SPECIFICALLY STATED IN THE PERMIT.

- A. Approval of Variations From Plans. The granting of this permit is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed to by the applicant. **Any variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.**
- B. Compliance With All Applicable Laws. The applicant shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.
- C. Erosion Control. **The applicant shall take all necessary measures to ensure that his activities or those of his agents do not result in measurable erosion of soils on the site during the construction and operation of the project covered by this Approval.**
- D. Compliance With Conditions. Should the project be found, at any time, not to be in compliance with any of the Conditions of this Approval, or should the applicant construct or operate this development in any way other the specified in the Application or Supporting Documents, as modified by the Conditions of this Approval, then the terms of this Approval shall be considered to have been violated.
- E. Time frame for approvals. **If construction or operation of the activity is not begun within four years, this permit shall lapse and the applicant shall reapply to the Board for a new permit.** The applicant may not begin construction or operation of the activity until a new permit is granted. Reapplications for permits may include information submitted in the initial application by reference. **This approval, if construction is begun within the four-year time frame, is valid for seven years.** If construction is not completed within the seven-year time frame, the applicant must reapply for, and receive, approval prior to continuing construction.
- F. No Construction Equipment Below High Water. **No construction equipment used in the undertaking of an approved activity is allowed below the mean high water line unless otherwise specified by this permit.**
- G. Permit Included In Contract Bids. **A copy of this permit must be included in or attached to all contract bid specifications for the approved activity.**
- H. Permit Shown To Contractor. **Work done by a contractor pursuant to this permit shall not begin before the contractor has been shown by the applicant a copy of this permit.**



DEP INFORMATION SHEET

Appealing a Department Licensing Decision

Dated: November 2018

Contact: (207) 287-2452

SUMMARY

There are two methods available to an aggrieved person seeking to appeal a licensing decision made by the Department of Environmental Protection's (DEP) Commissioner: (1) an administrative process before the Board of Environmental Protection (Board); or (2) a judicial process before Maine's Superior Court. An aggrieved person seeking review of a licensing decision over which the Board had original jurisdiction may seek judicial review in Maine's Superior Court.

A judicial appeal of final action by the Commissioner or the Board regarding an application for an expedited wind energy development (35-A M.R.S. § 3451(4)) or a general permit for an offshore wind energy demonstration project (38 M.R.S. § 480-HH(1)) or a general permit for a tidal energy demonstration project (38 M.R.S. § 636-A) must be taken to the Supreme Judicial Court sitting as the Law Court.

This information sheet, in conjunction with a review of the statutory and regulatory provisions referred to herein, can help a person to understand his or her rights and obligations in filing an administrative or judicial appeal.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

The laws concerning the DEP's *Organization and Powers*, 38 M.R.S. §§ 341-D(4) & 346; the *Maine Administrative Procedure Act*, 5 M.R.S. § 11001; and the DEP's *Rules Concerning the Processing of Applications and Other Administrative Matters* ("Chapter 2"), 06-096 C.M.R. ch. 2.

DEADLINE TO SUBMIT AN APPEAL TO THE BOARD

The Board must receive a written appeal within 30 days of the date on which the Commissioner's decision was filed with the Board. Appeals filed more than 30 calendar days after the date on which the Commissioner's decision was filed with the Board will be dismissed unless notice of the Commissioner's license decision was required to be given to the person filing an appeal (appellant) and the notice was not given as required.

HOW TO SUBMIT AN APPEAL TO THE BOARD

Signed original appeal documents must be sent to: Chair, Board of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017. An appeal may be submitted by fax or e-mail if it contains a scanned original signature. It is recommended that a faxed or e-mailed appeal be followed by the submittal of mailed original paper documents. The complete appeal, including any attachments, must be received at DEP's offices in Augusta on or before 5:00 PM on the due date; materials received after 5:00 pm are not considered received until the following day. The risk of material not being received in a timely manner is on the sender, regardless of the method used. The appellant must also send a copy of the appeal documents to the Commissioner of the DEP; the applicant (if the appellant is not the applicant in the license proceeding at issue); and if a hearing was held on the application, any intervenor in that hearing process. All of the information listed in the next section of this information sheet must be submitted at the time the appeal is filed.

INFORMATION APPEAL PAPERWORK MUST CONTAIN

Appeal materials must contain the following information at the time the appeal is submitted:

1. *Aggrieved Status.* The appeal must explain how the appellant has standing to maintain an appeal. This requires an explanation of how the appellant may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions, or conditions objected to or believed to be in error.* The appeal must identify the specific findings of fact, conclusions regarding compliance with the law, license conditions, or other aspects of the written license decision or of the license review process that the appellant objects to or believes to be in error.
3. *The basis of the objections or challenge.* For the objections identified in Item #2, the appeal must state why the appellant believes that the license decision is incorrect and should be modified or reversed. If possible, the appeal should cite specific evidence in the record or specific licensing requirements that the appellant believes were not properly considered or fully addressed.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license or permit to changes in specific permit conditions.
5. *All the matters to be contested.* The Board will limit its consideration to those matters specifically raised in the written notice of appeal.
6. *Request for hearing.* If the appellant wishes the Board to hold a public hearing on the appeal, a request for public hearing must be filed as part of the notice of appeal, and must include an offer of proof in accordance with Chapter 2. The Board will hear the arguments in favor of and in opposition to a hearing on the appeal and the presentations on the merits of an appeal at a regularly scheduled meeting. If the Board decides to hold a public hearing on an appeal, that hearing will then be scheduled for a later date.
7. *New or additional evidence to be offered.* If an appellant wants to provide evidence not previously provided to DEP staff during the DEP's review of the application, the request and the proposed evidence must be submitted with the appeal. The Board may allow new or additional evidence, referred to as supplemental evidence, to be considered in an appeal only under very limited circumstances. The proposed evidence must be relevant and material, and (a) the person seeking to add information to the record must show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process; or (b) the evidence itself must be newly discovered and therefore unable to have been presented earlier in the process. Specific requirements for supplemental evidence are found in Chapter 2 § 24.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, and is made easily accessible by the DEP. Upon request, the DEP will make application materials available during normal working hours, provide space to review the file, and provide an opportunity for photocopying materials. There is a charge for copies or copying services.
2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing your appeal.* DEP staff will provide this information on request and answer general questions regarding the appeal process.
3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed, the license normally remains in effect pending the processing of the appeal. Unless a stay of the decision is requested and granted, a license holder may proceed with a project pending the outcome of an appeal, but the license holder runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will formally acknowledge receipt of an appeal, and will provide the name of the DEP project manager assigned to the specific appeal. The notice of appeal, any materials accepted by the Board Chair as supplementary evidence, any materials submitted in response to the appeal, and relevant excerpts from the DEP's application review file will be sent to Board members with a recommended decision from DEP staff. The appellant, the license holder if different from the appellant, and any interested persons are notified in advance of the date set for Board consideration of an appeal or request for public hearing. The appellant and the license holder will have an opportunity to address the Board at the Board meeting. With or without holding a public hearing, the Board may affirm, amend, or reverse a Commissioner decision or remand the matter to the Commissioner for further proceedings. The Board will notify the appellant, the license holder, and interested persons of its decision.

II. JUDICIAL APPEALS

Maine law generally allows aggrieved persons to appeal final Commissioner or Board licensing decisions to Maine's Superior Court (see 38 M.R.S. § 346(1); 06-096 C.M.R. ch. 2; 5 M.R.S. § 11001; and M.R. Civ. P. 80C). A party's appeal must be filed with the Superior Court within 30 days of receipt of notice of the Board's or the Commissioner's decision. For any other person, an appeal must be filed within 40 days of the date the decision was rendered. An appeal to court of a license decision regarding an expedited wind energy development, a general permit for an offshore wind energy demonstration project, or a general permit for a tidal energy demonstration project may only be taken directly to the Maine Supreme Judicial Court. See 38 M.R.S. § 346(4).

Maine's Administrative Procedure Act, DEP statutes governing a particular matter, and the Maine Rules of Civil Procedure must be consulted for the substantive and procedural details applicable to judicial appeals.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, for administrative appeals contact the Board's Executive Analyst at (207) 287-2452, or for judicial appeals contact the court clerk's office in which your appeal will be filed.

Note: The DEP provides this INFORMATION SHEET for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.

**MAINE DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP)
NATURAL RESOURCES PROTECTION ACT
INDIVIDUAL PERMIT**

PORTLAND AREA WIDENING



DEPARTMENT ORDER

IN THE MATTER OF

MAINE TURNPIKE AUTHORITY	) NATURAL RESOURCES PROTECTION ACT
Scarborough, South Portland and Portland	) FRESHWATER WETLAND ALTERATION
Cumberland County)
PORTLAND AREA WIDENING	) WATER QUALITY CERTIFICATION
L-27726-TG-A-N (approval)	) FINDINGS OF FACT AND ORDER

Pursuant to the provisions of 38 M.R.S. §§ 480-A–480-JJ, Section 401 of the Federal Water Pollution Control Act (33 U.S.C. § 1341), and Chapters 310, 315, 335, and 502 of Department rules, the Department of Environmental Protection has considered the application of the MAINE TURNPIKE AUTHORITY with the supportive data, agency review comments, and other related materials on file and FINDS THE FOLLOWING FACTS:

1. PROJECT DESCRIPTION:

A. Summary: The applicant proposes to widen Interstate I-95, the Maine Turnpike (Turnpike) to three travel lanes in both directions between mile marker 43.0 and mile marker 48.8. The proposed project lies within the municipal limits of the Town of Scarborough, the City of South Portland, and the City of Portland. The proposed project will consist of the following elements:

- Along the mainline: A 12-foot wide travel lane will be constructed along the outside of the existing highway. Non-guardrail shoulders will be 12 feet wide, and guardrail shoulders will be 17 feet wide and include a three-foot guardrail panel from the face of the rail to the slope break. Side slopes will be 6H:1V, 4H:1V, or 2H:1V, depending on site conditions, all with parabolic shaped ditches. Vegetation clearing lines will be ten feet beyond the bottom of the side slopes.
- Along entrance and exit ramps: One-lane ramps will be constructed with a 14-foot wide travel lane with four-foot wide left-shoulders and eight-foot wide right-shoulders. Two-lane ramps will have 12-foot wide travel lanes with four-foot wide left-shoulders and eight-foot wide right-shoulders. Side slopes without guardrails will be 4H:1V with parabolic ditches. Vegetation clearing lines will be ten feet beyond the bottom of the side slopes.
- Within the median: Existing grassed swales will be replaced with a paved surface and a concrete median barrier installed along the median centerline to replace the existing steel guardrail. The existing catch basin and subsurface drainage system used to convey stormwater off the road surface will be renovated to the new median and travel lane conditions.

The proposed project will extend from mile marker 43.0 to mile marker 48.8 within the existing highway right-of-way owned by the applicant and is expected to take three

construction seasons to complete. The proposed project excludes portions of the Maine Turnpike around the Stroudwater River Bridge, the Maine Central Railroad Bridge, and the Warren Avenue Bridge. Widening of the Turnpike at these locations received earlier Department approval as part of the bridge improvements.

The proposed project will alter approximately 170 linear feet of stream as a result of culvert extensions at Red Brook, Long Creek, Nason's Brook (identified in the application as the Fore River), and an unnamed stream that empties into Capisic Brook. Approximately five acres of freshwater wetlands at 38 locations will be altered as a result of the proposed project. Impacts to streams and wetlands are discussed in Finding 6.

The proposed project is shown a set of plans, the first of which is titled "Wetland Impacts, Index Plan", prepared by HNTB Corporation and dated February 2019 with a last revision date of June 2019.

B. Current Use of the Site: The highway will be located within the right-of-way of the Turnpike travel corridor in which a four-lane divided highway is currently located.

2. EXISTING SCENIC, AESTHETIC, RECREATIONAL OR NAVIGATIONAL USES:

The Natural Resources Protection Act (NRPA), in 38 M.R.S. §480-D(1), requires the applicant to demonstrate that the proposed project will not unreasonably interfere with existing scenic, aesthetic, recreational and navigational uses.

In accordance with Chapter 315, *Assessing and Mitigating Impacts to Scenic and Aesthetic Uses* (06-096 C.M.R. ch. 315, effective June 29, 2003), the applicant submitted a copy of the Department's Visual Evaluation Field Survey Checklist as Appendix A to the application along with a description of the property and the proposed project. The applicant also submitted several photographs of the proposed project site and surroundings including an aerial photograph of the project site.

The proposed project is located in the portions of the Red Brook, Long Creek, the Stroudwater River, Nason's Brook, and Capisic Brook watersheds which are not scenic resources visited by the general public, in part, for the use, observation, enjoyment and appreciation of its natural and cultural visual qualities.

There are no navigational uses of any resources that would be unreasonably impacted by the proposed project.

The Department finds that the proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational or navigational uses of the freshwater wetlands that will be altered.

3. SOIL EROSION:

The NRPA, in 38 M.R.S. §480-D(2), requires the applicant to demonstrate that the proposed project will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.

In order to minimize sedimentation into protected natural resources, construction will be performed using a number of erosion and sedimentation control measures based on the latest version of the *Maine Department of Transportation Best Management Practices for Erosion and Sediment Control (BMPs)* and the applicant's standards and specifications (Supplemental Specification Section 656, Temporary Soil Erosion and Water Pollution Control). The applicant stated that each construction project implements a Construction Project Environmental Compliance Program, which assigns a Resident Engineer and Compliance Officer whose roles include inspection of all construction projects and bi-weekly inspection of erosion and sedimentation control devices, respectively. In addition, Supplemental Specification Section 656 requires each contractor to certify that its on-site responsible party has been trained and is knowledgeable in erosion and sediment control. Supplemental Specification Section 656 also establishes an overview of preparatory activities, excavation activities, construction activities (including spill prevention and control), a post-construction work plan, and a schedule of construction activity. Periodic inspections of the overall project, including the effectiveness and condition of erosion and sediment control devices are conducted by the applicant's Permitting Coordinator/Environmental Liaison.

In comments dated July 25, 2019, the Maine Department of Inland Fisheries and Wildlife (MDIFW) recommended that an independent third-party inspector be utilized to inspect the site. Given necessary requirements for limiting access to construction areas along the Turnpike and the on-site inspections that are routinely performed, the Department requested that, in lieu of utilizing a third-party inspector, the applicant provide the Department and MDIFW copies of weekly site inspections for those areas located within 100 feet of any streambank within the project site (riparian areas). The weekly reports must document site conditions, including photographs, and any necessary corrective actions that address erosion issues that may arise. Submission of these weekly inspections must continue until riparian areas are fully stabilized (vegetative cover over 90% of the area).

The Department finds that the activity will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment, provided that copies of weekly inspections of riparian areas that document site conditions, including photographs, and any necessary corrective actions that address erosion issues are submitted to the Department and MDIFW until the disturbed riparian areas are fully stabilized.

4. HABITAT CONSIDERATIONS:

The NRPA, in 38 M.R.S. §480-D(3), requires the applicant to demonstrate that the proposed project will not unreasonably harm significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life.

According to the Department's Geographic Information System database there are no mapped Essential or Significant Wildlife Habitats located at the site.

The MDIFW reviewed the proposed project, and in its comments, dated November 30, 2018, stated that no records of any Essential or Significant Wildlife Habitats were found within the project site. In its comments, MDIFW noted that the Maine Endangered Species Act lists several species of bats as endangered or threatened. Because bats are likely to be found on the project site during migration and/or breeding season, MDIFW recommended that tree clearing be limited to the period when bats are not present. The applicant agreed to limit tree clearing outside of the months of June and July, the recognized pupping season for tree-roosting bats.

MDIFW also noted that New England cottontail, a state endangered species, has been documented in the project site near Long Creek and recommended the applicant contact MDIFW's regional wildlife biologist to further assess the project site. On December 19, 2018, the regional wildlife biologist walked a portion of the project site within the area designated by MDIFW as potential cottontail habitat. Because of the proliferation of rabbit tracks noted during the site visit, DNA analyses of rabbit droppings were performed. Testing indicated that the droppings were from snowshoe hares, not New England cottontail. Based on this information, the regional biologist concluded that New England cottontail are not expected to be present on the project site.

Fisheries and stream protection issues are discussed in Finding 6.

Based on MDIFW's comments, the Department finds that the applicant has made adequate provision for the protection of wildlife, provided that no tree cutting is conducted during the period of June 1 and July 31.

5. WATER QUALITY CONSIDERATIONS:

The waters that are, or may be, affected by the proposed project are currently classified as Class C waters (38 M.R.S. §468(1)). Class C waters must be of such quality that they are suitable for the designated uses of drinking water supply after treatment, fishing, aquaculture, recreation in and on the water, industrial process and cooling water supply, hydroelectric power generation, navigation and as habitat for fish and other aquatic life (38 M.R.S. §465(4)(A)).

As discussed in Finding 3, the applicant proposes to use erosion and sediment control during construction to minimize impacts to water quality from siltation.

As discussed in Finding 6, MDIFW commented that Red Brook supports a population of wild brook trout. Prior to filing the application, the applicant and its consultants met with the Department to discuss treatment of stormwater from the proposed project. In accordance with the June 2017 Memorandum of Agreement for Stormwater Management Between the Maine Department of Transportation, Maine Turnpike Authority, and the Department of Environmental Protection (MOA), the applicant proposes to construct underdrained soil filters on both sides of the Turnpike adjacent to Red Brook. These stormwater BMPs are designed to be consistent with the treatment standards set forth in the Department's Chapter 500, *Stormwater Management* (06-096 C.M.R. ch.500, last amended August 12, 2015), and are expected to remove pollutants and provide some cooling of stormwater runoff, prior to discharge to Red Brook. As a result, treatment of stormwater runoff is anticipated to protect the water quality of the brook and the fish population in the brook. Underdrained soil filters are proposed adjacent to Long Creek and one stormwater meadow buffer is proposed in the vicinity of the Brighton Avenue overpass.

Based on the location of the proposed project, the construction methods proposed, and project's design and the Findings above, the Department finds that the proposed project will maintain and protect existing uses and the level of water quality necessary to protect those existing uses, will protect the existing water quality of affected waters, will not significantly impair the viability of the existing fish populations.

6. WETLANDS AND WATERBODIES PROTECTION RULES:

Wetlands:

The proposed project will also alter approximately 218,435 square feet (5.0 acres), and temporarily impact an additional 47,508 square feet (1.1 acres) of freshwater wetland at 38 locations. The impacted wetlands include approximately 25,639 square feet (0.59 acres) of forested wetlands and 192,794 square feet (4.4 acres) of wet meadow/emergent marsh vegetation, of which 134,580 square feet (3.1 acres) are currently routinely mowed to ensure highway safety. Thirteen wetland locations were identified as wetlands of special significance due to their proximity to streams, their location within designated flood plains, or that they contain greater than 20,000 square feet of emergent marsh vegetation. Most of the wetlands of special significance are designated as such because they contain greater than 20,000 square feet of emergent marsh vegetation and are already impaired because they are routinely managed (mowed or vegetation removed) to maintain highway clear zones.

Approximately 26,600 square feet of previously undisturbed of wet meadow/emergent marsh vegetation wetlands and approximately 7,000 square feet of forested wetland will be routinely managed to maintain highway clear zones following completion of the proposed project as the travel corridor extends further into adjacent wetland areas.

The applicant identified temporary wetland impacts as the area between the edge of project disturbance and the placement of silt fencing and stated that any wetlands disturbed in these areas will be restored to pre-disturbance conditions and revegetated with wetland vegetation.

Waterbodies:

The proposed project will require extending culverts on each side of the Turnpike from 20 to 68 feet, which will directly alter approximately 170 linear feet of stream at the four locations (Red Brook, Long Creek, Nason's Brook, and an unnamed stream that empties into Capisic Brook). Because of uncertainties in the construction schedule, the applicant is seeking approval for instream work windows outside of the normal window of July 15 to October 1, during periods of low flow.

Proposed measures to avoid or minimize impacts at each of the stream crossings include:

- All in-stream work will be completed within a contained work area created by the installation of temporary cofferdams that will be removed following construction.
- Culvert ends will be stabilized with riprap in the stream channel subsurface to minimize the formation of future scour holes and topped with 'special fill' materials selected to match the substrate of up or downstream areas and installed to match the elevation of the stream bed. The applicant's construction specifications include a materials and design specification for special fill – streambed materials, which was reviewed by MDIFW.
- The invert of culvert inlets and outlets will be set to facilitate fish and aquatic organism passage to avoid hanging conditions.
- MDIFW recommended, and the applicant agreed, that disturbed areas within riparian areas must be revegetated such that no exposed or unvegetated soil remain by October 1. In the event that ground disturbance activities are required following the October 1 limitation, the applicant has agreed to installing erosion and sediment control measures that include placement of six to 12 inches of erosion control mulch overlain with jute matting that will be pinned in place before freezing occurs. This material must be removed to allow the area to revegetate during the following growing season.

Red Brook

Red Brook crosses the Turnpike at mile marker 44.4 in a 192-foot long, 12-foot by 10-foot vertical ellipse plate arch culvert. The culvert is skewed approximately 30° from perpendicular to the travel lanes of the Turnpike. Designated as an urban impaired stream pursuant to the Department's Chapter 502, *Direct Watersheds of Lakes Most At Risk From New Development, And Urban Impaired Streams* (06-096 C.M.R. ch.502, last amended May 23, 2018), the stream supports a viable population of wild brook trout on both sides of the Turnpike, as documented by MDIFW. Within the project site, the stream runs south to north, parallel to the west side of the Turnpike, for approximately 400 feet before making an abrupt (approximately 90°) turn east toward the Turnpike

approximately 30 feet upstream from the inlet end of the culvert. Because of this turn, it was determined that extension of the inlet end of the culvert would require relocating the stream, an action that must be avoided.

The applicant examined several alternatives for extending the culvert ends of this crossing, including constructing a headwall and wingwall system to avoid extending the culvert altogether and minimize stream disturbance. The selected alternative is to slipline the existing culvert with an 11-foot by 9-foot aluminum plate or plastic (HDPE) pipe. At the inlet end, the slipline will be secured to a headwall and wingwall at the end of the existing culvert. At the outlet end, the culvert will be extended approximately 23 feet, for a total culvert length of approximately 215 feet. The applicant proposes to add natural bottom special fill matching the substrate of upstream or downstream areas, as best possible, within the sliplined pipe to improve habitat conditions and facilitate fish passage.

During initial project development, the applicant coordinated with MDIFW to establish instream work windows. For Red Brook, the proposed window of June 1 to September 30 was selected. In comments, dated July 24, 2019, MDIFW recommended that instream work be completed be reduced to the period July 1 to October 1. The applicant noted that for a project of this size, limiting the instream work window to periods of lowest flow may not always be available. The Department recognizes that stream flow in any given year is subject to multiple variables, and that these same variables affect the construction schedule. In the event that the Red Brook crossing can begin in the June 1 to July 1 period, and stream conditions would allow the work to begin without creating an unreasonable impact to the stream and fish habitat, the applicant may petition the Department and MDIFW to begin instream work prior to the July 1 date recommended by MDIFW. Both agencies must grant an approval for this early start.

Citing concerns with fish passage, the potential for hanging conditions, channel incision, and material in-culvert instability, MDIFW recommended that a five-year, post-construction monitoring plan be implemented and reports outlining stream conditions be filed with the Department and MDIFW. The applicant agreed to collaborate with the regulatory agencies in developing the post-construction monitoring plan, prior to initiation of the plan. MDIFW recommended that monitoring be performed during years 1, 3, and 5 following installation of culvert extension. Given the variability of stream conditions and that a single rain event may result in significant impacts to the stream, the Department determined that annual stream monitoring would be appropriate.

To ensure adequate fish passage and suitable stream flow conditions, the applicant must submit to the Department for review and approval a post-construction monitoring plan for the Red Brook crossing within three months of the date of this Order. Once approved, the applicant must file annual reports that document stream conditions for five years following the installation of the Red Brook culvert extension with reports due by December 31 of each calendar year.

Long Creek

Long Creek crosses the Turnpike at mile marker 45.9 in a 168-foot long, 78-inch diameter reinforced concrete pipe culvert. Pursuant to Chapter 502, Long Creek is designated by the Department as an urban impaired stream. Within the project site the stream runs northwest to southeast, crossing perpendicular to the travel lanes of the Turnpike. Approximately 30 feet downstream from the outlet end of the culvert, the stream makes an abrupt (approximately 90°) turn south and runs parallel to the east side of the Turnpike, for approximately 375 feet before turning east. Because of this turn, it was determined that extension of the outlet end of the culvert would not be practicable.

The applicant examined several alternatives for extending the culvert ends of this crossing, including constructing a headwall and wingwall system to avoid extending the culvert altogether and minimize stream disturbance. The selected alternative is to extend the inlet end on the west side of the Turnpike approximately 20 feet and the rebuild the headwall and wing walls at the outlet end, which will avoid realigning the stream. Using a 78-inch diameter reinforced concrete pipe to match the size of the existing culvert, the proposed work will result in a total culvert length of approximately 188 feet.

The applicant initially proposed instream work beyond the normal July 15 to October 1, except for the high flow period of March 15 to June 1. Given that MDIFW has expressed concern with working in riparian areas during frozen conditions, the applicant and MDIFW agreed to narrow the instream window to the period April 1 to November 1. MDIFW did not identify any fisheries issues with Long Creek.

Nason's Brook

Nason's Brook crosses the Turnpike at mile marker 47.8 in a triple, 194-foot long, 66-inch diameter reinforced concrete pipe culvert. Nason's Brook is designated by the Department as an urban impaired stream pursuant to Chapter 502. Within the project site the stream runs west to east and crosses perpendicular to the Turnpike.

The applicant examined several alternatives for extending the culvert ends of this crossing, including constructing a headwall and wingwall system to avoid extending the culvert altogether and minimize stream disturbance. The selected alternative is to extend both ends of the culvert approximately 28 feet using 66-inch diameter reinforced concrete pipes collared on to the existing culvert pipes. The proposed 56-foot extension will result in a total culvert length of approximately 250 feet.

The applicant initially proposed instream work beyond the normal July 15 to October 1, except for the high flow period of March 15 to June 1. Given that MDIFW has expressed concern with working in riparian areas during frozen conditions, the applicant and MDIFW agreed to narrow the instream window to the period April 1 to November 1. MDIFW did not identify any fisheries issues with Nason's Brook.

Unnamed Stream, Capisic Brook Watershed

Channelized man-made ditches from offsite converge and discharge to the western end of an existing 164-foot long, 60-inch diameter reinforced concrete pipe culvert at mile marker 48.9. At the outlet on the eastern side of the Turnpike, this waterbody exhibits the characteristics of a stream as defined in 38 M.R.S. §480-B(9) which ultimately drains into Capisic Brook an urban impaired stream designated by the Department as pursuant to Chapter 502.

The applicant examined several alternatives for extending the culvert ends of this crossing. The selected alternative is to extend both ends of the culvert approximately 32 feet at the inlet and 36 feet at the outlet using 60-inch reinforced concrete pipe collared on to the existing culvert pipes. The proposed 68-foot extension will result in a total culvert length of approximately 232 feet.

The applicant initially proposed instream work beyond the normal July 15 to October 1, except for the high flow period of March 15 to June 1. Given that MDIFW has expressed concern with working in riparian areas during frozen conditions, the applicant and MDIFW agreed to narrow the instream window to the period April 1 to November 1. MDIFW did not identify any fisheries issues with this stream.

Department Analysis

The *Wetlands and Waterbodies Protection Rules*, 06-096 C.M.R. ch. 310 (last amended January 26, 2009), interpret and elaborate on the Natural Resources Protection Act (NRPA) criteria for obtaining a permit. The rules guide the Department in its determination of whether a project's impacts would be unreasonable. A proposed project would generally be found to be unreasonable if it would cause a loss in wetland area, functions and values and there is a practicable alternative to the project that would be less damaging to the environment. Each application for a NRPA permit that involves a freshwater wetland alteration must provide an analysis of alternatives in order to demonstrate that a practicable alternative does not exist.

A. Avoidance. An applicant must submit an analysis of whether there is a practicable alternative to the project that would be less damaging to the environment and this analysis is considered by the Department in its assessment of the reasonableness of any impacts. The applicant submitted an alternatives analysis for the proposed project completed by the applicant and dated February 28, 2019. The project purpose is to improve mobility and enhance safety for current and future traffic demand, and to meet the Maine Turnpike Authority's obligation of providing a safe and efficient highway for the mobility of both people and goods (freight).

The applicant examined 14 alternatives, including the no-action alternative, in its determination for the most practicable alternative that would meet the project purpose. Alternatives ranged from new/improved bus service, passenger and/or rail service, to construction of additional lanes on the Turnpike or I-295. Alternatives were grouped into

five categories (no action, demand management, system management, capacity, and combination of types), and then evaluated using the applicant's Portland Area Comprehensive Transportation System Regional Demand Model, a Benefit/Cost Analysis, and an Effects of Induced Demand review. The alternatives were also evaluated using 21 different measures of effectiveness, which were divided into five groups: transportation measures, environmental measures, cost/funding measures, implementation measures, and an overall summary. A final evaluation of the reasonableness of the alternatives was used to select the most practicable alternative that meets the project purpose.

Although several alternatives would result in impacts less damaging to the environment, these alternatives were dismissed because of costs or because the applicant would be the agency responsible for implementation of the alternative. The selected alternative was determined to fully meet the project purpose, would be cost effective, and readily implementable. Given the location of the protected natural resources on the project site, some impact to freshwater wetlands cannot be avoided.

B. Minimal Alteration. In support of an application and to address the analysis of the reasonableness of any impacts of a proposed project, an applicant must demonstrate that the amount of freshwater wetland to be altered will be kept to the minimum amount necessary for meeting the overall purpose of the project. The applicant noted that the American Association of State Highway and Transportation Organizations' roadside design guide recommends maintaining the widest possible "clear zone," an unencumbered roadside recovery area to enable vehicles that go off the road the ability to recover and return. The guide also recommended that, in the event that roadside obstructions could not be removed, then placement of guardrails would be acceptable, even as the guardrail itself would then be considered a roadside hazard. Where practicable, the applicant proposes to place side slopes at a 6H:1V grade as the clear zone for the project area but will place guardrails and 2H:1V side slopes adjacent to the stream crossings and in wetland areas, as needed.

Typical wetland impacts will result from the culvert extensions, as discussed above, and from shaping new road side slopes. The location and orientation of the freshwater wetlands along the project site allow the applicant to limit impacts to the wetland edges.

The Department finds that the road design and the angle of the side slopes in and adjacent to the wetland edges resulted in the minimum amount of wetland impacts necessary for the project.

C. Compensation. In accordance with Chapter 310 §5(C)(6)(d), compensation is not required to achieve the goal of no net loss of stream functions and values because the project will not result in over 300 linear feet of stream alteration, which is the threshold over which compensation is generally required. Further, the proposed project is not expected to have an adverse impact on fisheries or fish habitat provided that the applicant implements the stream protection measures discussed above. For these reasons, the Department determined that compensation is not required for stream alterations.

In accordance with Chapter 310, compensation is required for the proposed project to achieve the goal of no net loss of freshwater wetland functions and values.

The applicant submitted a functional assessment, dated December 2017, that described the wetlands to be altered by the proposed project. The functional assessment documented that the primary functions and values of these wetlands are sediment toxicant retention and wildlife habitat. The functional assessment noted that wetland functions, including wildlife habitat, for wetlands in the project area were generally low due to the periodic mowing and road safety maintenance programs performed by the applicant in the travel corridor. The functional assessment also noted that while these wetlands are effective at capturing sediment and pollutants that runoff the road surface and from adjacent commercial development, the elevated pollutant loading is contributing to degradation of the wetlands. High velocity flows from stormwater running off the road surface and surrounding developed area also reduce the retention time of pollutants in the wetland and lead to incised drainage channels.

Of the approximately 218,435 square feet wetland impacts associated with the proposed project, a loss of wetland functions or values was determined to occur for 191,832 square feet. Approximately 26,600 square feet of previously undisturbed wet meadow/emergent marsh vegetation wetlands will be altered as a result of management activities (mowed or vegetation removed) to maintain highway clear zones following completion of the proposed project as the travel corridor extends further into adjacent wetland areas. The Department has determined that these wetlands, although altered, will not result in a loss of wetland area or that wetland functions or values will be not be lost or degraded as a result of management activities, such that compensation will not be required for these wetland areas.

The application included a table that identified the wetland type, their functions and values, the type of impact, and a calculation of an In-Lieu Fee payment amount for the wetland impacts from the proposed project. Wetlands identified as wet meadow/emergent marsh vegetation wetlands were not subject to a resource multiplier because these areas are either located in artificial impoundments or are routinely altered (mowed) as part of the applicant's management program to maintain highway clear zones. The applicant proposes to make a contribution into the In-Lieu Fee program of the Maine Natural Resource Conservation Program in the amount of \$803,816.63. Prior to the start of construction, the applicant must submit a payment in the amount of \$803,816.63, payable to "Treasurer, State of Maine", and directed to the attention of the In-Lieu Fee Program Administrator at 17 State House Station, Augusta, Maine 04333.

The Department finds that the applicant has avoided and minimized stream and wetland impacts to the greatest extent practicable, and that the proposed project represents the least environmentally damaging alternative that meets the overall purpose of the project provided that the applicant files a post-construction monitoring plan for the Red Brook crossing to the Department for review and approval within three months of the date of this Order, and annual monitoring reports that document stream conditions are filed with

the Department for five years following approval of the post-construction monitoring plan and installation of the Red Brook culvert extension as outlined above; that instream work windows for each stream are limited to the specific period discussed above; and that prior to project construction, the applicant submits the In-Lieu Fee payment as described above.

The Department further finds that the activity will not unreasonably harm any freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life.

7. OTHER CONSIDERATIONS:

The Department finds, based on the design, proposed construction methods, and location, the proposed project will not inhibit the natural transfer of soil from the terrestrial to the marine environment, will not interfere with the natural flow of any surface or subsurface waters, and will not cause or increase flooding. The proposed project is not located in a coastal sand dune system, is not a crossing of an outstanding river segment, and does not involve dredge spoils disposal or the transport of dredge spoils by water.

The proposed project is exempt from review under the Site Location of Development Act pursuant to 38 M.R.S. § 488(10).

The proposed project is also exempt from review under the Stormwater Management Law pursuant to 38 M.R.S. § 420-D(7)(G), as long as the project is constructed in accordance with the MOA referenced in Finding 5. The MOA requires that projects developed by the applicant located within watersheds of urban impaired streams must meet the General Standards contained in Chapter 500 *Stormwater Management Rules* (06-096 C.M.R. ch. 500, effective August 12, 2015) to the extent practicable. The applicant and the Department met several times to discuss stormwater treatment of the proposed project. The proposed project includes six underdrained soil filters located adjacent to Red Brook and Long Creek and one stormwater meadow buffer is proposed in the vicinity of the Brighton Avenue overpass. In addition, bridge improvement/roadway widening at the Stroudwater River Bridge, the Maine Central Railroad Bridge, and the Warren Avenue Bridge each include installation of underdrained soils that will capture stormwater runoff from the road surface created by the proposed project.

Given the linear nature of the project and the limitations for constructing stormwater treatment devices along the Turnpike, the Department is satisfied that the proposed project complies with the General Standards of Chapter 500 to the extent practicable.

BASED on the above findings of fact, and subject to the conditions listed below, the Department makes the following conclusions pursuant to 38 M.R.S. §§ 480-A–480-JJ and Section 401 of the Federal Water Pollution Control Act:

- A. The proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational, or navigational uses.
- B. The proposed activity will not cause unreasonable erosion of soil or sediment.
- C. The proposed activity will not unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment, provided that weekly site inspections that address erosion issues for those areas located within 100 feet of any streambank within the project site are submitted to the Department and MDIFW, as described in Finding 3 and instream work windows for each stream are limited to the specific period discussed in Finding 6.
- D. The proposed activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine, or marine fisheries or other aquatic life provided that no tree cutting is conducted during the period of June 1 and July 31, as described in Finding 4; provided that the applicant files a post-construction monitoring plan for the Red Brook crossing to the Department for review and approval within three months of the date of this Order, and annual monitoring reports that document stream conditions are filed with the Department for five years following approval of the post-construction monitoring plan and installation of the Red Brook culvert extension, as described in Finding 6; provided that instream work windows for each stream are limited to the specific period discussed in Finding 6; and provided that prior to construction the applicant makes a contribution to the In-Lieu Fee program, as described in Finding 6.
- E. The proposed activity will not unreasonably interfere with the natural flow of any surface or subsurface waters.
- F. The proposed activity will not violate any state water quality law including those governing the classifications of the State's waters.
- G. The proposed activity will not unreasonably cause or increase the flooding of the alteration area or adjacent properties.
- H. The proposed activity is not on or adjacent to a sand dune.
- I. The proposed activity is not on an outstanding river segment as noted in 38 M.R.S. § 480-P.

THEREFORE, the Department APPROVES the above noted application of the MAINE TURNPIKE AUTHORITY to widen the Maine Turnpike between mile marker 43.0 and mile marker 48.8, as described in Finding 1, SUBJECT TO THE ATTACHED CONDITIONS, and all applicable standards and regulations:


1. Standard Conditions of Approval, a copy attached.
2. The applicant shall take all necessary measures to ensure that its activities or those of its agents do not result in measurable erosion of soil on the site during the construction of the project covered by this approval.
3. Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.
4. The applicant shall submit to the Department and MDIFW copies weekly site inspections that address erosion issues for those areas located within 100 feet of any streambank within the project site and any necessary corrective actions that address erosion issues. Submission of weekly inspections shall continue until riparian areas are fully stabilized (vegetative cover over 90% of the area).
5. The applicant shall submit to the Department for review and approval a post-construction monitoring plan for the Red Brook crossing within three months of the date of this Order.
6. The applicant shall file annual reports, in accordance with the approved post-construction monitoring plan, that document stream conditions for five years following the installation of the Red Brook culvert extension with reports due by December 31 of each calendar year.
7. The applicant shall limit instream work for Red Brook to period July 1 to October 1. In the event that the Red Brook crossing can begin in the June 1 to July 1 period, and stream conditions would allow the work to begin without creating an unreasonable impact to the stream and fish habitat, the applicant may petition the Department and MDIFW to begin instream work prior to the July 1. Both the Department and MDIFW must grant an approval for the instream work to begin prior to July 1. The applicant shall limit instream work for Long Creek, Nason's Brook, and the unnamed tributary to Capisic Brook to the period April 1 to November 1.

8. Prior to the start of construction, the applicant shall submit a payment in the amount of \$803,816.63, payable to "Treasurer, State of Maine", to the attention of the In-Lieu Fee Program Administrator at 17 State House Station, Augusta, Maine 04333.

THIS APPROVAL DOES NOT CONSTITUTE OR SUBSTITUTE FOR ANY OTHER REQUIRED STATE, FEDERAL OR LOCAL APPROVALS NOR DOES IT VERIFY COMPLIANCE WITH ANY APPLICABLE SHORELAND ZONING ORDINANCES.

DONE AND DATED IN AUGUSTA, MAINE, THIS 9th DAY OF August, 2019.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: 
For: Gerald D. Reid, Commissioner



PLEASE NOTE THE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES.

RLG/L27726AN/ATS#84203



Natural Resources Protection Act (NRPA) Standard Conditions

THE FOLLOWING STANDARD CONDITIONS SHALL APPLY TO ALL PERMITS GRANTED UNDER THE NATURAL RESOURCES PROTECTION ACT, 38 M.R.S. § 480-A ET SEQ., UNLESS OTHERWISE SPECIFICALLY STATED IN THE PERMIT.

- A. Approval of Variations From Plans. The granting of this permit is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed to by the applicant. Any variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.
- B. Compliance With All Applicable Laws. The applicant shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.
- C. Erosion Control. The applicant shall take all necessary measures to ensure that his activities or those of his agents do not result in measurable erosion of soils on the site during the construction and operation of the project covered by this Approval.
- D. Compliance With Conditions. Should the project be found, at any time, not to be in compliance with any of the Conditions of this Approval, or should the applicant construct or operate this development in any way other the specified in the Application or Supporting Documents, as modified by the Conditions of this Approval, then the terms of this Approval shall be considered to have been violated.
- E. Time frame for approvals. If construction or operation of the activity is not begun within four years, this permit shall lapse and the applicant shall reapply to the Board for a new permit. The applicant may not begin construction or operation of the activity until a new permit is granted. Reapplications for permits may include information submitted in the initial application by reference. This approval, if construction is begun within the four-year time frame, is valid for seven years. If construction is not completed within the seven-year time frame, the applicant must reapply for, and receive, approval prior to continuing construction.
- F. No Construction Equipment Below High Water. No construction equipment used in the undertaking of an approved activity is allowed below the mean high water line unless otherwise specified by this permit.
- G. Permit Included In Contract Bids. A copy of this permit must be included in or attached to all contract bid specifications for the approved activity.
- H. Permit Shown To Contractor. Work done by a contractor pursuant to this permit shall not begin before the contractor has been shown by the applicant a copy of this permit.



DEP INFORMATION SHEET

Appealing a Department Licensing Decision

Dated: November 2018

Contact: (207) 287-2452

SUMMARY

There are two methods available to an aggrieved person seeking to appeal a licensing decision made by the Department of Environmental Protection's (DEP) Commissioner: (1) an administrative process before the Board of Environmental Protection (Board); or (2) a judicial process before Maine's Superior Court. An aggrieved person seeking review of a licensing decision over which the Board had original jurisdiction may seek judicial review in Maine's Superior Court.

A judicial appeal of final action by the Commissioner or the Board regarding an application for an expedited wind energy development (35-A M.R.S. § 3451(4)) or a general permit for an offshore wind energy demonstration project (38 M.R.S. § 480-HH(1)) or a general permit for a tidal energy demonstration project (38 M.R.S. § 636-A) must be taken to the Supreme Judicial Court sitting as the Law Court.

This information sheet, in conjunction with a review of the statutory and regulatory provisions referred to herein, can help a person to understand his or her rights and obligations in filing an administrative or judicial appeal.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

The laws concerning the DEP's *Organization and Powers*, 38 M.R.S. §§ 341-D(4) & 346; the *Maine Administrative Procedure Act*, 5 M.R.S. § 11001; and the DEP's *Rules Concerning the Processing of Applications and Other Administrative Matters* ("Chapter 2"), 06-096 C.M.R. ch. 2.

DEADLINE TO SUBMIT AN APPEAL TO THE BOARD

The Board must receive a written appeal within 30 days of the date on which the Commissioner's decision was filed with the Board. Appeals filed more than 30 calendar days after the date on which the Commissioner's decision was filed with the Board will be dismissed unless notice of the Commissioner's license decision was required to be given to the person filing an appeal (appellant) and the notice was not given as required.

HOW TO SUBMIT AN APPEAL TO THE BOARD

Signed original appeal documents must be sent to: Chair, Board of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017. An appeal may be submitted by fax or e-mail if it contains a scanned original signature. It is recommended that a faxed or e-mailed appeal be followed by the submittal of mailed original paper documents. The complete appeal, including any attachments, must be received at DEP's offices in Augusta on or before 5:00 PM on the due date; materials received after 5:00 pm are not considered received until the following day. The risk of material not being received in a timely manner is on the sender, regardless of the method used. The appellant must also send a copy of the appeal documents to the Commissioner of the DEP; the applicant (if the appellant is not the applicant in the license proceeding at issue); and if a hearing was held on the application, any intervenor in that hearing process. All of the information listed in the next section of this information sheet must be submitted at the time the appeal is filed.

INFORMATION APPEAL PAPERWORK MUST CONTAIN

Appeal materials must contain the following information at the time the appeal is submitted:

1. *Aggrieved Status.* The appeal must explain how the appellant has standing to maintain an appeal. This requires an explanation of how the appellant may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions, or conditions objected to or believed to be in error.* The appeal must identify the specific findings of fact, conclusions regarding compliance with the law, license conditions, or other aspects of the written license decision or of the license review process that the appellant objects to or believes to be in error.
3. *The basis of the objections or challenge.* For the objections identified in Item #2, the appeal must state why the appellant believes that the license decision is incorrect and should be modified or reversed. If possible, the appeal should cite specific evidence in the record or specific licensing requirements that the appellant believes were not properly considered or fully addressed.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license or permit to changes in specific permit conditions.
5. *All the matters to be contested.* The Board will limit its consideration to those matters specifically raised in the written notice of appeal.
6. *Request for hearing.* If the appellant wishes the Board to hold a public hearing on the appeal, a request for public hearing must be filed as part of the notice of appeal, and must include an offer of proof in accordance with Chapter 2. The Board will hear the arguments in favor of and in opposition to a hearing on the appeal and the presentations on the merits of an appeal at a regularly scheduled meeting. If the Board decides to hold a public hearing on an appeal, that hearing will then be scheduled for a later date.
7. *New or additional evidence to be offered.* If an appellant wants to provide evidence not previously provided to DEP staff during the DEP's review of the application, the request and the proposed evidence must be submitted with the appeal. The Board may allow new or additional evidence, referred to as supplemental evidence, to be considered in an appeal only under very limited circumstances. The proposed evidence must be relevant and material, and (a) the person seeking to add information to the record must show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process; or (b) the evidence itself must be newly discovered and therefore unable to have been presented earlier in the process. Specific requirements for supplemental evidence are found in Chapter 2 § 24.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, and is made easily accessible by the DEP. Upon request, the DEP will make application materials available during normal working hours, provide space to review the file, and provide an opportunity for photocopying materials. There is a charge for copies or copying services.
2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing your appeal.* DEP staff will provide this information on request and answer general questions regarding the appeal process.
3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed, the license normally remains in effect pending the processing of the appeal. Unless a stay of the decision is requested and granted, a license holder may proceed with a project pending the outcome of an appeal, but the license holder runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will formally acknowledge receipt of an appeal, and will provide the name of the DEP project manager assigned to the specific appeal. The notice of appeal, any materials accepted by the Board Chair as supplementary evidence, any materials submitted in response to the appeal, and relevant excerpts from the DEP's application review file will be sent to Board members with a recommended decision from DEP staff. The appellant, the license holder if different from the appellant, and any interested persons are notified in advance of the date set for Board consideration of an appeal or request for public hearing. The appellant and the license holder will have an opportunity to address the Board at the Board meeting. With or without holding a public hearing, the Board may affirm, amend, or reverse a Commissioner decision or remand the matter to the Commissioner for further proceedings. The Board will notify the appellant, the license holder, and interested persons of its decision.

II. JUDICIAL APPEALS

Maine law generally allows aggrieved persons to appeal final Commissioner or Board licensing decisions to Maine's Superior Court (see 38 M.R.S. § 346(1); 06-096 C.M.R. ch. 2; 5 M.R.S. § 11001; and M.R. Civ. P. 80C). A party's appeal must be filed with the Superior Court within 30 days of receipt of notice of the Board's or the Commissioner's decision. For any other person, an appeal must be filed within 40 days of the date the decision was rendered. An appeal to court of a license decision regarding an expedited wind energy development, a general permit for an offshore wind energy demonstration project, or a general permit for a tidal energy demonstration project may only be taken directly to the Maine Supreme Judicial Court. See 38 M.R.S. § 346(4).

Maine's Administrative Procedure Act, DEP statutes governing a particular matter, and the Maine Rules of Civil Procedure must be consulted for the substantive and procedural details applicable to judicial appeals.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, for administrative appeals contact the Board's Executive Analyst at (207) 287-2452, or for judicial appeals contact the court clerk's office in which your appeal will be filed.

Note: The DEP provides this INFORMATION SHEET for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.

APPENDIX C

US ARMY CORPS OF ENGINEERS
INDIVIDUAL PERMIT

**US ARMY CORPS OF ENGINEERS
INDIVIDUAL PERMIT**

EXIT 45

DEPARTMENT OF THE ARMY PERMIT

Permittee Maine Turnpike Authority, 2360 Congress Street, Portland, Maine 04102

Permit No. NAE-2018-02924

Issuing Office New England District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

Place temporary and permanent fill in conjunction with the reconstruction of Exit 45 off the Maine Turnpike (Maine Mall Exit). The project is designed to maintain and enhance safety and operational efficiency for current and future traffic by replacing the substandard Exit 45 ramp

Project Description Continued on Page 4

This work is shown on the attached plans entitled, "EXIT 45 INTERCHANGE RECONFIGURATION PROJECT" in 16 sheets dated "MARCH 2019".

Project Location:

In wetlands adjacent to Red Brook, Long Creek, and their unnamed tributaries at Scarborough & South Portland, Maine

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on December 31, 2024. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. The permittee shall ensure that a copy of this permit is at the work site whenever work is being performed and that all personnel performing work at the site of the work authorized by this permit are fully aware of the terms and conditions of the permit. This permit, including its drawings and any appendices and other attachments, shall be made a part of any and all contracts and sub-contracts for work which affects areas of Corps of Engineers jurisdiction at the site of the work authorized by this permit. This shall be done by including the entire permit in the specifications for work.

Special Conditions continued on Page 4

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

() Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

Section 404 of the Clean Water Act (33 U.S.C. 1344).

() Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. **Reliance on Applicant's Data:** The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. **Reevaluation of Permit Decision.** This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require a reevaluation include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of this permit.

b. The information provided by you in support of your permit application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.


Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. **Extensions.** General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

(PERMITTEE) (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.



Frank J. Del Giudice
Chief, Permits & Enforcement Branch
For District Engineer

9 September 2019

(DATE)

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

(TRANSFEREE) (DATE)

Project Description Continued from Page 1

bridge to remedy deficiencies, replacing the current obsolete toll plaza with modern tolling facilities and technology, meeting turnpike-wide system requirements, and improving the highway and toll plaza geometrics in accordance with design standards.

Impacts to aquatic resources include approximately 5.86 acres of permanent and 2.15 acres of temporary wetland fills. All but 2.86 acres of the 5.86 acres of permanent wetland impact will be to wetlands routinely kept cleared as part of turnpike right-of-way maintenance.

Special Conditions continued from Page 2

If the permit is issued after the construction specifications but before receipt of bids or quotes, the entire permit shall be included as an addendum to the specifications. **If the permit is issued after receipt of bids or quotes, the entire permit shall be included in the contract or sub-contract as a change order. The term "entire permit" includes permit amendments. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions of the entire permit, and no contract or sub-contract shall require or allow unauthorized work in areas of Corps jurisdiction.**

2. This authorization requires you to 1) notify us before beginning work so we may inspect the project, and 2) submit a Compliance Certification Form. You must complete and return the enclosed Work Start Notification Form(s) to this office at least two weeks before the anticipated starting date. The permittee shall complete and return the enclosed Compliance Certification Form within one month following the completion of the authorized work.

3. Adequate sedimentation and erosion control devices, such as geo-textile silt fences or other devices capable of filtering the fines involved, shall be installed and properly maintained to minimize impacts during construction. These devices must be removed upon completion of work and stabilization of disturbed areas. The sediment collected by these devices must also be removed and placed upland, in a manner that will prevent its later erosion and transport to a waterway or wetland.

4. No temporary fill (e.g., access roads, cofferdams) may be placed in waters or wetlands unless specifically authorized by this permit. If temporary fill is used, it shall be disposed of at an upland site and suitably contained to prevent its subsequent erosion into a water of the U.S., and the area shall be restored to its original contours (but not higher) and character upon completion of the project. During use, such temporary fill must be stabilized to prevent erosion or, in the case fill placed in flowing water (rivers or streams), clean washed stone should be used.

5. Except where stated otherwise, reports, drawings, correspondence and any other submittals required by this permit shall be marked with the words "Permit No. NAE-2018-02924" and shall

Project Description Continued on Page 5

Project Description Continued from Page 4

be addressed to "Inspection Section, CENAE-R, U.S. Army Corps of Engineers, 696 Virginia Road, Concord, MA 01742-2751." Documents which are not marked and addressed in this manner may not reach their intended destination and do not comply with the requirements of this permit.

6. Mitigation shall consist of payment of \$1,263,976.34 to the Natural Resource Mitigation Fund. The completed ILF Project Data Worksheet which must be mailed with a cashiers check or bank draft, made out to "Treasurer, State of Maine", with the permit number noted on the check. The check and worksheet should be mailed to: ME DEP, Attn: ILF Program Administrator, State House Station 17, Augusta, ME 04333. **This authorization is not valid until the permittee provides the Corps with a copy of the check, with the permit number noted on the check.** The ILF amount is only valid for a period of one year from the date on the authorization letter. After that time, the project would need to be reevaluated and a new amount determined.

7. All tree cutting shall occur between October 16 and April 19 of any year to the maximum extent practicable and no tree cutting shall occur between June 1 and July 31 of any year in order to minimize potential impacts to federally threatened northern long-eared bats.

MAINE IN-LIEU-FEE (ILF) PROJECT IMPACT WORKSHEET

DEP Invoice # _____ *Filled in by ILF Administrator in Augusta*

Project name: Maine Turnpike Authority; Exit 45 Interchange Reconstruction

Permittee(s): Maine Turnpike Authority

DEP/Corps permit #: L-28275-TG-A-N/ L-19935-TD-L-M
NAE-2018-02924 *Attach a copy of the permit*

DEP/Corps Project Manager: R. Green/J. Clement

ILF Fee Amount: \$1,363,976.34

Check Date: _____ *Filled in by ILF Administrator in Augusta*

Project address: Maine Turnpike; vic. Exit 45; Scarborough &
Portland, Maine *Attach a locus map*

Biophysical region - Section: Southern Maine

Biophysical region - Subsection: Gulf of Maine Coastal Lowland

Total impact area subject to compensation: 255,261 SF

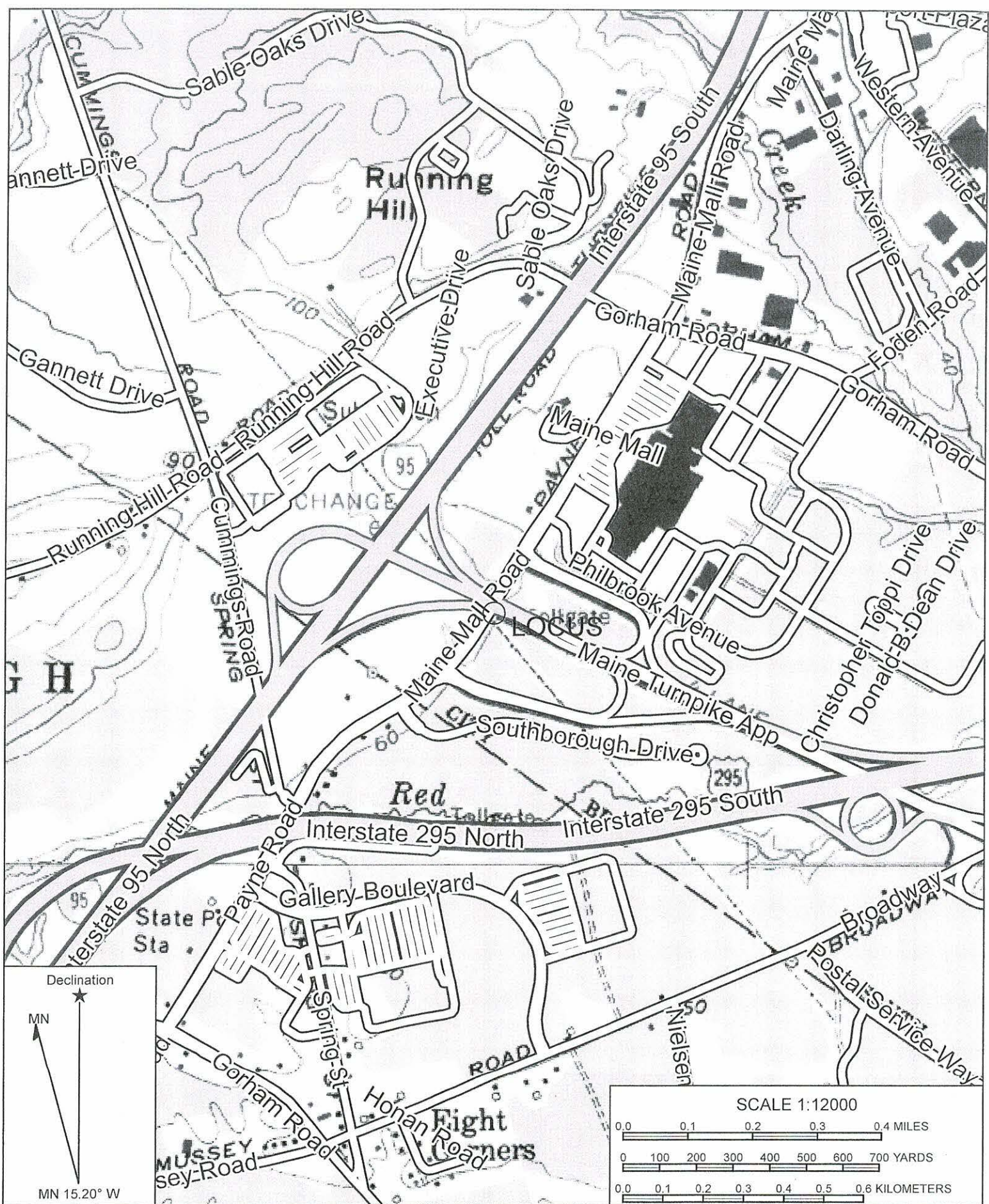
Resource(s) impacted:

Resource Types (list all that apply)	Functions & Values (for wetland impacts) (list all that apply, by resource type)	Types of Impacts (list all that apply, by resource type)	SF Impacted (by resource type)	Linear FT of Streams Impacted (for Corps use)
PFO	NR, WH, STR, GWR, STR, FF	Filling	20,234	
PSS	NR, WH, STR, GWR, STR, FF	Filling	18,953	
PEM	NR, WH, STR, GWR, STR, FF	Filling	215,874	
Total impacts:			255,061	NA

Resource Types: Wetlands by NWI Type (PEM, PFO, PSS, PUB, M1, M2, E1, E2, etc), significant vernal pool depression (SVP), significant vernal pool critical terrestrial habitat (VPCTH), shorebird feeding & staging habitat (shorebird), inland waterfowl & wading bird habitat (IWWH), Tidal waterfowl & wading bird habitat (TWWH), lake or pond (L1, L2), river/stream/brook (RSB)

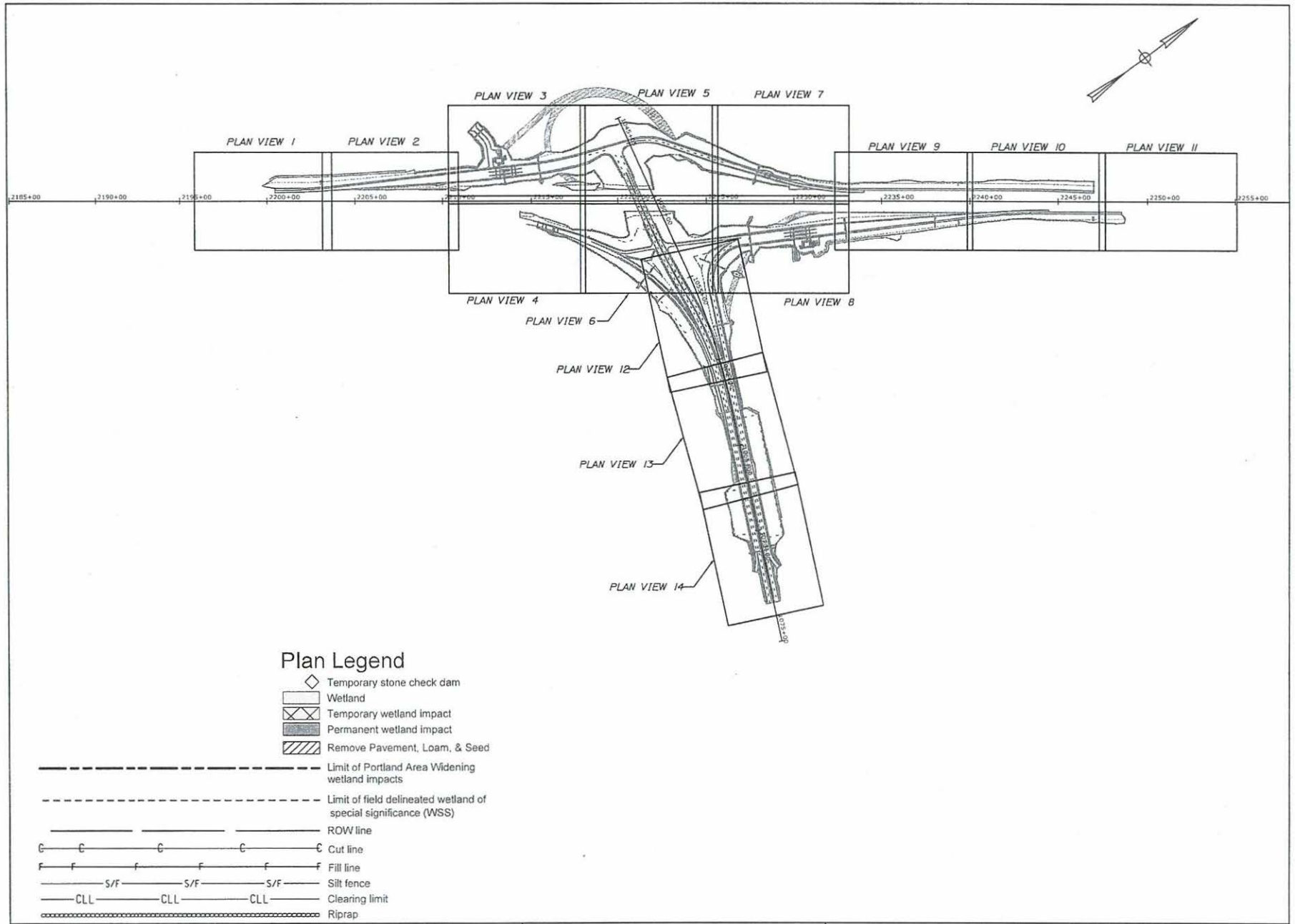
Wetland Functions & Values: Groundwater recharge/discharge (GWR); floodflow alteration (FF); fish & shellfish habitat (FSH); sediment toxicant retention (STR); nutrient removal (NR); production export (PE); sediment/shoreline stabilization (SS); recreation (R); education/scientific value (ESV); uniqueness/heritage (UH); and visual quality/aesthetics (VQ); wildlife habitat (WH)

Types of Impacts: May include: filling, dredging, vegetation conversion (e.g. forested to shrub/scrub), excavation with associated discharge, etc.



Name: PORTLAND WEST
 Date: 05/23/19
 Scale: 1 inch = 1,000 ft.

Location: 43.630651° N, 70.341196° W
**EXIT 45 INTERCHANGE
 RECONFIGURATION PROJECT** **DATE: MARCH 2019**



750 0 750 1500

SCALE: 1"=750'

HNTB
ARCHITECTS ENGINEERS PLANNERS

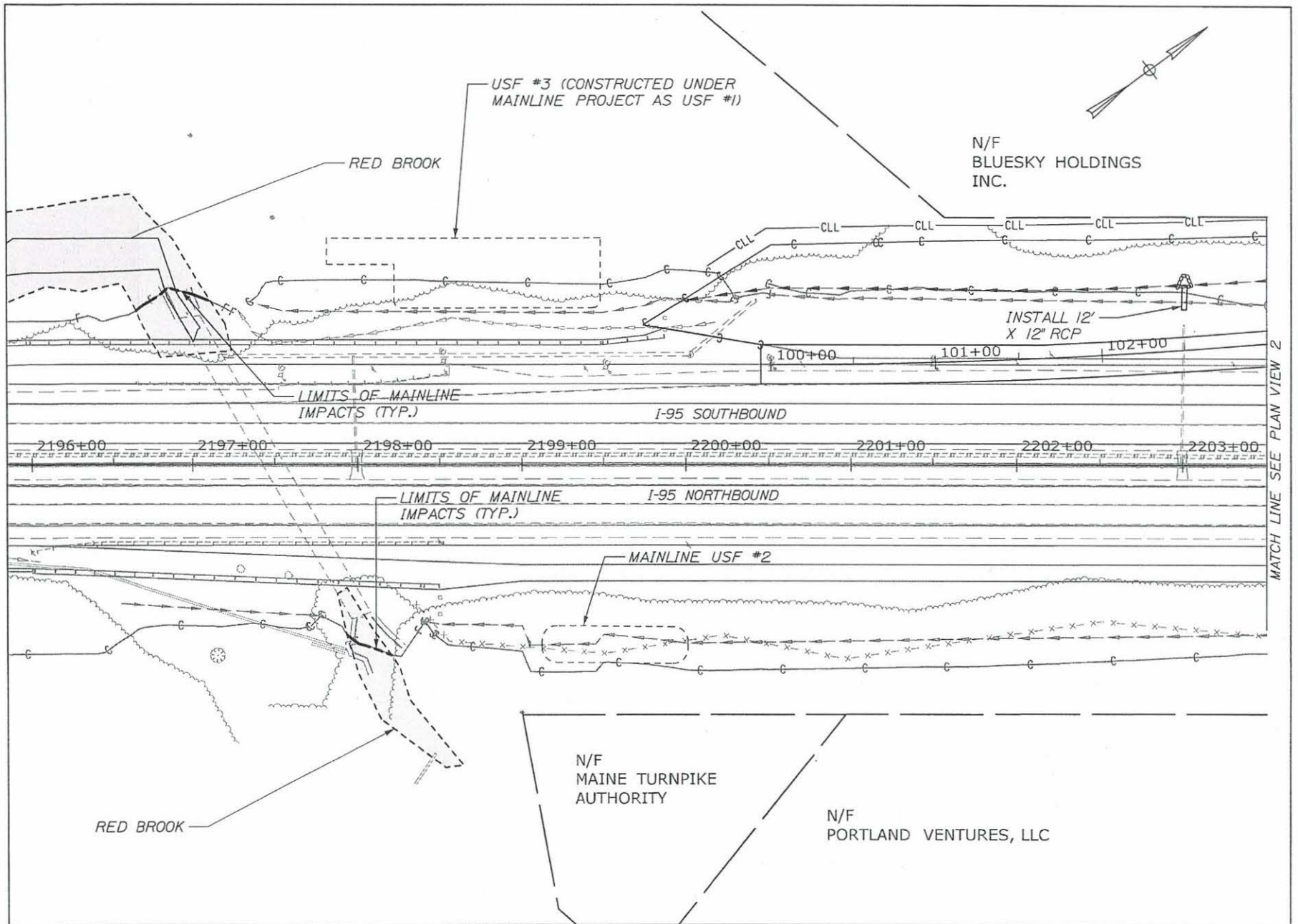
THE GOLD STAR MEMORIAL HIGHWAY

EXIT 45 INTERCHANGE RECONFIGURATION PROJECT

WETLAND IMPACTS INDEX PLAN

DATE: MARCH, 2019

SHEET 1 OF 15



MATCH LINE SEE PLAN VIEW 2



SCALE: 1"=80'

HNTB
ARCHITECTS ENGINEERS PLANNERS



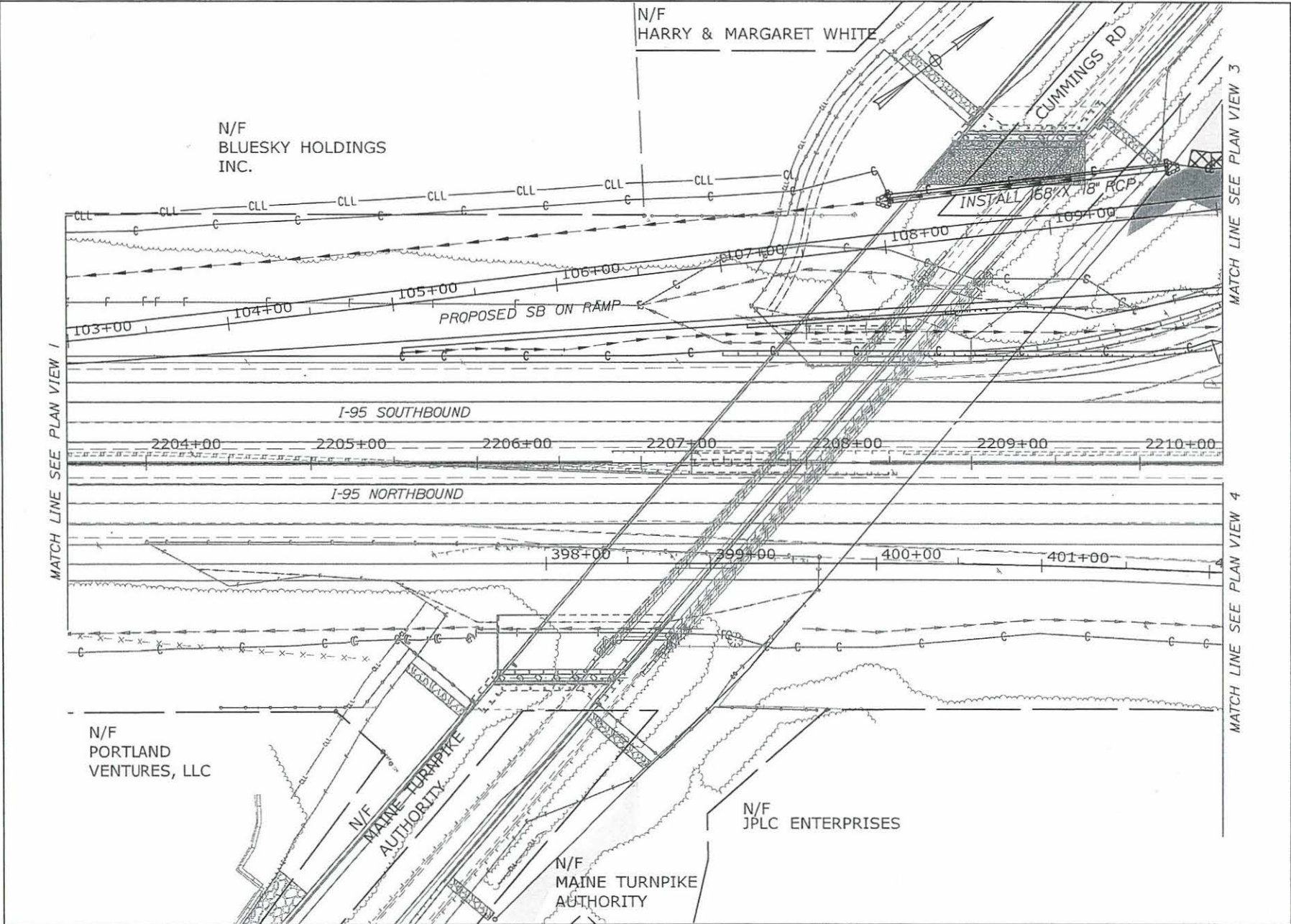
THE GOLD STAR
MEMORIAL HIGHWAY

EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 1

DATE: MARCH, 2019

SHEET 2 OF 15



HNTB
ARCHITECTS ENGINEERS PLANNERS



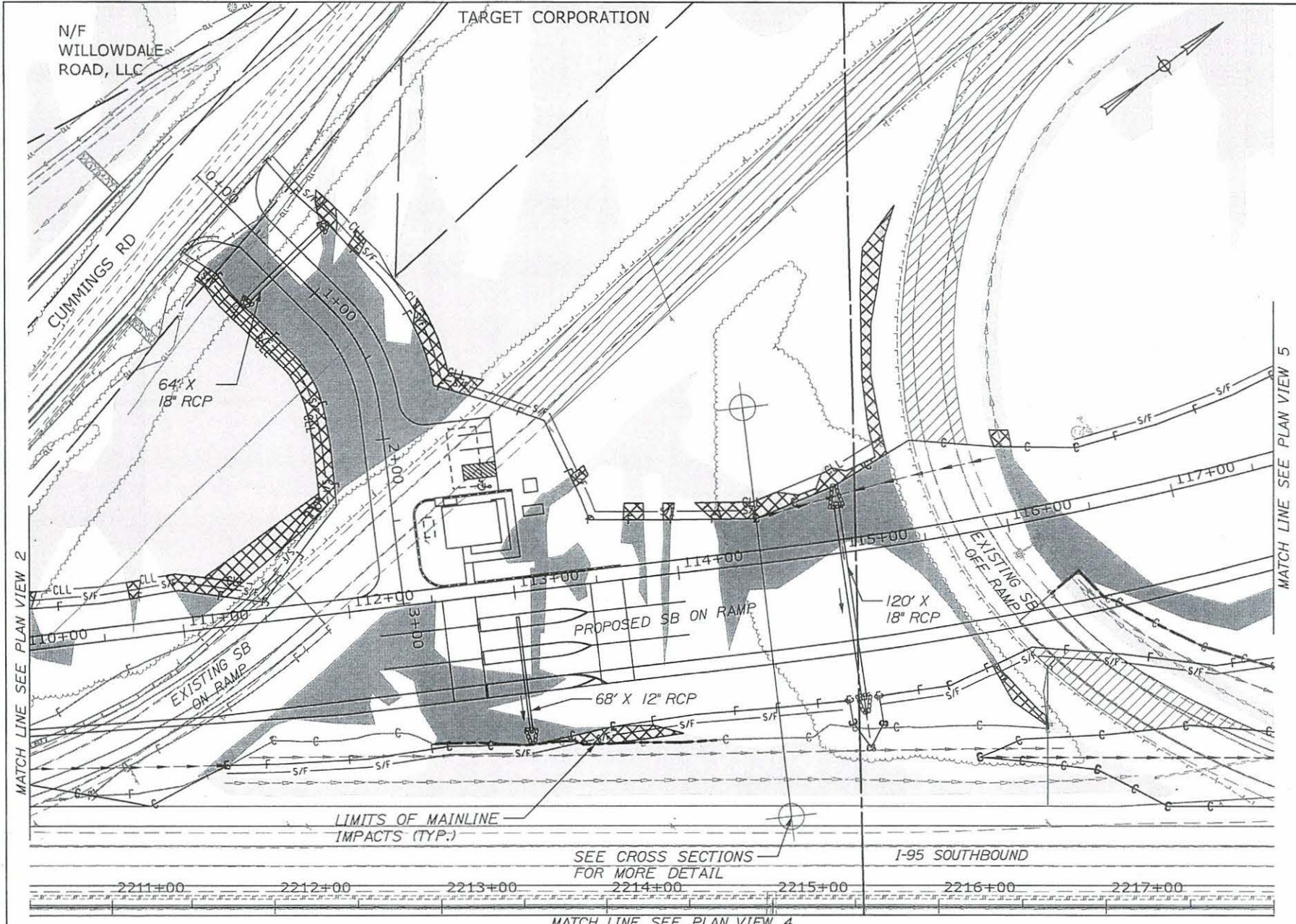
THE GOLD STAR
MEMORIAL HIGHWAY

EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 2

DATE: MARCH, 2019

SHEET 3 OF 15



HNTB
ARCHITECTS ENGINEERS PLANNERS



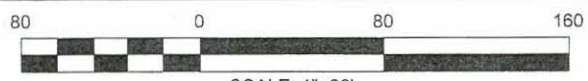
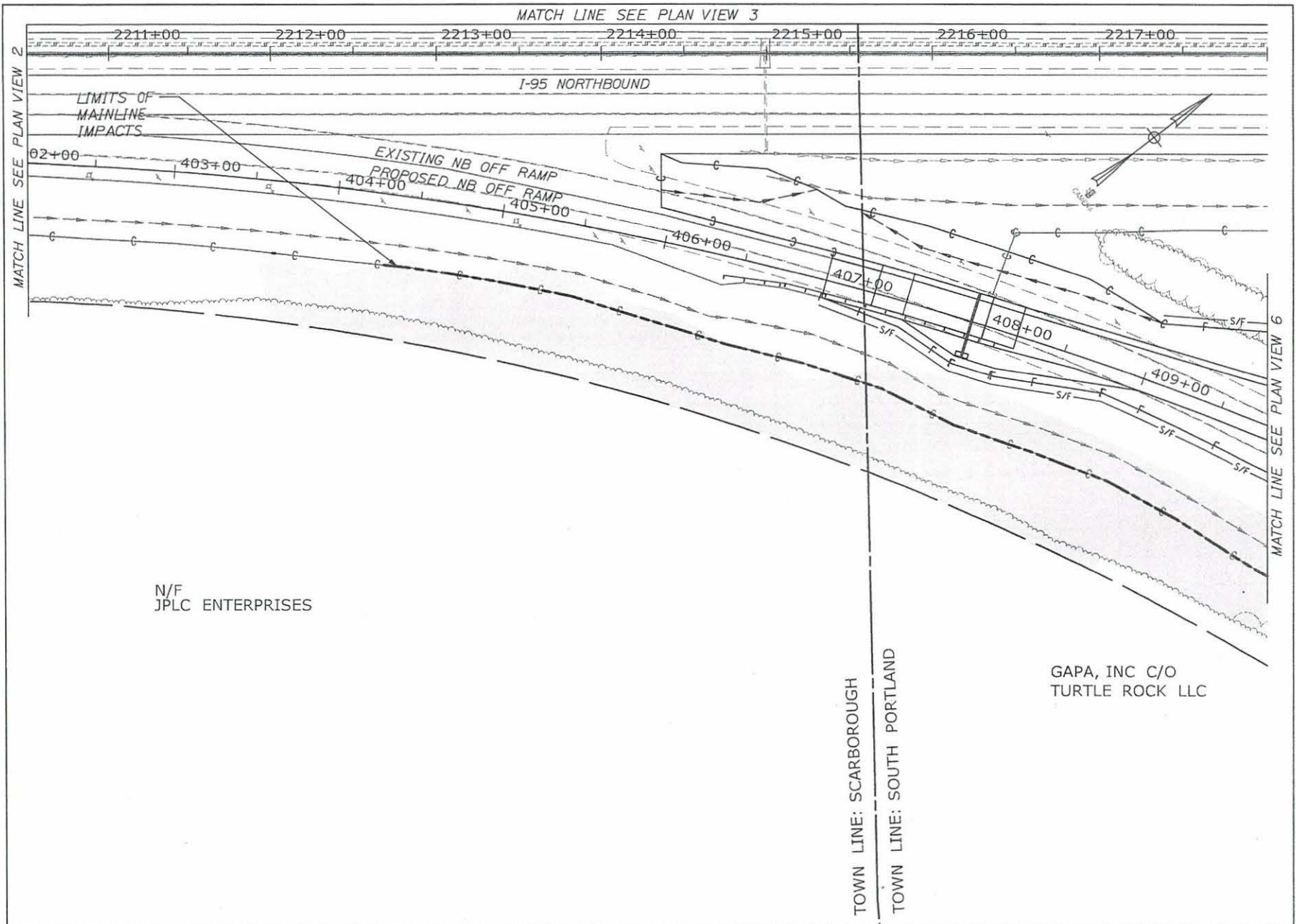
THE GOLD STAR
MEMORIAL HIGHWAY

EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 3

DATE: MARCH, 2019

SHEET 4 OF 15



SCALE: 1"=80'

HNTB
ARCHITECTS ENGINEERS PLANNERS



THE GOLD STAR
MEMORIAL HIGHWAY

EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 4

DATE: MARCH, 2019

SHEET 5 OF 15



HNTB
ARCHITECTS ENGINEERS PLANNERS



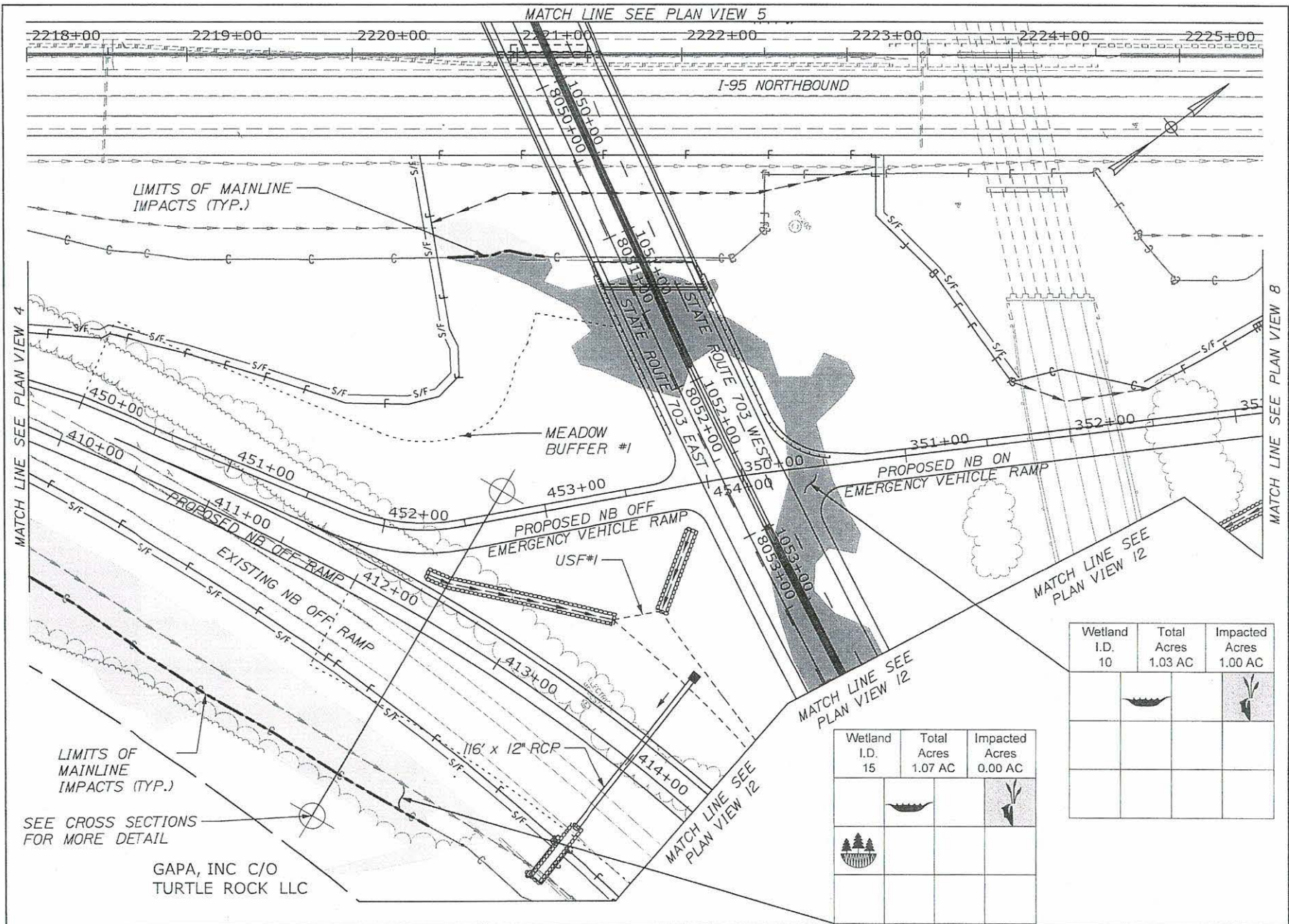
THE GOLD STAR
MEMORIAL HIGHWAY

EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 5

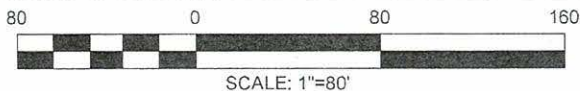
DATE: MARCH, 2019

SHEET 6 OF 15



Wetland I.D.	Total Acres	Impacted Acres
10	1.03 AC	1.00 AC

Wetland I.D.	Total Acres	Impacted Acres
15	1.07 AC	0.00 AC



HNTB
ARCHITECTS ENGINEERS PLANNERS



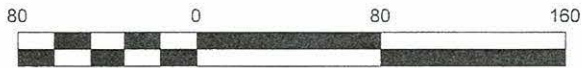
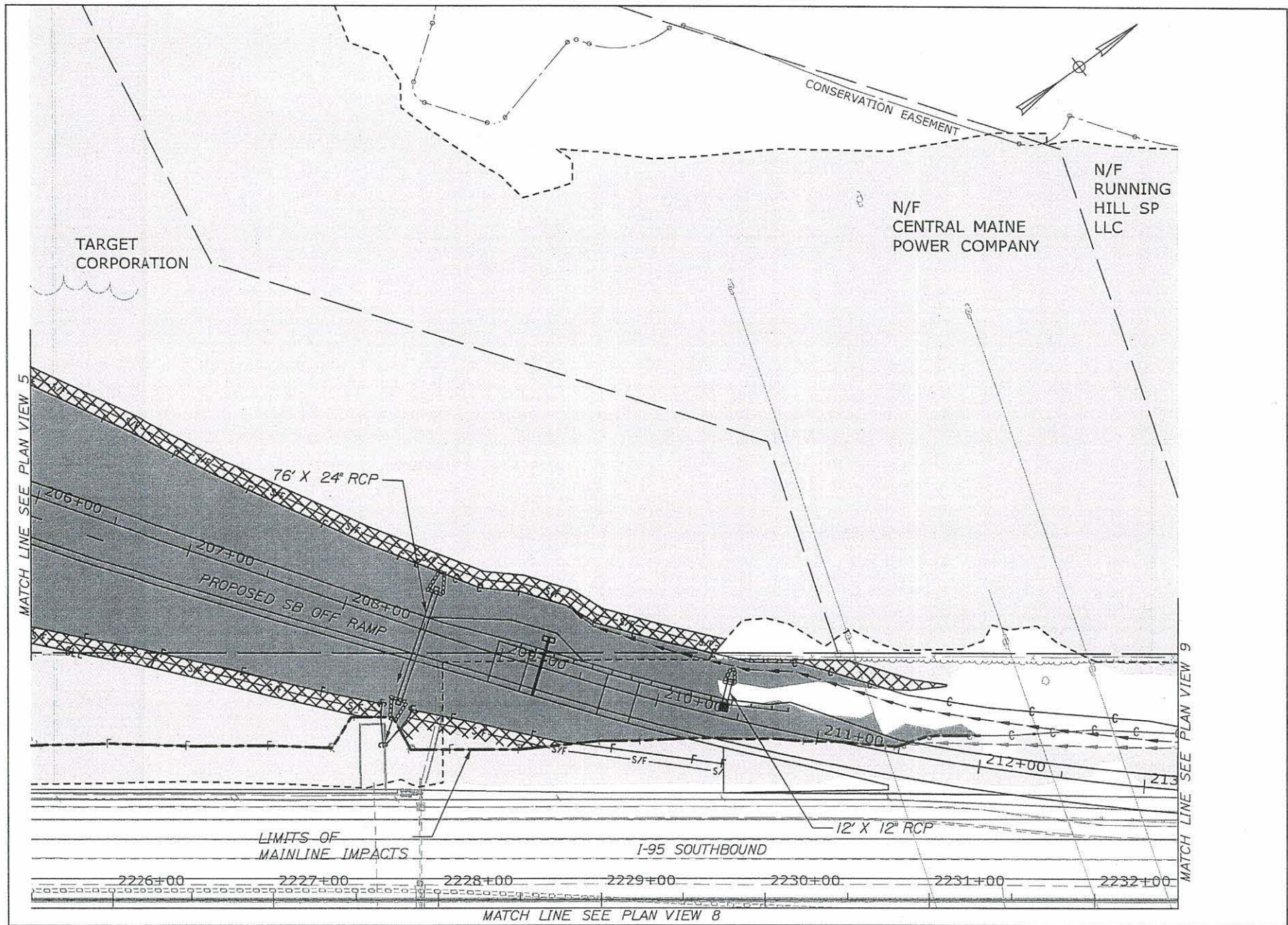
THE GOLD STAR
MEMORIAL HIGHWAY

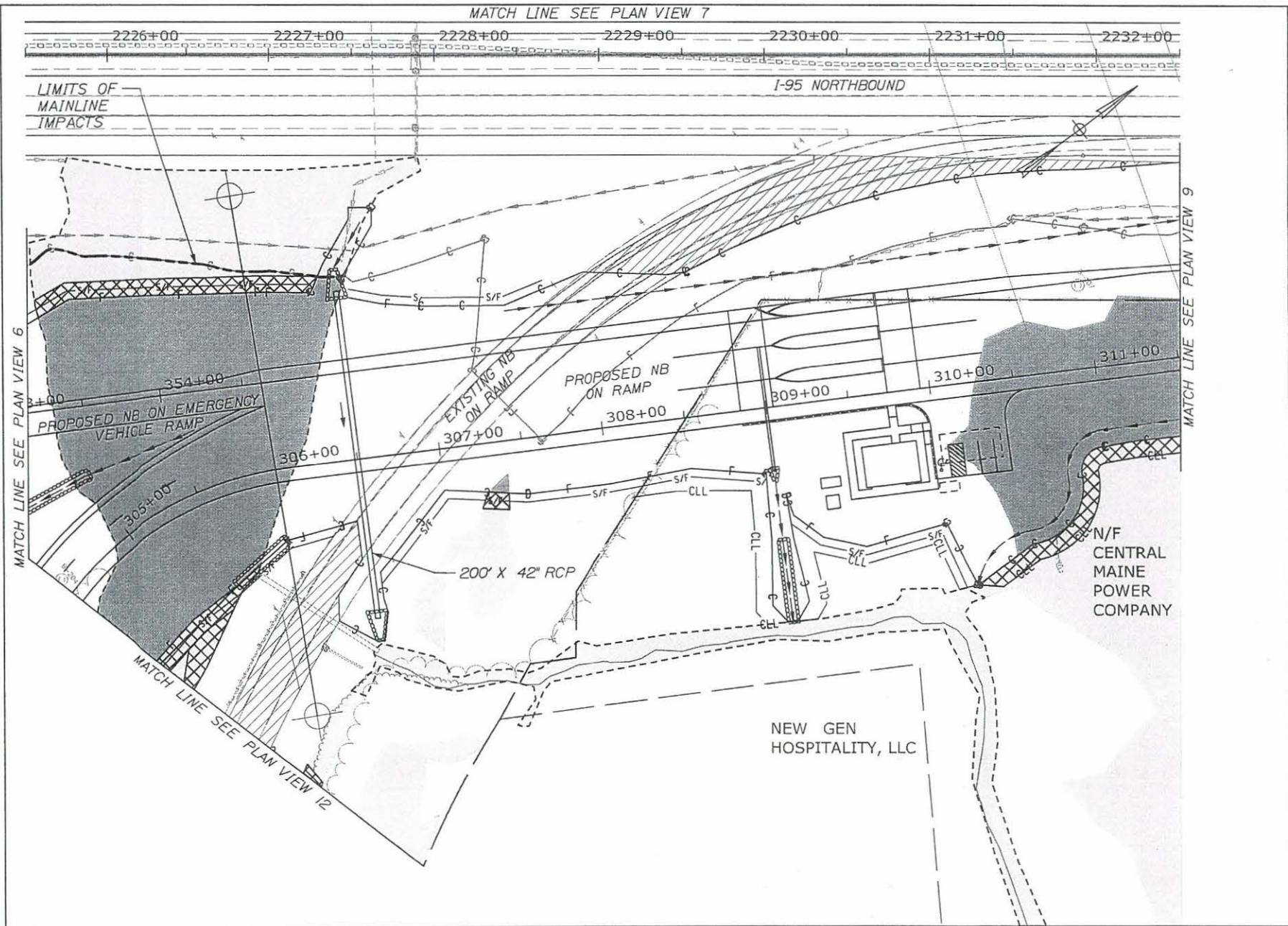
EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 6

DATE: MARCH, 2019

SHEET 7 OF 15





HNTB
ARCHITECTS ENGINEERS PLANNERS



THE GOLD STAR
MEMORIAL HIGHWAY

EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

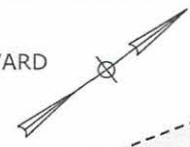
WETLAND IMPACTS
PLAN VIEW 8

DATE: MARCH, 2019

SHEET 9 OF 15

N/F
RUNNING HILL SP LLC

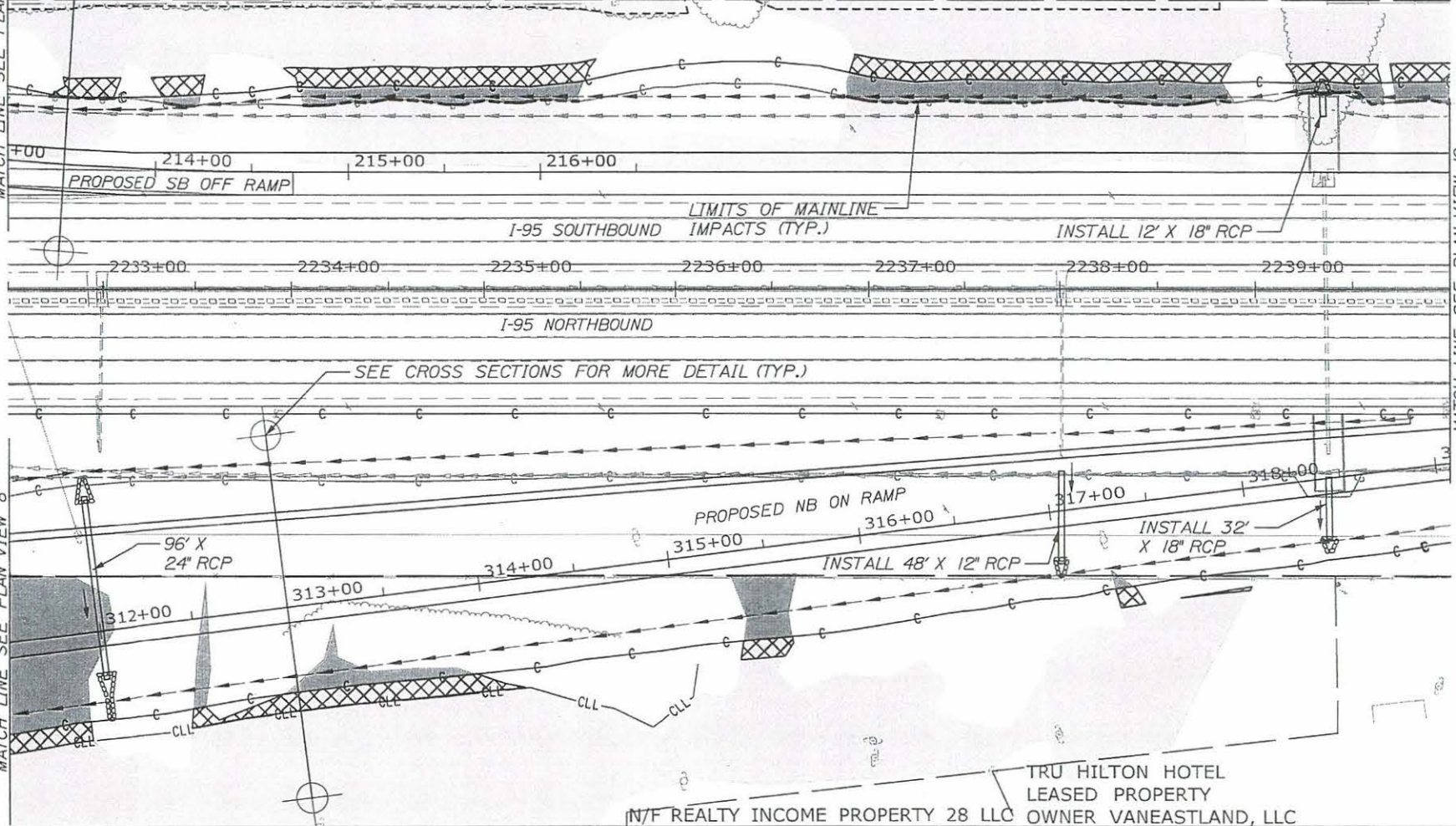
N/F
607 NORTHERN BOULEVARD
REALTY CORP



MATCH LINE SEE PLAN VIEW 7

MATCH LINE SEE PLAN VIEW 8

MATCH LINE SEE PLAN VIEW 10



HNTB
ARCHITECTS ENGINEERS PLANNERS



THE GOLD STAR
MEMORIAL HIGHWAY

EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 9

DATE: MARCH, 2019

SHEET 10 OF 15

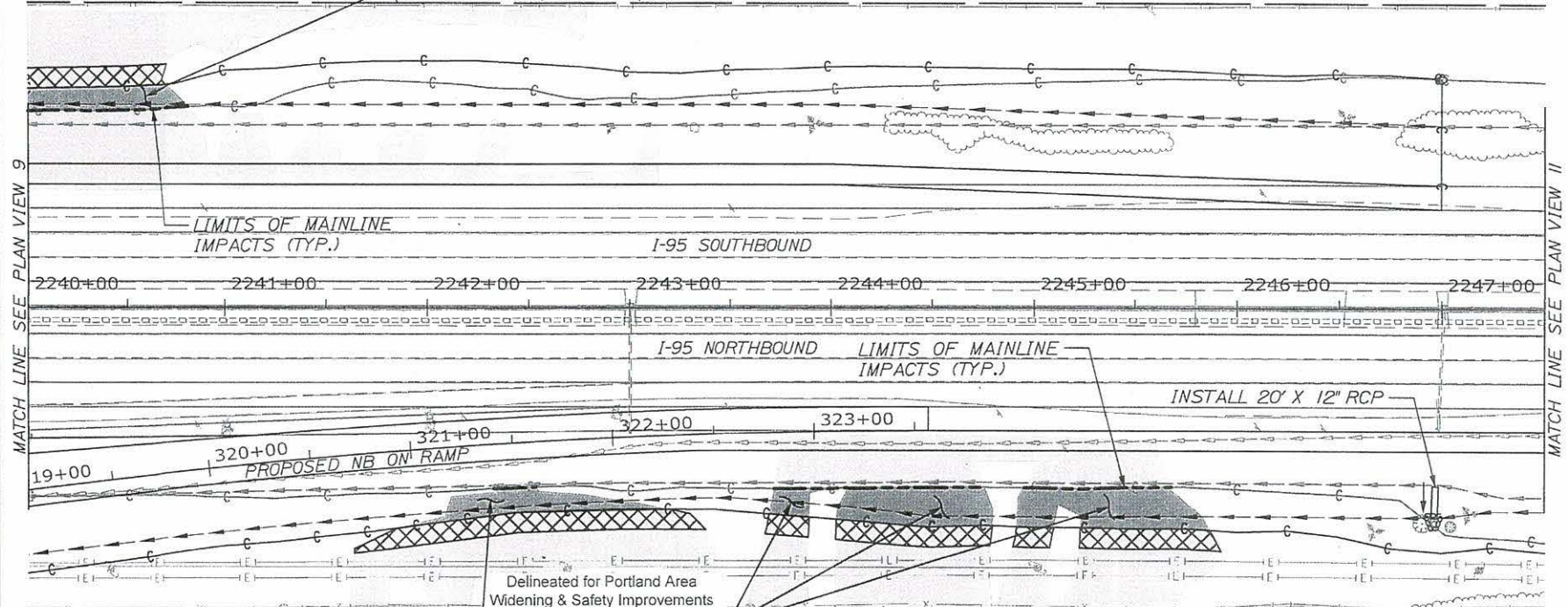
TRU HILTON HOTEL
LEASED PROPERTY
OWNER VANEASTLAND, LLC
N/F REALTY INCOME PROPERTY 28 LLC

N/F
607 NORTHERN
BOULEVARD
REALTY CORP

Wetland I.D.	Total Acres	Impacted Acres
1	18.31 AC	1.76 AC
		ES

N/F
RLC PORTLAND RETIREMENT
COMMUNITY LLC

WSS: 1.12 AC Perm, 0.27 AC Temp



TRU HILTON
HOTEL
LEASED
PROPERTY
OWNER
VANEASTLAND,
LLC

LEASED
PROPERTY
OWNER
VANEASTLAND,
LLC

Delineated for Portland Area
Widening & Safety Improvements
Project

Wetland I.D.	Total Acres	Impacted Acres
PAW 6	0.73 AC	0.10 AC

CRACKER BARREL
LEASED PROPERTY
OWNER
VANEASTLAND, LLC

N/F
TRU-2005 REALTY LLC



SCALE: 1"=80'

HNTB
ARCHITECTS ENGINEERS PLANNERS



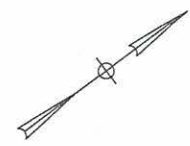
THE GOLD STAR
MEMORIAL HIGHWAY

EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 10

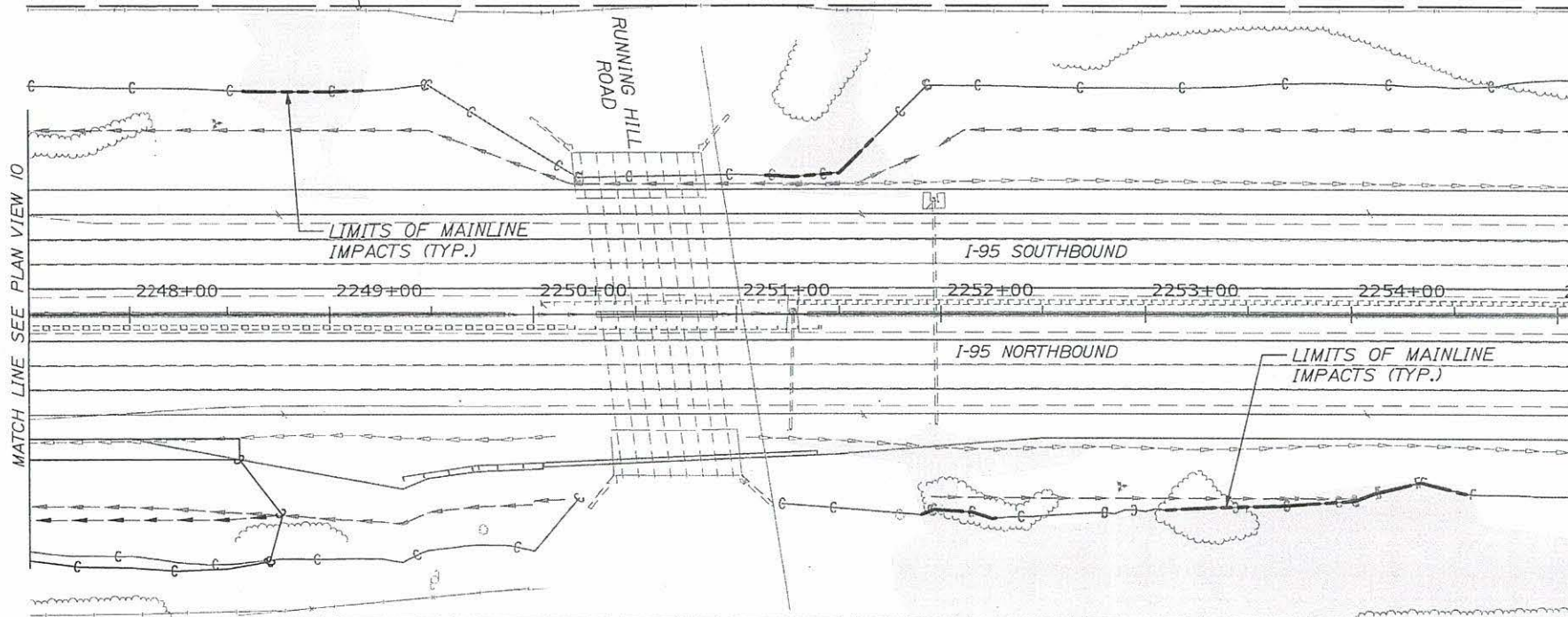
DATE: MARCH, 2019

SHEET 11 OF 15



N/F
RLC PORTLAND RETIREMENT
COMMUNITY LLC

SABLE OAKS DR



MATCH LINE SEE PLAN VIEW 10

N/F
TRU-2005
REALTY LLC

N/F
AMA REALTY VENTURES



SCALE: 1"=80'

HNTB
ARCHITECTS ENGINEERS PLANNERS



THE GOLD STAR
MEMORIAL HIGHWAY

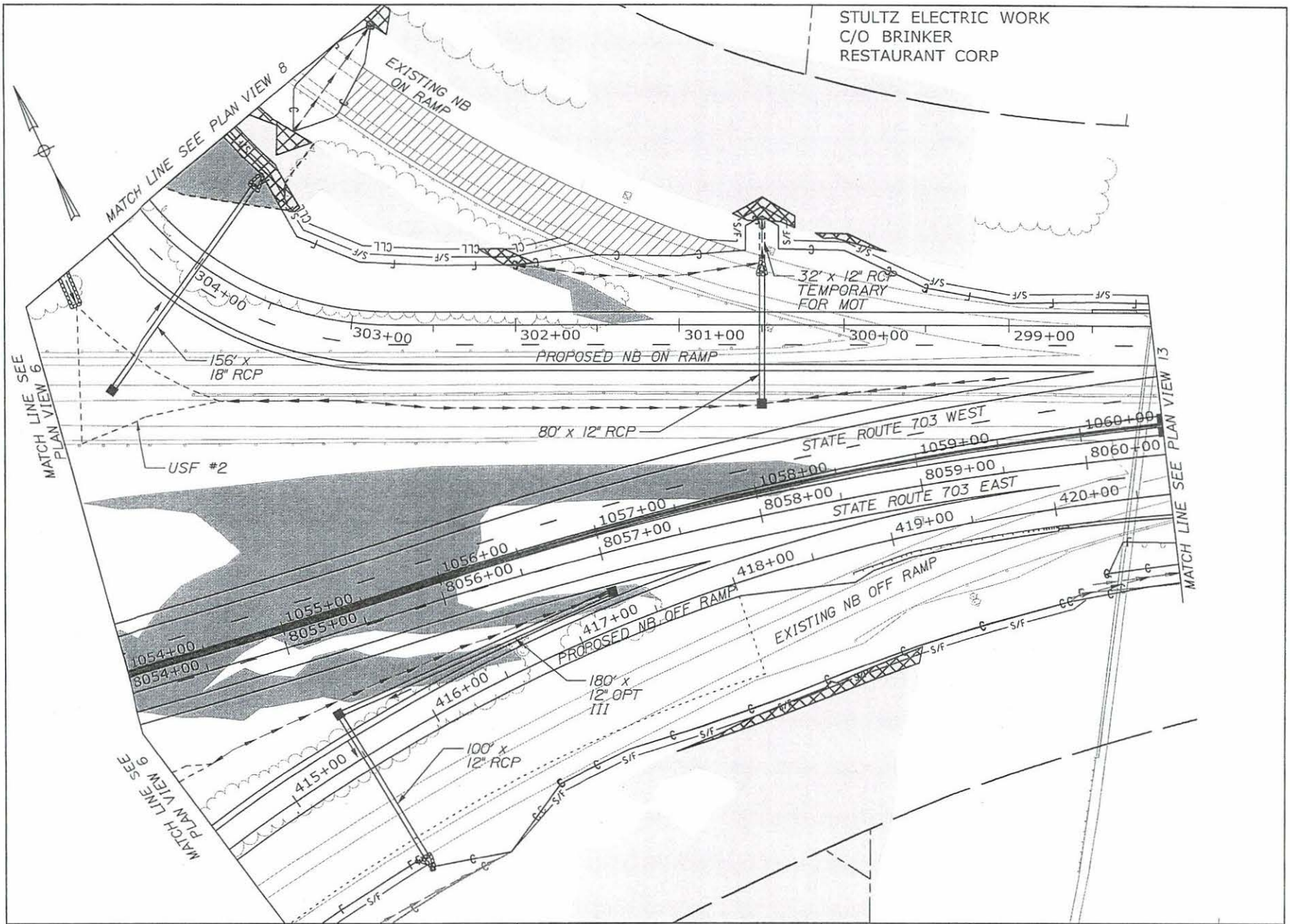
EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 11

DATE: MARCH, 2019

SHEET 12 OF 15

STULTZ ELECTRIC WORK
C/O BRINKER
RESTAURANT CORP



SCALE: 1"=80'

HNTB
ARCHITECTS ENGINEERS PLANNERS



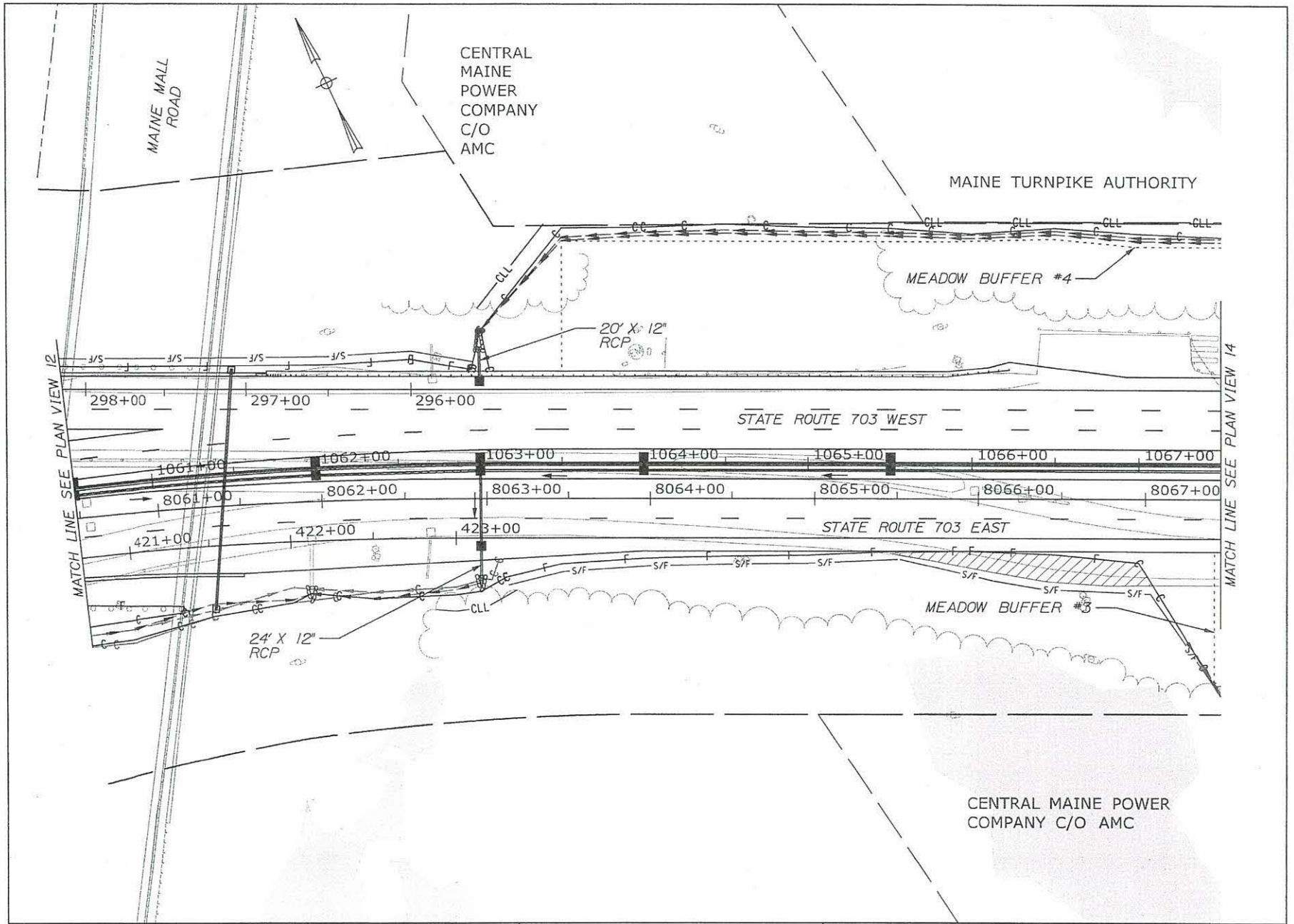
THE GOLD STAR
MEMORIAL HIGHWAY

EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 12

DATE: MARCH, 2019

SHEET 13 OF 15



HNTB
ARCHITECTS ENGINEERS PLANNERS



THE GOLD STAR
MEMORIAL HIGHWAY

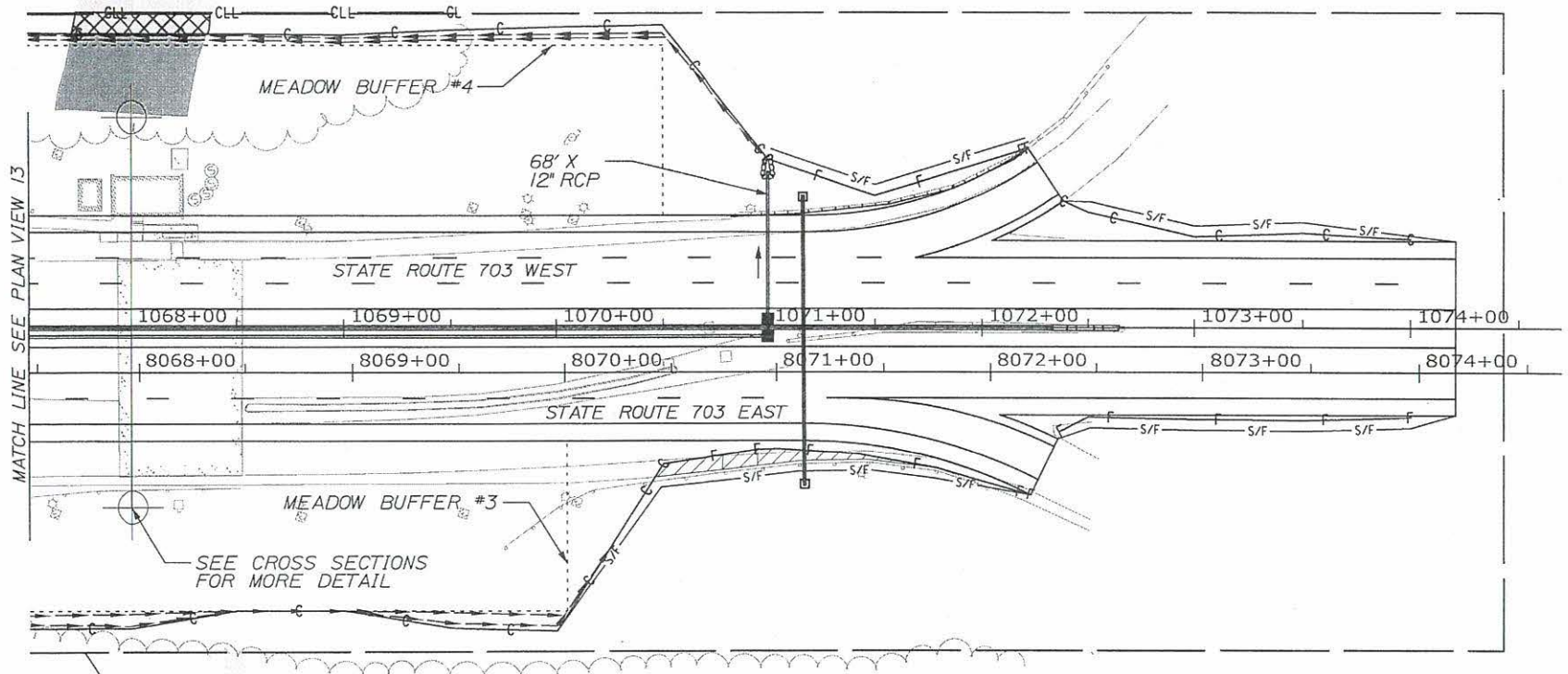
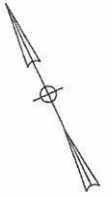
EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 13

DATE: MARCH, 2019

SHEET 14 OF 15

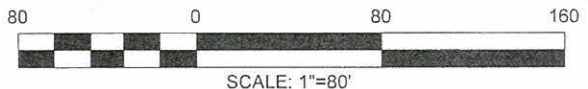
MAINE TURNPIKE AUTHORITY



MATCH LINE SEE PLAN VIEW 13

SEE CROSS SECTIONS FOR MORE DETAIL

MAINE TURNPIKE AUTHORITY



HNTB
ARCHITECTS ENGINEERS PLANNERS



THE GOLD STAR
MEMORIAL HIGHWAY

EXIT 45
INTERCHANGE
RECONFIGURATION
PROJECT

WETLAND IMPACTS
PLAN VIEW 14

DATE: MARCH, 2019

SHEET 15 OF 15



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION AUGUSTA, MAINE 04333-0017

DEPARTMENT ORDER

IN THE MATTER OF

MAINE TURNPIKE AUTHORITY	) NATURAL RESOURCES PROTECTION ACT
Scarborough and South Portland	) FRESHWATER WETLAND ALTERATION
Cumberland County	) WATER QUALITY CERTIFICATION
EXIT 45 RECONFIGURATION)
L-28275-TG-A-N (approval)	) FINDINGS OF FACT AND ORDER

Pursuant to the provisions of 38 M.R.S. §§ 480-A–480-JJ, Section 401 of the Federal Water Pollution Control Act (33 U.S.C. § 1341), and Chapters 310, 315, and 335 of Department rules, the Department of Environmental Protection has considered the application of the MAINE TURNPIKE AUTHORITY with the supportive data, agency review comments, and other related materials on file and FINDS THE FOLLOWING FACTS:

1. PROJECT DESCRIPTION:

A. Summary: To correct several deficiencies with the Exit 45 interchange, the applicant proposes to reconstruct and reconfigure the existing interchange. The project site is located at mile marker 45 on the Maine Turnpike in the Town of Scarborough and the City of South Portland.

The proposed project will consist of a new, reconfigured interchange, including new four new on- and off-ramps; replacement of the Exit 45 Underpass Bridge; removal of unused impervious surfaces from retired ramps, which will otherwise remain in place; construction of new toll plazas (two cash lanes and one electronic tolling lane) for northbound and southbound traffic, with related infrastructure; a new employee access drive from Cummings Road; relocation of Central Maine Power's (CMP) 115kV and 34.5kV lines that cross the Turnpike north of the existing Exit 45 interchange; and construction of stormwater management measures within the Turnpike right-of-way. The proposed project will require preloading to improve soil stability and minimize post-construction settlement and is expected to take four construction seasons to complete. Approximately 5.86 acres of freshwater wetlands will be permanently altered as a result of the proposed project.

The proposed project is shown on a set of plans, the first of which is titled "Exit 45 Interchange Reconfiguration Project, Wetland Impacts, Index Plan", prepared by HNTB Corporation and dated March 2019.

B. Current Use of the Site: The project site is located within the right-of-way of the Turnpike travel corridor, which includes northbound and southbound travel lanes and the Exit 45 interchange.

2. EXISTING SCENIC, AESTHETIC, RECREATIONAL OR NAVIGATIONAL USES:

The Natural Resources Protection Act (NRPA), in 38 M.R.S. §480-D(1), requires the applicant to demonstrate that the proposed project will not unreasonably interfere with existing scenic, aesthetic, recreational and navigational uses.

In accordance with Chapter 315, *Assessing and Mitigating Impacts to Scenic and Aesthetic Uses* (06-096 C.M.R. ch. 315, effective June 29, 2003), the applicant submitted a copy of the Department's Visual Evaluation Field Survey Checklist as Appendix 14 to the application along with a description of the property and the proposed project. The applicant also submitted several photographs of the proposed project site and surroundings, including an aerial photograph of the project site.

The proposed project is located in the portions of the Red Brook and Long Creek watersheds, which are not scenic resources visited by the general public, in part, for the use, observation, enjoyment and appreciation of its natural and cultural visual qualities.

The Department finds that the proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational or navigational uses of the freshwater wetlands that will altered.

3. SOIL EROSION:

The NRPA, in 38 M.R.S. §480-D(2), requires the applicant to demonstrate that the proposed project will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.

In order to minimize sedimentation into protected natural resources, construction will be performed using a number of erosion and sedimentation control measures based on the latest version of the *Maine Department of Transportation Best Management Practices for Erosion and Sediment Control (BMPs)* and the applicant's standards and specifications (Supplemental Specification Section 656, Temporary Soil Erosion and Water Pollution Control). The applicant stated that each construction project implements a Construction Project Environmental Compliance Program, which assigns a Resident Engineer and Compliance Officer whose roles include inspection of the construction project and weekly reports of erosion and sedimentation control devices. In addition, Supplemental Specification Section 656 requires each contractor to certify that its on-site responsible party has been trained and is knowledgeable in erosion and sediment control.

Supplemental Specification Section 656 also establishes an overview of preparatory activities, excavation activities, construction activities (including spill prevention and control), a post-construction work plan, and a schedule of construction activity. Periodic inspections of the overall project, including the effectiveness and condition of erosion and sediment control devices are conducted by the applicant's Permitting Coordinator/Environmental Liaison.

The Department finds that the activity will not cause unreasonable erosion of soil or sediment nor unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.

4. HABITAT CONSIDERATIONS:

The NRPA, in 38 M.R.S. §480-D(3), requires the applicant to demonstrate that the proposed project will not unreasonably harm significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life.

According to the Department's Geographic Information System database there are no mapped Essential or Significant Wildlife Habitats located at the site.

The Maine Department of Inland Fisheries and Wildlife (MDIFW) reviewed the proposed project, and in its comments, dated January 4, 2019, stated that no records of any Essential or Significant Wildlife Habitats were found within the project site. In its comments, MDIFW noted that the Maine Endangered Species Act lists several species of bats as endangered or threatened. **Because bats are likely to be found on the project site during migration and/or breeding season, MDIFW recommended that tree clearing be limited to the period when bats are not present. The applicant agreed to limit tree clearing outside of the months of June and July, the recognized pupping season for tree-roosting bats.**

No fisheries and stream protection issues were identified.

The Department finds that the activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life provided that **no tree cutting is conducted during the period of June 1 and July 31.**

5. WATER QUALITY CONSIDERATIONS:

The waters that may be affected by the proposed project are currently classified as Class C waters (38 M.R.S. §468(1)). Class C waters must be of such quality that they are suitable for the designated uses of drinking water supply after treatment, fishing, aquaculture, recreation in and on the water, industrial process and cooling water supply, hydroelectric power generation, navigation and as habitat for fish and other aquatic life (38 M.R.S. §465(4)(A)).

As discussed in Finding 3, the applicant proposes to use erosion and sediment control during construction to minimize impacts to water quality from siltation.

Prior to filing the application, the applicant and its consultants met with the Department to discuss treatment of stormwater from the proposed project. In accordance with the June 2017 Memorandum of Agreement (MOA) for Stormwater Management Between

the Maine Department of Transportation, Maine Turnpike Authority, and the Department of Environmental Protection, **the applicant proposes to construct three underdrained soil filters and four meadow buffers associated with the proposed project.** These stormwater BMPs are designed to be consistent with the treatment standards set forth in the Department's Chapter 500, *Stormwater Management* (06-096 C.M.R. ch.500, last amended August 12, 2015), and are expected to remove pollutants and provide some cooling of stormwater runoff, prior to discharge to Red Brook or Long Creek.

Based on the location of the proposed project, the construction methods proposed, and project's design and the Findings above, the Department finds that the proposed project will maintain and protect existing uses and the level of water quality necessary to protect those existing uses, will protect the existing water quality of affected waters, and will not significantly impair the viability of the existing fish populations.

6. WETLANDS AND WATERBODIES PROTECTION RULES:

The proposed project will permanently alter 255,061 square feet (5.86 acres), and temporarily impact an additional 93,507 square feet (2.15 acres) of freshwater wetlands within the overall project site. The permanently impacted wetlands include approximately 20,234 square feet (0.46 acres) of forested wetlands, 18,953 (0.44 acres) of scrub shrub wetlands, and 215,874 square feet (4.95 acres) of wet meadow/emergent marsh vegetation, of which 129,957 square feet (2.98 acres) are currently routinely mowed to ensure highway safety.

The CMP transmission line replacement will require the placement of five steel monopoles (one of which will be a self-supporting structure on a foundation), three wood monopoles, and six steel three-pole structures. Installation of the transmission line poles will result in the permanent fill of 847 square feet of freshwater wetlands. **Access to utility poles would be gained using temporary wooden construction mats, with a mat road** width of 16 feet and with a 25-foot working area around each transmission line support structure, resulting in temporary impacts to 50,445 square feet of freshwater wetlands.

The applicant also identified temporary wetland impacts as the area between the edge of project disturbance and the placement of silt fencing and stated that any wetlands disturbed in these areas will be restored to pre-disturbance conditions and revegetated with wetland vegetation and will result in temporary impacts to 43,062 square feet of freshwater wetlands.

The *Wetlands and Waterbodies Protection Rules*, 06-096 C.M.R. ch. 310 (last amended January 26, 2009), interpret and elaborate on the NRPA criteria for obtaining a permit. The rules guide the Department in its determination of whether a project's impacts would be unreasonable. A proposed project would generally be found to be unreasonable if it would cause a loss in wetland area, functions and values and there is a practicable alternative to the project that would be less damaging to the environment. Each application for a NRPA permit that involves a freshwater wetland alteration must provide an analysis of alternatives in order to demonstrate that a practicable alternative does not exist.

A. Avoidance. An applicant must submit an analysis of whether there is a practicable alternative to the project that would be less damaging to the environment and this analysis is considered by the Department in its assessment of the reasonableness of any impacts. The applicant submitted an alternatives analysis for the proposed project, dated March 29, 2019. The purpose of the project is to reconstruct the Exit 45 interchange of the Maine Turnpike to resolve deficiencies with the ramp bridge, toll plaza/system, and road geometrics to enhance safety and operational efficiency for current and future traffic.

The applicant examined seven alternatives, including the no-action alternative, in its initial (Phase 1) determination for the most practicable alternative that would meet the project purpose. Several interchange alternatives (trumpet, diamond, and cloverleaf configurations, a stacked configuration, and two variations that use a rotary) were evaluated in the Phase 1 review based on eight criteria that included: costs, right-of-way impacts, level of service, crash potential, construction complexity, and environmental impacts. Two alternatives, trumpet and diamond configurations, were selected for Phase 2, refined Alternatives Analysis, review. Phase 2 review was conducted based on refined geotechnical data, resource mapping, and constraints from existing infrastructure and adjacent development. The evaluation criteria for these two alternatives, after including these refined factors, were similar to Phase 1 review, but with additional emphasis on environmental impacts.

The selected alternative was determined to best meet the project purpose, would meet the safety, engineering, and impact minimization desired by the applicant. Given the location of the protected natural resources on the project site, impacts to freshwater wetlands cannot be avoided.

B. Minimal Alteration. In support of an application and to address the analysis of the reasonableness of any impacts of a proposed project, an applicant must demonstrate that the amount of freshwater wetland to be altered will be kept to the minimum amount necessary for meeting the overall purpose of the project. Freshwater wetlands are found immediately adjacent to the southbound travel lanes on the entire western side of the project site and adjacent to northbound travel lanes immediately north of the existing interchange on the eastern side of the project site. Geotechnical investigations have documented poor soil conditions throughout the site, such that preloading will be required prior to construction of the road surfaces. Because of the poor soils, the applicant determined that use of 4H:1V road side slopes would be preferable to 2H:1V road side slopes with guard rails for their stability and highway design advantages. The steeper slopes would require use of stability berms at the toe of slope to ensure subsurface soil failure would not occur, which would require additional wetland fill. The applicant sought to minimize impacts to adjacent wetlands by “hugging” ramps to existing roadways and by maintaining the necessary vertical clearance of the Exit 45 Underpass bridge, which would then limit height of road embankments, and encroachment into adjacent wetlands.

The Department finds that the road design and the angle of the side slopes in and adjacent to the wetland edges resulted in the minimum amount of wetland impacts necessary for the project.

C. Compensation. In accordance with Chapter 310, compensation is required for the proposed project to achieve the goal of no net loss of freshwater wetland functions and values.

The applicant submitted a functional assessment, dated March 2019, that described the wetlands to be altered by the proposed project. The functional assessment documented that the primary functions and values of these wetlands are sediment toxicant retention and floodflow alteration. The functional assessment noted that additional wetland functions for wetlands in the project area were generally low due to the periodic mowing and road safety maintenance programs performed by the applicant in the travel corridor. The functional assessment also noted that while these wetlands are effective at capturing sediment and pollutants that runoff the road surface and from adjacent commercial development, the elevated pollutant loading is contributing to degradation of the wetlands.

The application included a table that identified the wetland type, their functions and values, the type of impact, and a calculation of an In-Lieu Fee payment amount for the wetland impacts from the proposed project. Wetlands identified as wet meadow/emergent marsh vegetation wetlands were not subject to a resource multiplier because these areas are either located in artificial impoundments or are routinely altered (mowed) as part of the applicant's management program to maintain highway clear zones. A resource multiplier was applied to 48,615 square feet of emergent marsh vegetation wetlands that are not routinely maintained. The applicant proposes to make a contribution into the In-Lieu Fee program of the Maine Natural Resource Conservation Program in the amount of \$1,302,164.70. Prior to the start of construction, the applicant must submit a payment in the amount of \$1,302,164.70, payable to "Treasurer, State of Maine", and directed to the attention of the In-Lieu Fee Program Administrator at 17 State House Station, Augusta, Maine 04333.

The Department finds that the applicant has avoided and minimized stream and wetland impacts to the greatest extent practicable, and that the proposed project represents the least environmentally damaging alternative that meets the overall purpose of the project provided that prior to project construction, the applicant submits the In-Lieu Fee payment as described above.

The Department further finds that the activity will not unreasonably harm any freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine or marine fisheries or other aquatic life.

7. OTHER CONSIDERATIONS:

The proposed project is not located in a coastal sand dune system, is not a crossing of an outstanding river segment, and does not involve dredge spoils disposal or the transport of

dredge spoils by water. The Department finds, based on the project's design, the proposed construction methods, and project location, the proposed project will not inhibit the natural transfer of soil from the terrestrial to the marine environment, will not interfere with the natural flow of any surface or subsurface waters, and will not cause or increase flooding.

The proposed project is exempt from review under the Site Location of Development Act pursuant to 38 M.R.S. § 488(10).

The proposed project is also exempt from review under the Stormwater Management Law pursuant to 38 M.R.S. § 420-D(7)(G), as long as the project is constructed in accordance with the MOA referenced in Finding 5. The MOA requires that projects developed by the applicant located within watersheds of urban impaired streams must meet the General Standards contained in Chapter 500 *Stormwater Management Rules* (06-096 C.M.R. ch. 500, effective August 12, 2015) to the extent practicable. The applicant and the Department met several times to discuss stormwater treatment of the proposed project. **The proposed project includes three underdrained soil filters and four stormwater meadow buffers.**

Given the nature of the project and the limitations for constructing stormwater treatment devices along the Turnpike, the Department is satisfied that the proposed project complies with the General Standards of Chapter 500 to the extent practicable.

BASED on the above findings of fact, and subject to the conditions listed below, the Department makes the following conclusions pursuant to 38 M.R.S. §§ 480-A–480-JJ and Section 401 of the Federal Water Pollution Control Act:

- A. The proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational, or navigational uses.
- B. The proposed activity will not cause unreasonable erosion of soil or sediment.
- C. The proposed activity will not unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.
- D. The proposed activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine, or marine fisheries or other aquatic life provided that prior to construction the applicant makes a contribution to the In-Lieu Fee program as described in Finding 6.
- E. The proposed activity will not unreasonably interfere with the natural flow of any surface or subsurface waters.
- F. The proposed activity will not violate any state water quality law including those governing the classifications of the State's waters.

- G. The proposed activity will not unreasonably cause or increase the flooding of the alteration area or adjacent properties.
- H. The proposed activity is not on or adjacent to a sand dune.
- I. The proposed activity is not on an outstanding river segment as noted in 38 M.R.S. § 480-P.

THEREFORE, the Department APPROVES the above noted application of the MAINE TURNPIKE AUTHORITY to reconstruct Exit 45 of the Maine Turnpike as described in Finding 1, SUBJECT TO THE ATTACHED CONDITIONS, and all applicable standards and regulations:

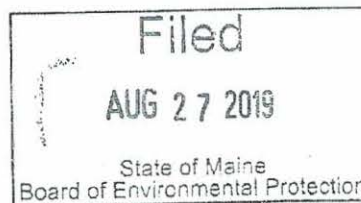
1. Standard Conditions of Approval, a copy attached.
2. The applicant shall take all necessary measures to ensure that its activities or those of its agents do not result in measurable erosion of soil on the site during the construction of the project covered by this approval.
3. Severability. The invalidity or unenforceability of any provision, or part thereof, of this License shall not affect the remainder of the provision or any other provisions. This License shall be construed and enforced in all respects as if such invalid or unenforceable provision or part thereof had been omitted.
5. Prior to the start of construction, the applicant shall submit a payment in the amount of \$1,302,164.70, payable to "Treasurer, State of Maine", to the attention of the In-Lieu Fee Program Administrator at 17 State House Station, Augusta, Maine 04333.

THIS APPROVAL DOES NOT CONSTITUTE OR SUBSTITUTE FOR ANY OTHER REQUIRED STATE, FEDERAL OR LOCAL APPROVALS NOR DOES IT VERIFY COMPLIANCE WITH ANY APPLICABLE SHORELAND ZONING ORDINANCES.

DONE AND DATED IN AUGUSTA, MAINE, THIS 27th DAY OF August, 2019.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

BY: Melanie K. Reid
For: Gerald D. Reid, Commissioner



PLEASE NOTE THE ATTACHED SHEET FOR GUIDANCE ON APPEAL PROCEDURES.
RLG/L28275AN/ATS#84345



Natural Resources Protection Act (NRPA) Standard Conditions

THE FOLLOWING STANDARD CONDITIONS SHALL APPLY TO ALL PERMITS GRANTED UNDER THE NATURAL RESOURCES PROTECTION ACT, 38 M.R.S. § 480-A ET SEQ., UNLESS OTHERWISE SPECIFICALLY STATED IN THE PERMIT.

- A. Approval of Variations From Plans. The granting of this permit is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed to by the applicant. Any variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.
- B. Compliance With All Applicable Laws. The applicant shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.
- C. Erosion Control. The applicant shall take all necessary measures to ensure that his activities or those of his agents do not result in measurable erosion of soils on the site during the construction and operation of the project covered by this Approval.
- D. Compliance With Conditions. Should the project be found, at any time, not to be in compliance with any of the Conditions of this Approval, or should the applicant construct or operate this development in any way other the specified in the Application or Supporting Documents, as modified by the Conditions of this Approval, then the terms of this Approval shall be considered to have been violated.
- E. Time frame for approvals. If construction or operation of the activity is not begun within four years, this permit shall lapse and the applicant shall reapply to the Board for a new permit. The applicant may not begin construction or operation of the activity until a new permit is granted. Reapplications for permits may include information submitted in the initial application by reference. This approval, if construction is begun within the four-year time frame, is valid for seven years. If construction is not completed within the seven-year time frame, the applicant must reapply for, and receive, approval prior to continuing construction.
- F. No Construction Equipment Below High Water. No construction equipment used in the undertaking of an approved activity is allowed below the mean high water line unless otherwise specified by this permit.
- G. Permit Included In Contract Bids. A copy of this permit must be included in or attached to all contract bid specifications for the approved activity.
- H. Permit Shown To Contractor. Work done by a contractor pursuant to this permit shall not begin before the contractor has been shown by the applicant a copy of this permit.



DEP INFORMATION SHEET

Appealing a Department Licensing Decision

Dated: November 2018

Contact: (207) 287-2452

SUMMARY

There are two methods available to an aggrieved person seeking to appeal a licensing decision made by the Department of Environmental Protection's (DEP) Commissioner: (1) an administrative process before the Board of Environmental Protection (Board); or (2) a judicial process before Maine's Superior Court. An aggrieved person seeking review of a licensing decision over which the Board had original jurisdiction may seek judicial review in Maine's Superior Court.

A judicial appeal of final action by the Commissioner or the Board regarding an application for an expedited wind energy development (35-A M.R.S. § 3451(4)) or a general permit for an offshore wind energy demonstration project (38 M.R.S. § 480-HH(1)) or a general permit for a tidal energy demonstration project (38 M.R.S. § 636-A) must be taken to the Supreme Judicial Court sitting as the Law Court.

This information sheet, in conjunction with a review of the statutory and regulatory provisions referred to herein, can help a person to understand his or her rights and obligations in filing an administrative or judicial appeal.

I. ADMINISTRATIVE APPEALS TO THE BOARD

LEGAL REFERENCES

The laws concerning the DEP's *Organization and Powers*, 38 M.R.S. §§ 341-D(4) & 346; the *Maine Administrative Procedure Act*, 5 M.R.S. § 11001; and the DEP's *Rules Concerning the Processing of Applications and Other Administrative Matters* ("Chapter 2"), 06-096 C.M.R. ch. 2.

DEADLINE TO SUBMIT AN APPEAL TO THE BOARD

The Board must receive a written appeal within 30 days of the date on which the Commissioner's decision was filed with the Board. Appeals filed more than 30 calendar days after the date on which the Commissioner's decision was filed with the Board will be dismissed unless notice of the Commissioner's license decision was required to be given to the person filing an appeal (appellant) and the notice was not given as required.

HOW TO SUBMIT AN APPEAL TO THE BOARD

Signed original appeal documents must be sent to: Chair, Board of Environmental Protection, 17 State House Station, Augusta, ME 04333-0017. An appeal may be submitted by fax or e-mail if it contains a scanned original signature. It is recommended that a faxed or e-mailed appeal be followed by the submittal of mailed original paper documents. The complete appeal, including any attachments, must be received at DEP's offices in Augusta on or before 5:00 PM on the due date; materials received after 5:00 pm are not considered received until the following day. The risk of material not being received in a timely manner is on the sender, regardless of the method used. The appellant must also send a copy of the appeal documents to the Commissioner of the DEP; the applicant (if the appellant is not the applicant in the license proceeding at issue); and if a hearing was held on the application, any intervenor in that hearing process. All of the information listed in the next section of this information sheet must be submitted at the time the appeal is filed.

INFORMATION APPEAL PAPERWORK MUST CONTAIN

Appeal materials must contain the following information at the time the appeal is submitted:

1. *Aggrieved Status.* The appeal must explain how the appellant has standing to maintain an appeal. This requires an explanation of how the appellant may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions, or conditions objected to or believed to be in error.* The appeal must identify the specific findings of fact, conclusions regarding compliance with the law, license conditions, or other aspects of the written license decision or of the license review process that the appellant objects to or believes to be in error.
3. *The basis of the objections or challenge.* For the objections identified in Item #2, the appeal must state why the appellant believes that the license decision is incorrect and should be modified or reversed. If possible, the appeal should cite specific evidence in the record or specific licensing requirements that the appellant believes were not properly considered or fully addressed.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license or permit to changes in specific permit conditions.
5. *All the matters to be contested.* The Board will limit its consideration to those matters specifically raised in the written notice of appeal.
6. *Request for hearing.* If the appellant wishes the Board to hold a public hearing on the appeal, a request for public hearing must be filed as part of the notice of appeal, and must include an offer of proof in accordance with Chapter 2. The Board will hear the arguments in favor of and in opposition to a hearing on the appeal and the presentations on the merits of an appeal at a regularly scheduled meeting. If the Board decides to hold a public hearing on an appeal, that hearing will then be scheduled for a later date.
7. *New or additional evidence to be offered.* If an appellant wants to provide evidence not previously provided to DEP staff during the DEP's review of the application, the request and the proposed evidence must be submitted with the appeal. The Board may allow new or additional evidence, referred to as supplemental evidence, to be considered in an appeal only under very limited circumstances. The proposed evidence must be relevant and material, and (a) the person seeking to add information to the record must show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process; or (b) the evidence itself must be newly discovered and therefore unable to have been presented earlier in the process. Specific requirements for supplemental evidence are found in Chapter 2 § 24.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, and is made easily accessible by the DEP. Upon request, the DEP will make application materials available during normal working hours, provide space to review the file, and provide an opportunity for photocopying materials. There is a charge for copies or copying services.
2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing your appeal.* DEP staff will provide this information on request and answer general questions regarding the appeal process.
3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed, the license normally remains in effect pending the processing of the appeal. Unless a stay of the decision is requested and granted, a license holder may proceed with a project pending the outcome of an appeal, but the license holder runs the risk of the decision being reversed or modified as a result of the appeal.

WHAT TO EXPECT ONCE YOU FILE A TIMELY APPEAL WITH THE BOARD

The Board will formally acknowledge receipt of an appeal, and will provide the name of the DEP project manager assigned to the specific appeal. The notice of appeal, any materials accepted by the Board Chair as supplementary evidence, any materials submitted in response to the appeal, and relevant excerpts from the DEP's application review file will be sent to Board members with a recommended decision from DEP staff. The appellant, the license holder if different from the appellant, and any interested persons are notified in advance of the date set for Board consideration of an appeal or request for public hearing. The appellant and the license holder will have an opportunity to address the Board at the Board meeting. With or without holding a public hearing, the Board may affirm, amend, or reverse a Commissioner decision or remand the matter to the Commissioner for further proceedings. The Board will notify the appellant, the license holder, and interested persons of its decision.

II. JUDICIAL APPEALS

Maine law generally allows aggrieved persons to appeal final Commissioner or Board licensing decisions to Maine's Superior Court (see 38 M.R.S. § 346(1); 06-096 C.M.R. ch. 2; 5 M.R.S. § 11001; and M.R. Civ. P. 80C). A party's appeal must be filed with the Superior Court within 30 days of receipt of notice of the Board's or the Commissioner's decision. For any other person, an appeal must be filed within 40 days of the date the decision was rendered. An appeal to court of a license decision regarding an expedited wind energy development, a general permit for an offshore wind energy demonstration project, or a general permit for a tidal energy demonstration project may only be taken directly to the Maine Supreme Judicial Court. See 38 M.R.S. § 346(4).

Maine's Administrative Procedure Act, DEP statutes governing a particular matter, and the Maine Rules of Civil Procedure must be consulted for the substantive and procedural details applicable to judicial appeals.

ADDITIONAL INFORMATION

If you have questions or need additional information on the appeal process, for administrative appeals contact the Board's Executive Analyst at (207) 287-2452, or for judicial appeals contact the court clerk's office in which your appeal will be filed.

Note: The DEP provides this INFORMATION SHEET for general guidance only; it is not intended for use as a legal reference. Maine law governs an appellant's rights.



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
17 STATE HOUSE STATION AUGUSTA, MAINE 04333-0017

DEPARTMENT ORDER

IN THE MATTER OF

MAINE TURNPIKE AUTHORITY	) NATURAL RESOURCES PROTECTION ACT
South Portland, Cumberland County	) FRESHWATER WETLAND ALTERATION
MAINE CROSSING - AMENDED	) WATER QUALITY CERTIFICATION
WETLAND COMPENSATION PLAN	) MINOR REVISION
L-19935-TG-L-M (approval)	) FINDINGS OF FACT AND ORDER

Pursuant to the provisions of 38 M.R.S. §§ 480-A–480-JJ and Section 401 of the Federal Water Pollution Control Act (33 U.S.C. § 1341), the Department of Environmental Protection has considered the application of the MAINE TURNPIKE AUTHORITY with the supportive data and other related materials on file and FINDS THE FOLLOWING FACTS:

1. PROJECT DESCRIPTION:

A. History: In Department Order #L-19935-23-A-N/L-19935-31-C-N, dated November 23, 1999, the Department approved the development of Maine Crossing, a retail shopping center on approximately 40 acres of land in the City of South Portland. As part of the development, the Department approved the alteration of approximately 3.9 acres of freshwater wetlands and established a wetland compensation plan to mitigate for wetland impacts. The Department issued subsequent orders acknowledging compliance with special conditions and approving minor revisions to the initial project design, including Department Order #L-19935-23-F-M/L-19935-31-G-M, dated March 27, 2001, which authorized changes to the project following a landslide of incompetent soil. This Order revised the wetland compensation plan, in part, to incorporate the soil mass within the compensation area. The development is located on the south side of Running Hill Road in the City of South Portland.

B. Summary: The applicant is seeking Department approval for revisions to the wetland compensation plan. The applicant proposes to remove approximately 1.29 acres of preserved land located adjacent to southbound lanes of the Maine Turnpike and the Exit 45 southbound entrance ramp. The applicant is proposing to develop a portion of this area as part of its proposed Exit 45 Reconfiguration Project, which is currently under review by the Department (#L-28275-TG-A-N, filed March 29, 2019).

The proposed Exit 45 Reconfiguration Project requires realignment of the Central Maine Power (CMP) transmission line crossing north of the existing Exit 45 interchange. The applicant is also seeking Department approval to allow maintenance activities for two tracts of land (0.22 acres and 0.14 acres) located in the compensation area which is adjacent to the existing CMP right-of-way.

The proposed project will not significantly affect any other issues identified during previous Department reviews of the project site.

Based on its review of the application, the Department finds the requested minor revision to be in accordance with all relevant Departmental standards. All other findings of fact, conclusions and conditions remain as approved in Department Order #L-19935-23-A-N/L-19935-31-C-N, and subsequent Orders.

BASED on the above findings of fact, and subject to the conditions listed below, the Department makes the following conclusions pursuant to 38 M.R.S. §§ 480-A–480-JJ and Section 401 of the Federal Water Pollution Control Act:

- A. The proposed activity will not unreasonably interfere with existing scenic, aesthetic, recreational, or navigational uses.
- B. The proposed activity will not cause unreasonable erosion of soil or sediment.
- C. The proposed activity will not unreasonably inhibit the natural transfer of soil from the terrestrial to the marine or freshwater environment.
- D. The proposed activity will not unreasonably harm any significant wildlife habitat, freshwater wetland plant habitat, threatened or endangered plant habitat, aquatic or adjacent upland habitat, travel corridor, freshwater, estuarine, or marine fisheries or other aquatic life provided that prior to construction of Exit 45 Reconfiguration project, the applicant makes a contribution to the In-Lieu Fee program and the Partial Release of Covenants is executed, as described in Finding 2.
- E. The proposed activity will not unreasonably interfere with the natural flow of any surface or subsurface waters.
- F. The proposed activity will not violate any state water quality law including those governing the classifications of the State's waters.
- G. The proposed activity will not unreasonably cause or increase the flooding of the alteration area or adjacent properties.
- H. The proposed activity is not on or adjacent to a sand dune.
- I. The proposed activity is not on an outstanding river segment as noted in 38 M.R.S. § 480-P.

THEREFORE, the Department APPROVES the application of the MAINE TURNPIKE AUTHORITY to amend the wetland compensation plan for the Maine Crossing development as described in Finding 1, SUBJECT TO THE FOLLOWING CONDITIONS and all applicable standards and regulations:



Natural Resources Protection Act (NRPA)

Standard Conditions

THE FOLLOWING STANDARD CONDITIONS SHALL APPLY TO ALL PERMITS GRANTED UNDER THE NATURAL RESOURCES PROTECTION ACT, 38 M.R.S.A. § 480-A ET SEQ., UNLESS OTHERWISE SPECIFICALLY STATED IN THE PERMIT.

- A. **Approval of Variations From Plans.** The granting of this permit is dependent upon and limited to the proposals and plans contained in the application and supporting documents submitted and affirmed to by the applicant. Any variation from these plans, proposals, and supporting documents is subject to review and approval prior to implementation.
- B. **Compliance With All Applicable Laws.** The applicant shall secure and comply with all applicable federal, state, and local licenses, permits, authorizations, conditions, agreements, and orders prior to or during construction and operation, as appropriate.
- C. **Erosion Control.** The applicant shall take all necessary measures to ensure that his activities or those of his agents do not result in measurable erosion of soils on the site during the construction and operation of the project covered by this Approval.
- D. **Compliance With Conditions.** Should the project be found, at any time, not to be in compliance with any of the Conditions of this Approval, or should the applicant construct or operate this development in any way other the specified in the Application or Supporting Documents, as modified by the Conditions of this Approval, then the terms of this Approval shall be considered to have been violated.
- E. **Time frame for approvals.** If construction or operation of the activity is not begun within four years, this permit shall lapse and the applicant shall reapply to the Board for a new permit. The applicant may not begin construction or operation of the activity until a new permit is granted. Reapplications for permits may include information submitted in the initial application by reference. This approval, if construction is begun within the four-year time frame, is valid for seven years. If construction is not completed within the seven-year time frame, the applicant must reapply for, and receive, approval prior to continuing construction.
- F. **No Construction Equipment Below High Water.** No construction equipment used in the undertaking of an approved activity is allowed below the mean high water line unless otherwise specified by this permit.
- G. **Permit Included In Contract Bids.** A copy of this permit must be included in or attached to all contract bid specifications for the approved activity.
- H. **Permit Shown To Contractor.** Work done by a contractor pursuant to this permit shall not begin before the contractor has been shown by the applicant a copy of this permit.

INFORMATION APPEAL PAPERWORK MUST CONTAIN

Appeal materials must contain the following information at the time the appeal is submitted:

1. *Aggrieved Status.* The appeal must explain how the appellant has standing to maintain an appeal. This requires an explanation of how the appellant may suffer a particularized injury as a result of the Commissioner's decision.
2. *The findings, conclusions, or conditions objected to or believed to be in error.* The appeal must identify the specific findings of fact, conclusions regarding compliance with the law, license conditions, or other aspects of the written license decision or of the license review process that the appellant objects to or believes to be in error.
3. *The basis of the objections or challenge.* For the objections identified in Item #2, the appeal must state why the appellant believes that the license decision is incorrect and should be modified or reversed. If possible, the appeal should cite specific evidence in the record or specific licensing requirements that the appellant believes were not properly considered or fully addressed.
4. *The remedy sought.* This can range from reversal of the Commissioner's decision on the license or permit to changes in specific permit conditions.
5. *All the matters to be contested.* The Board will limit its consideration to those matters specifically raised in the written notice of appeal.
6. *Request for hearing.* If the appellant wishes the Board to hold a public hearing on the appeal, a request for public hearing must be filed as part of the notice of appeal, and must include an offer of proof in accordance with Chapter 2. The Board will hear the arguments in favor of and in opposition to a hearing on the appeal and the presentations on the merits of an appeal at a regularly scheduled meeting. If the Board decides to hold a public hearing on an appeal, that hearing will then be scheduled for a later date.
7. *New or additional evidence to be offered.* If an appellant wants to provide evidence not previously provided to DEP staff during the DEP's review of the application, the request and the proposed evidence must be submitted with the appeal. The Board may allow new or additional evidence, referred to as supplemental evidence, to be considered in an appeal only under very limited circumstances. The proposed evidence must be relevant and material, and (a) the person seeking to add information to the record must show due diligence in bringing the evidence to the DEP's attention at the earliest possible time in the licensing process; or (b) the evidence itself must be newly discovered and therefore unable to have been presented earlier in the process. Specific requirements for supplemental evidence are found in Chapter 2 § 24.

OTHER CONSIDERATIONS IN APPEALING A DECISION TO THE BOARD

1. *Be familiar with all relevant material in the DEP record.* A license application file is public information, subject to any applicable statutory exceptions, and is made easily accessible by the DEP. Upon request, the DEP will make application materials available during normal working hours, provide space to review the file, and provide an opportunity for photocopying materials. There is a charge for copies or copying services.
2. *Be familiar with the regulations and laws under which the application was processed, and the procedural rules governing your appeal.* DEP staff will provide this information on request and answer general questions regarding the appeal process.
3. *The filing of an appeal does not operate as a stay to any decision.* If a license has been granted and it has been appealed, the license normally remains in effect pending the processing of the appeal. Unless a stay of the decision is requested and granted, a license holder may proceed with

**US ARMY CORPS OF ENGINEERS
INDIVIDUAL PERMIT**

PORTLAND AREA WIDENING



DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NEW ENGLAND DISTRICT
696 VIRGINIA ROAD
CONCORD MA 01742-2751

Regulatory Division
File No. NAE-2019-00701

August 21, 2019

Maine Turnpike Authority
c/o Sean Donohue
2360 Congress Street
Portland, Maine 04102

Dear Mr. Donohue:

Enclosed are two copies of a Department of the Army permit authorizing you to place temporary and permanent fill below the ordinary high water mark of waters of the U.S. including adjacent freshwater wetlands. **Please sign both copies of the permit and return one signed copy to this office at the address above.** No fee is required. The authorized work cannot start until we receive a complete, signed copy of the permit.

You are required to complete and return the enclosed forms to this office:

1. Preliminary Jurisdictional Determination Form to be submitted along with your signed copy of the permit
2. Work Start Notification Form at least two weeks before the anticipated work start date.
3. Compliance Certification Form within one month following the completion of the authorized work.

This permit is a limited authorization containing a specific set of conditions. Please read the permit thoroughly to familiarize yourself with those conditions, **including any conditions contained on the enclosed state water quality certification.** If a contractor does the work for you, both you and the contractor are responsible for ensuring that the work is done in compliance with the permit's terms and conditions, as any violations could result in civil or criminal penalties.

Our verification of this project's wetland delineation under the Corps of Engineers Wetlands Delineation Manual, and its applicable supplement, is valid for a period of five years from the date of this letter unless new information warrants revision of the determination before the expiration date.

A combined Notification of Administrative Appeal Options and Process (NAP) and Request for Appeal (RFA) form, and flow chart explaining the appeals process and your options, are enclosed. If you desire to appeal this proffered permit, you must submit a completed RFA form along with any supporting or clarifying information to James W. Haggerty; Administrative Appeals Review Officer; North Atlantic Division, Corps of Engineers; North Atlantic Fort Hamilton Military Community, Bldg. 301; General Lee Avenue; Brooklyn, NY 11252-6700.

Contact info: (347) 370-4650 or james.w.haggerty@usace.army.mil.


In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP.

You may not appeal conditions contained in the State water quality certification or the CZM consistency determination under this program as they are automatically included in the Federal permit. This authorization does not obviate the need to obtain other Federal, state, or local authorizations required by law.

We continually strive to improve our customer service. In order for us to better serve you, we would appreciate your completing our Customer Service Survey located at http://corpsmapu.usace.army.mil/cm_apex/f?p=regulatory_survey.

If you have any questions regarding this correspondence, please contact Colin Greenan at 978-318-8676 at our Augusta, Maine Project Office.

Sincerely,


Frank J. Del Giudice
Chief, Permits and Enforcement Branch
Regulatory Division

Enclosures

cc:

Laura Teracino, U.S. Environmental Protection Agency Region 1, Teracino.Laura@epa.gov

DEPARTMENT OF THE ARMY PERMIT

Permittee Maine Turnpike Authority c/o Sean Donohue, 2360 Congress Street, Portland, Maine 04102

Permit No. NAE-2019-00701

Issuing Office New England District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the Corps of Engineers having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description:

Place temporary and permanent fill below the ordinary high water marks of Red Brook, Long Creek, an unnamed tributary to the Fore River, and an unnamed tributary to Capisic Brook and in adjacent freshwater wetlands along the Maine Turnpike (Interstate 95) from Holmes Road at Scarborough, north 5.7 mi. to approximately 0.2 mile north of Exit 48 at Portland, Maine all in order to upgrade the Turnpike to current safety and capacity standards and to accommodate projected traffic volumes.

Project Description Continued on Page 4

This work is shown on the attached plans entitled, "USGS Topographic Map" in one sheet dated "January 2019", "Sections" in 12 sheets dated "06/19" and "10/18" respectively and "WETLAND IMPACTS" in 32 sheets dated "FEBRUARY, 2019".

Project Location:

Along the Maine Turnpike in numerous waterways and adjacent freshwater wetlands between Scarborough, Maine and Portland, Maine.

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on December 31, 2024. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least one month before the above date is reached.
2. You must maintain the activity authorized by this permit in good condition and in conformance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification of this permit from this office, which may require restoration of the area.
3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and state coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

Special Conditions:

1. The permittee shall ensure that a copy of this permit is at the work site whenever work is being performed and that all personnel performing work at the site of the work authorized by this permit are fully aware of the terms and conditions of the permit. This permit, including its drawings and any appendices and other attachments, shall be made a part of any and all contracts and sub-contracts for work which affects areas of Corps of Engineers jurisdiction at the site of the work authorized by this permit. This shall be done by including the entire permit in the specifications for work.

Special Conditions continued on Page 4

Further Information:

1. Congressional Authorities: You have been authorized to undertake the activity described above pursuant to:

() Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403).

(X) Section 404 of the Clean Water Act (33 U.S.C. 1344).

() Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, state, or local authorizations required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted or unpermitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

Project Description Continued from Page 1

This work includes the addition of a third travel lane in each direction, shoulder widening, sideslope improvements, and drainage improvements. This work will result in approximately 4,873 s.f. of permanent and 3,351 s.f. temporary streambed impact and 4.24 ac. of permanent and 1.17 ac. of temporary freshwater wetland impact.

Special Conditions continued from Page 2

If the permit is issued after the construction specifications but before receipt of bids or quotes, the entire permit shall be included as an addendum to the specifications. If the permit is issued after receipt of bids or quotes, the entire permit shall be included in the contract or sub-contract as a change order. The term "entire permit" includes permit amendments. Although the permittee may assign various aspects of the work to different contractors or sub-contractors, all contractors and sub-contractors shall be obligated by contract to comply with all environmental protection provisions of the entire permit, and no contract or sub-contract shall require or allow unauthorized work in areas of Corps jurisdiction.

2. This authorization requires you to 1) notify us before beginning work so we may inspect the project, and 2) submit a Compliance Certification Form. You must complete and return the enclosed Work Start Notification Form to this office at least two weeks before the anticipated starting date. The permittee shall complete and return the enclosed Compliance Certification Form within one month following the completion of the authorized work. **These forms are attached after the plans.**

3. Except where stated otherwise, reports, drawings, correspondence and any other submittals required by this permit shall be marked with the words "Permit No. NAE-2019-00701" and shall be addressed to "Inspection Section, CENAE-R, U.S. Army Corps of Engineers, 696 Virginia Road, Concord, MA 01742-2751." Documents which are not marked and addressed in this manner may not reach their intended destination and do not comply with the requirements of this permit.

4. Compensatory mitigation shall consist of payment of \$803,816.63 to the Maine Natural Resource Conservation Program. The attached completed In-Lieu-Fee (ILF) Project Data Worksheet shall be mailed with a cashier's check or bank draft made out to "Treasurer, State of Maine", with the permit number clearly noted on the check. The check and worksheet shall be mailed to Maine Department of Environmental Protection, Attention: ILF Program Administrator, 17 State House Station, Augusta, Maine 04333. **This authorization is not valid until the permittee provides the Corps with a copy of the check with the permit number noted on the check.** The ILF amount is only valid for a period of one year from the date of the authorization. After that time, the project shall be reevaluated and a new amount determined.

5. Adequate sedimentation and erosion control devices, such as geo-textile silt fences or other devices capable of filtering the fines involved, shall be installed and properly maintained to minimize impacts during construction. These devices must be removed upon completion of work and stabilization of disturbed areas. The sediment collected by these devices must also be

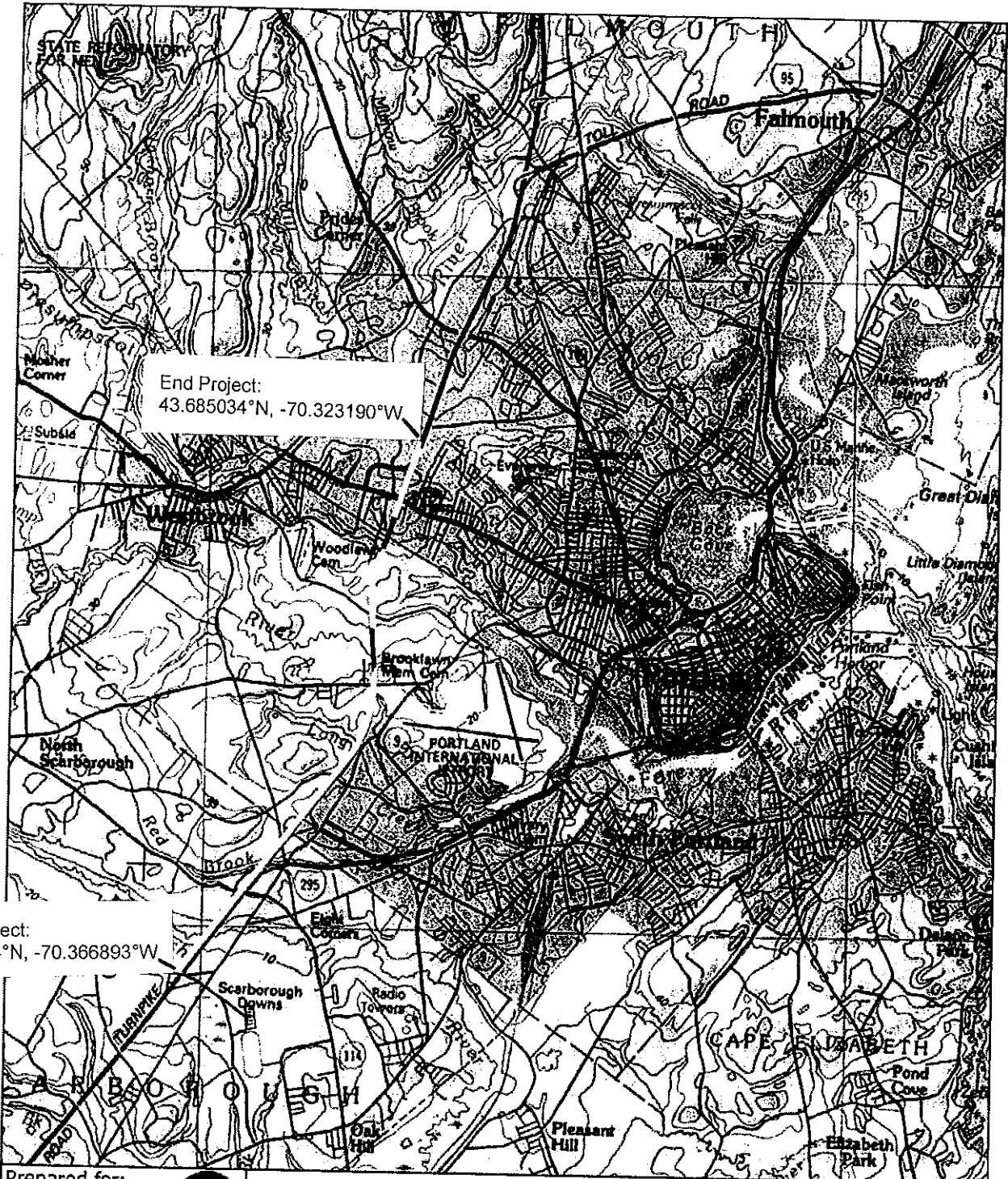
removed and placed upland, in a manner that will prevent its later erosion and transport to a waterway or wetland.

6. No temporary fill (e.g., access roads, cofferdams) may be placed in waters or wetlands unless specifically authorized by this permit. If temporary fill is used, it shall be disposed of at an upland site and suitably contained to prevent its subsequent erosion into a water of the U.S., and the area shall be restored to its original contours (but not higher) and character upon completion of the project. During use, such temporary fill must be stabilized to prevent erosion or, in the case fill placed in flowing water (rivers or streams), clean washed stone should be used.

7. In-stream construction work at the Red Brook crossing shall be conducted between July 1st and October 1st in any year in order to minimize potential impacts to aquatic resources and local water quality. In-stream construction work at the Long Creek, unnamed tributary to the Fore River and unnamed tributary to Capisic Brook crossings shall be conducted between April 1st and November 1st in any year also in order to minimize potential impacts to aquatic resources and local water quality. All in-stream construction work shall also be conducted "in the dry" using cofferdams, temporary flume pipes, culverts, etc. and downstream flows shall be maintained during in-stream construction.


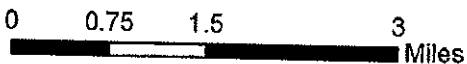

8. No tree cutting shall occur between June 1st and July 31st of any year, and to the maximum extent practicable, tree cutting shall occur between October 16th and April 9th of any year in order to minimize potential impacts to federally threatened northern long-eared bats.

APPENDIX A: U.S.G.S. TOPOGRAPHICAL MAP AND AERIAL SITE PLAN

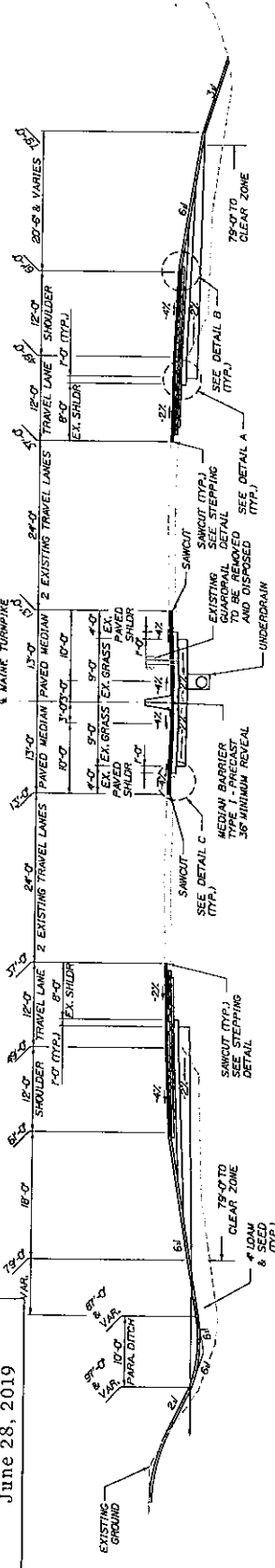


Begin Project:
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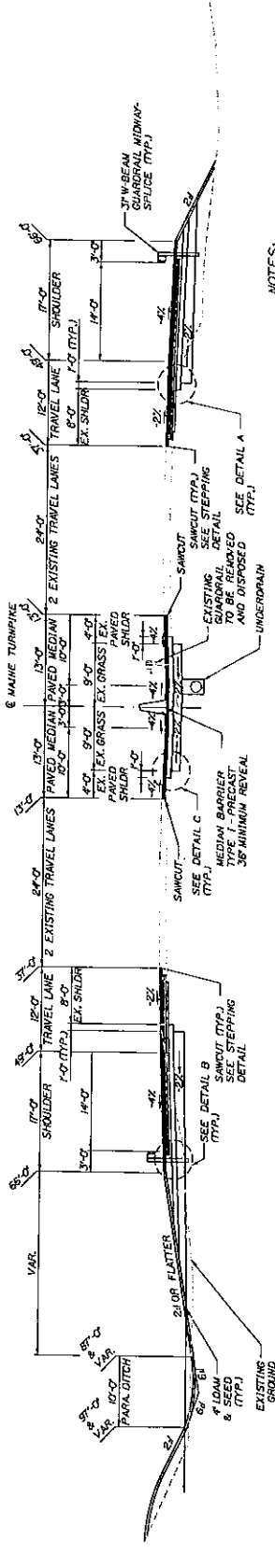
End Project:
43.685034°N, -70.323190°W

Prepared for: The Maine Turnpike Authority 	Portland Area Widening Project Area	USGS Topographic Map
Prepared by: HNTB		 January 2019

60% Submission
June 28, 2019

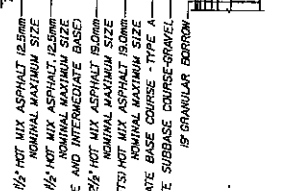
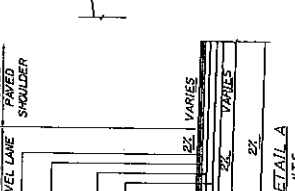
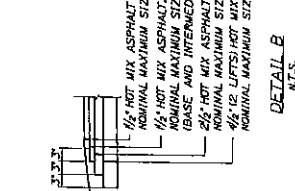
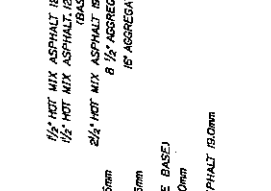
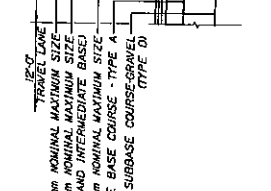
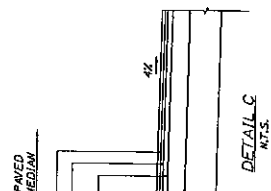


3 LANE SECTION WITH 12' SHOULDER



3 LANE SECTION WITH 17' SHOULDER

- NOTES:
1. THE PAVEMENT BASE DEPTHS AND CROSS SLOPES AS SHOWN ON THE PLANS ARE INTENDED TO BE NOMINAL.
 2. WHEN SUPERELEVATION OF THE TRAVEL LANES EXCEEDS 4% LOW SIDE SHOULDER SHALL HAVE THE SAME SLOPE AS THE TRAVEL LANE.
 3. CONCRETE WEARWASH DIFFERENCE IN RATES OF CROSS SLOPE SHALL NOT EXCEED 6%.
 4. CURBS FOR BOTH SUPERELEVATED AND NORMAL SECTIONS FOR ALL COURSES OF SUBBASE AND PAVEMENT SHALL BE STRAIGHT.
 5. A COATING OF HOT RUBBERIZED ASPHALT SHALL BE APPLIED TO SURFACE LAYER OF ALL SAWCUT AND PAVEMENT JOINTS PRIOR TO PAVING. REMAINDER TO BE BITUMINOUS TACK COAT. PAVEMENT SHALL BE INCIDENTAL TO THE PAVEMENT THEMSELVES.
 6. BITUMINOUS TACK COAT IS REQUIRED BETWEEN ALL LIFTS OF PAVEMENT OR BETWEEN PAVEMENT AND SUBBASE OR WELDED SURFACES PRIOR TO FINISHING PROPOSED PAVEMENT.
 7. CONTRACTOR TO VERIFY FOR ADEQUATE COURSE DEPTHS FROM RAMP ADJACENT TO TURNPIKE TO RAMP PROPER.



Scale: NOT TO SCALE.

No.	Revision	By	Date

Designed by: **HNTB**

CONSULTANT PROJECT MANAGER: DALE A. MITCHELL, P.E.

By	Date

Checked: PJS 05/19
In Charge: RAL 06/19

HNTB CORPORATION
340 County Road, Suite 6-C
Westbrook, ME 04092
TEL (207) 774-5155
FAX (207) 228-0808



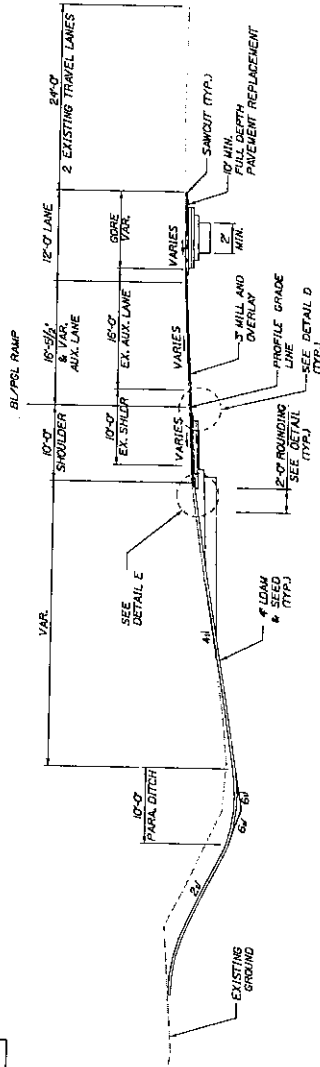
THE GOLD STAR
MEMORIAL HIGHWAY

PORTLAND AREA WIDENING &
SAFETY IMPROVEMENTS
MM 43.0 TO MM 49.3
TYPICAL SECTIONS (1 OF 3)

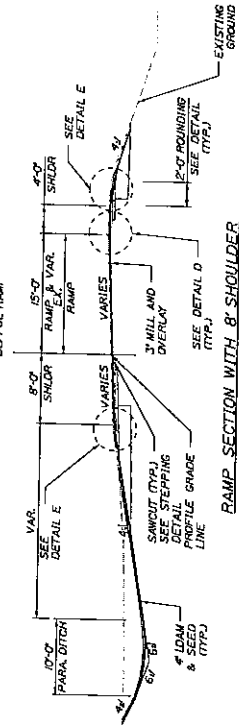
CONTRACTS
SHEET NUMBER: TYP-01

Sections
Maine Turnpike Authority- Portland Area
Widening
NAE-2019-00701
Sheet 1 of 12
Date: 06/19/19

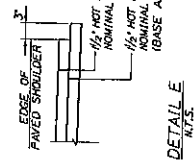
60% Submission
June 28, 2019



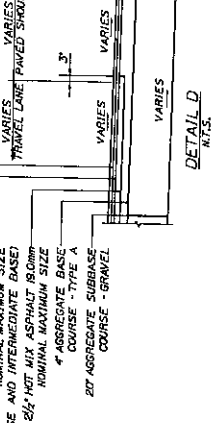
ACCELERATION, DECELERATION LANE SECTION
WITH 10' SHOULDER AND GORE



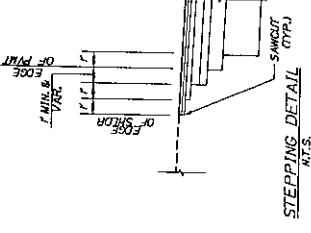
RAMP SECTION WITH 8' SHOULDER



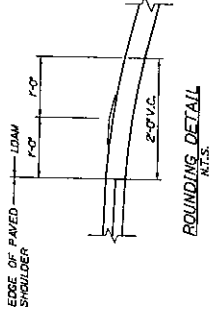
DETAIL E
N.T.S.



DETAIL D
N.T.S.



STEPPING DETAIL
N.T.S.



ROUNDING DETAIL
N.T.S.

Scale: NOT TO SCALE

No.	Revision	By	Date

Designed by:



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FAX (207) 228-0809

Consultant	Project Manager	Checked	Date
DALE A. MITCHELL, P.E.	DALE A. MITCHELL, P.E.	Checked	06/19
JUS	JUS	Checked	06/19
GW	GW	Checked	06/19
Brown	Brown	Checked	06/19

THE GOLD STAR
MEMORIAL HIGHWAY



PORTLAND AREA
MAINLINE IMPROVEMENTS
MM 43.7 TO MM 49.3
TYPICAL SECTION (3 OF 3)

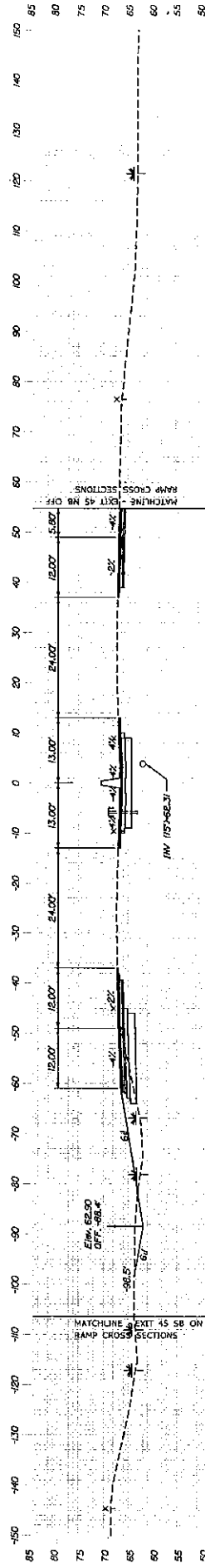
CONTRACTOR
MIA PROJECT MANAGER: RALPH HORNWOOD IV, P.E., PTOE

SHEET NUMBER: TYP-03

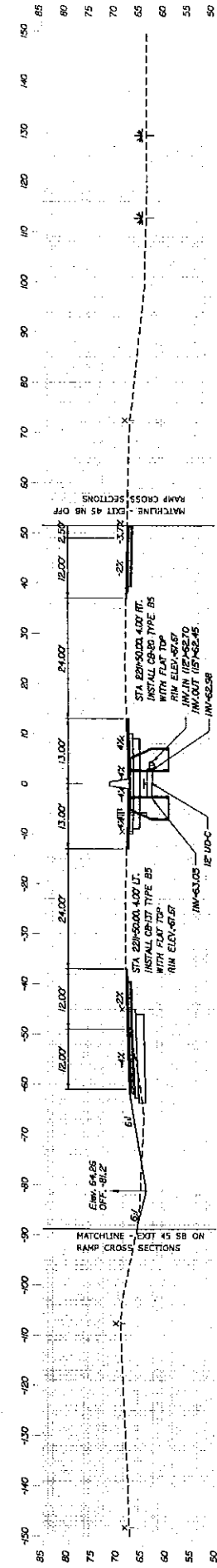
Sections
Maine Turnpike Authority- Portland Area
Widening
NAE-2019-00701
Sheet 3 of 12

60% SUBMISSION
June 28, 2019

Date: 6/28/2019



b 2212+00.00



b 2211+50.00

Scale: 1" = 20' (Scale of Foot)

No.	Revision	By	Date

Designed by:

Consultant	Project Manager	DALE A. MITCHELL, P.E.
By	Date	06/19
Designed	Checked	TRB 06/19
Drawn	In Charge of	RAL 06/19

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340 County Road, Suite 6-C
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THE GOLD STAR
MEMORIAL HIGHWAY

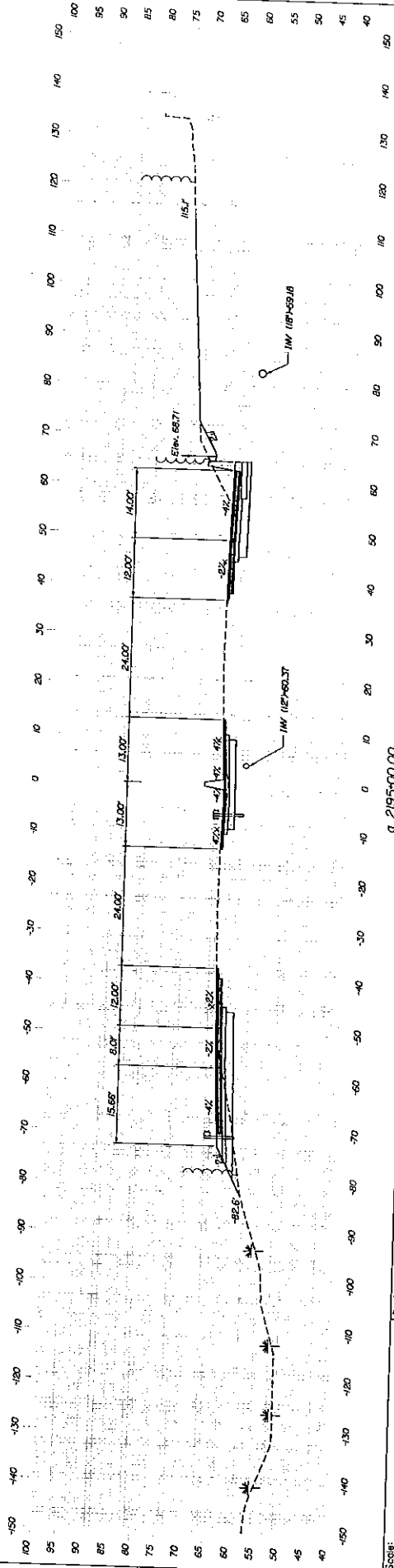
MTA PROJECT MANAGER: RALPH NORWOOD, W.P.E., PTOE

PORTLAND AREA WIDENING &
SAFETY IMPROVEMENTS
MM 43.0 TO MM 49.3
MAINE TURNPIKE CROSS SECTIONS
STA. b 2211+50 TO STA. b 2212+00

Sections
Maine Turnpike Authority - Portland Area
Widening
NAE-2019-00701
Sheet 4 of 12
Date: "06/19"

60% SUBMISSION
June 28, 2019

Date: 6/28/2019



Scale: 1" = 20'
 Scale of Paper: 1" = 20'
 Revision:
 No.
 By
 Date
 Checked
 Drawn
 In Charge of
 Date
 Date
 Date

Designed by:
 HNTB

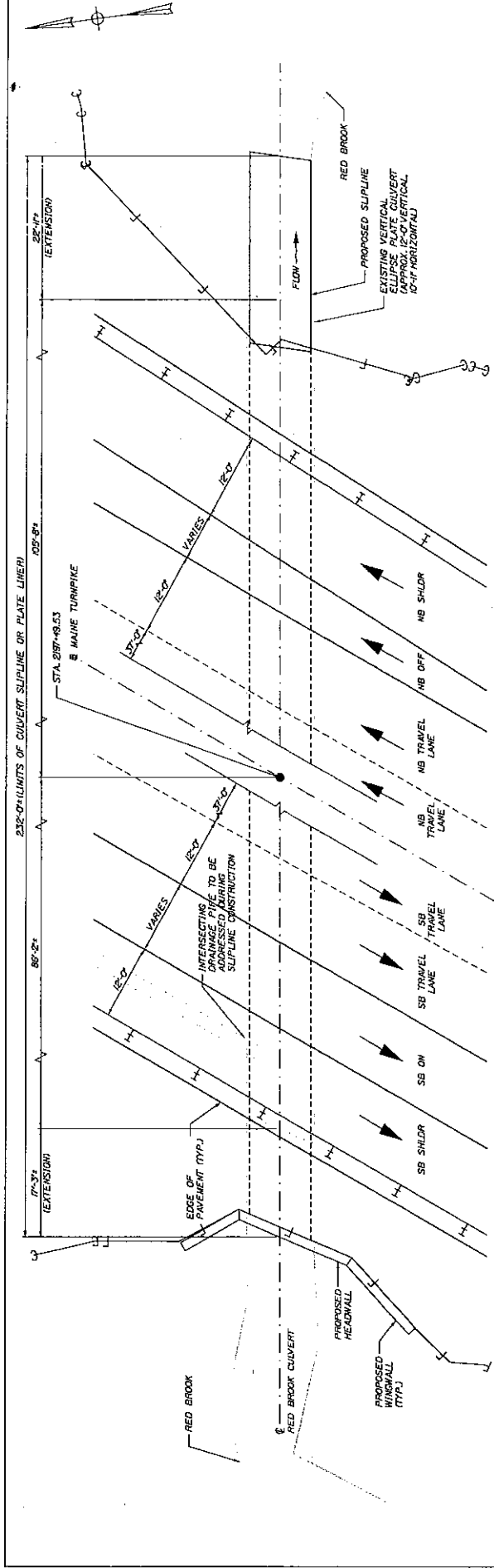
HNTB CORPORATION
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 Westbrook, ME 04092
 TEL (207) 774-9852
 FAX (207) 228-9909

MAINE TURNPIKE
 THE GOLD STAR
 MEMORIAL HIGHWAY

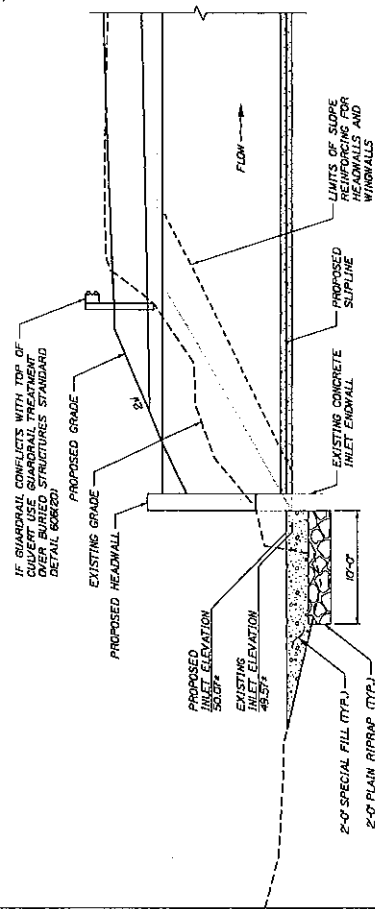
PORTLAND AREA WIDENING & SAFETY IMPROVEMENTS
 MM 43.0 TO MM 49.3
 MAINE TURNPIKE CROSS SECTIONS
 STA. 0 2195+00 TO STA. 0 2195+00

M.A. PROJECT MANAGER: RALPH INGHAM IV, P.E., P.T.C.E.
 CONTRACT:
 SHEET NUMBER:

Sections
 Maine Turnpike Authority- Portland Area
 Widening
 NAE-2019-00701
 Sheet 6 of 12



60% Submission
June 28, 2019



LONGITUDINAL SECTION - RED BROOK CULVERT
SCALE: 1/4" = 1'-0"

Designed by:

No.	Revised	By	Date

CONSULTANT PROJECT MANAGER: DALE A MITCHELL, P.E.

Designed	Checked	By	Date

Drawn: JRAL 06/19
In Charge: JRAL 06/19

HNTB CORPORATION
340 County Road, Suite 6-C
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FAX (207) 728-0303



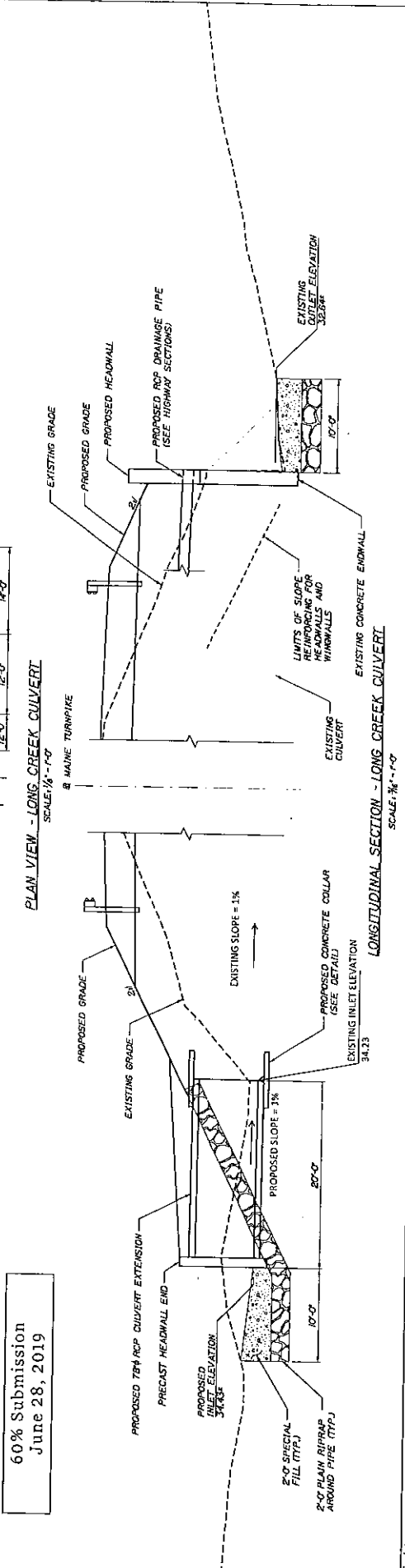
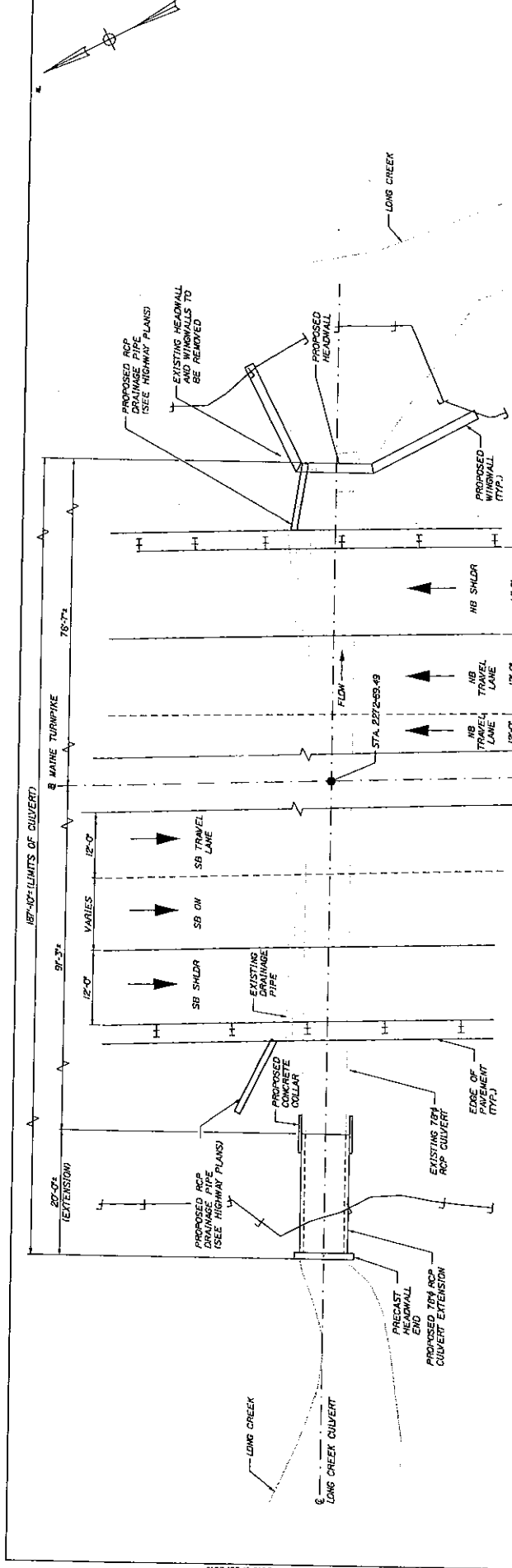
THE GOLD STAR
MEMORIAL HIGHWAY

PORTLAND AREA WIDENING &
SAFETY IMPROVEMENTS
RED BROOK CULVERT MODIFICATIONS
GENERAL PLAN AND SECTION
SHEET NUMBER: S-02

CONTRACT: 17

MTA PROJECT MANAGER: RALPH NORWOOD IV, P.E., PTCE

Sections
Maine Turnpike Authority- Portland Area
Widening
NAE-2019-00701
Sheet 7 of 12



60% Submission
June 28, 2019

PORTLAND AREA WIDENING &
SAFETY IMPROVEMENTS
LONG CREEK CULVERT MODIFICATIONS
GENERAL PLAN AND SECTION
SHEET NUMBER: S-04

**THE GOLD STAR
MEMORIAL HIGHWAY**

CONTRACT: MTA PROJECT MANAGER: RALPH NORWOOD IV, P.E., PTOC

HNTB CORPORATION
340 County Road, Suite 6-C
Westbrook, ME 04092
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FAX (207) 728-0908

HNTB		DESIGNED BY:	
No.	Revision	By	Date

CONSULTANT PROJECT MANAGER: DALE A. MITCHELL, P.E.
 BY: Date Checked By: Date
 DRG: 05/19
 ERE: 05/19 In Charge of: RAL 05/19

Sections
Maine Turnpike Authority - Portland Area
Widening
NAE-2019-00701
Sheet 8 of 12

Date: 6/28/2019

Scale: 1/8" = 1'-0"

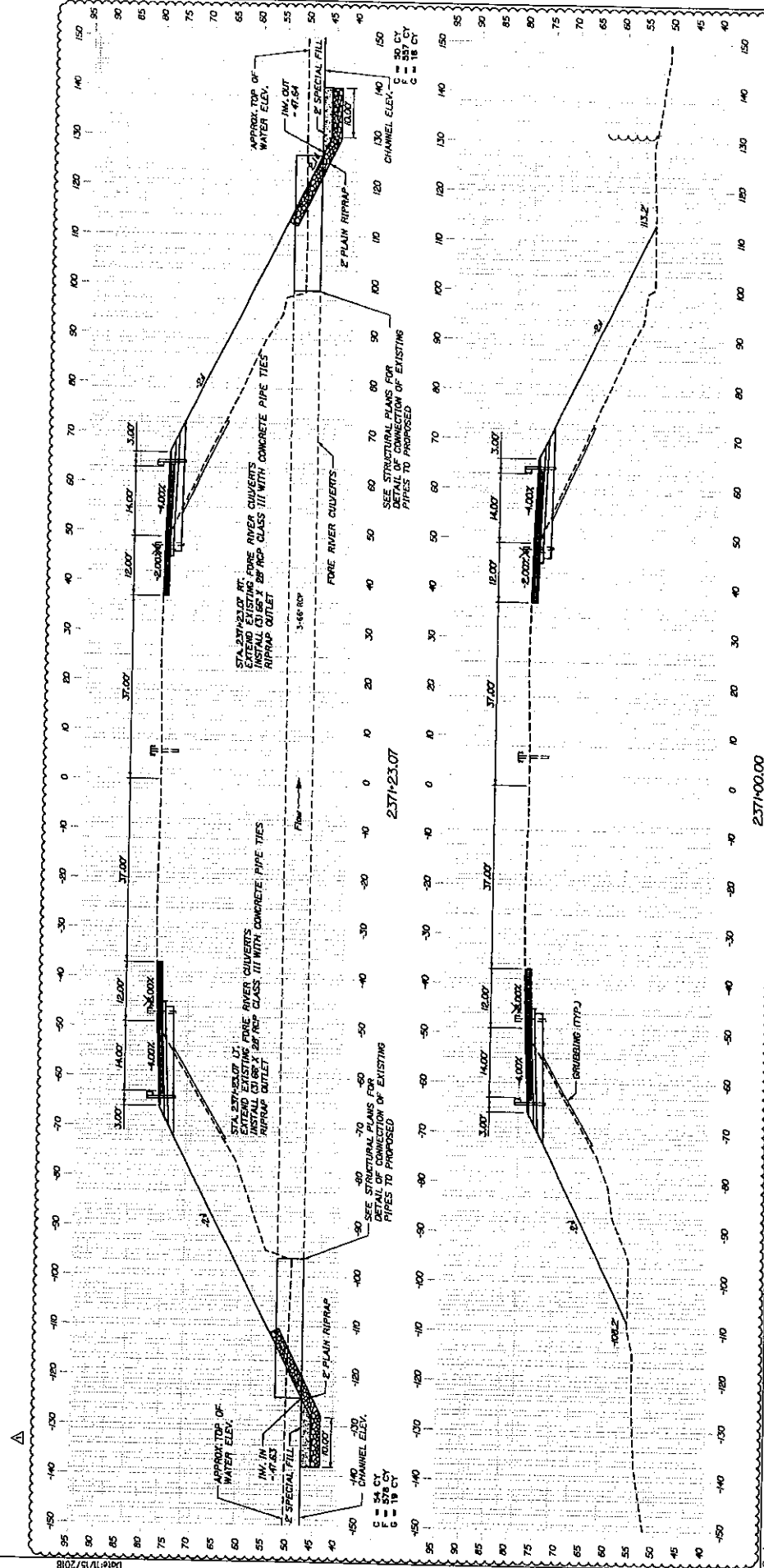
Scale: 1/4" = 1'-0"

Scale: 1/4" = 1'-0"

Scale: 1/4" = 1'-0"

Scale: 1/4" = 1'-0"

Frame: 004 - Long Creek Culvert Mods - General Plan and Elevation



THE GOLD STAR MEMORIAL HIGHWAY
 BRIDGE IMPROVEMENTS
 MAINE CENTRAL RAILROAD OVERPASS
 STA. 2371+00 TO STA. 2371+23
 SHEET NUMBER: XS-014

HNTB
 HNTB CORPORATION
 340 County Road, Suite 6-C
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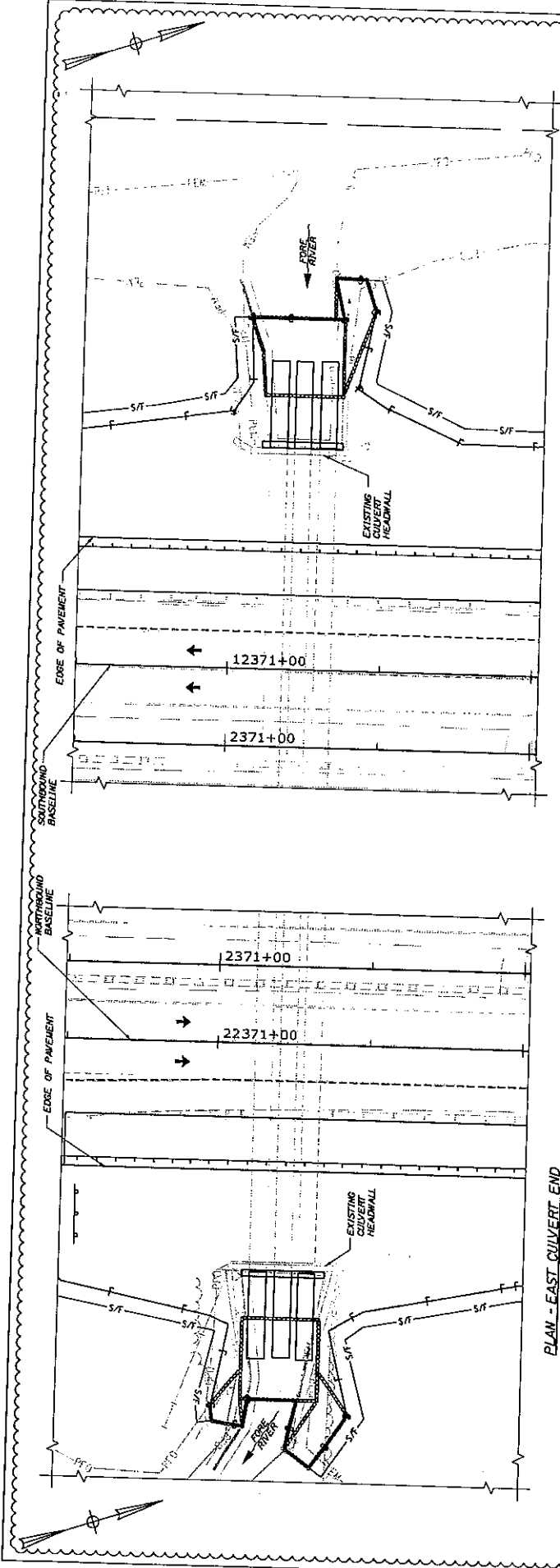
MTA PROJECT MANAGER: Kristin Goyen, P.E.
 CONTRACT: 2

No.	Revision	By	Date
1	FORE RIVER CULVERTS	JRH	10/18

CONSULTANT PROJECT MANAGER:	Timothy Coils, PE
Designated	By: JAL 10/18
Checked	By: JAL 10/18
Drawn	By: JAL 10/18
In Charge of	By: JAL 10/18

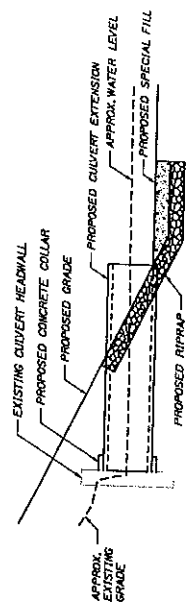
Sections
 Maine Turnpike Authority- Portland Area
 Widening
 NAE-2019-00701
 Sheet 9 of 12

Date: 11/15/2018
 Scale of Feet
 0 10 20 30
 1" = 30'



PLAN - WEST CULVERT END
1/8" = 1'-0"

PLAN - EAST CULVERT END
1/8" = 1'-0"



ELEVATION AT CULVERT END
EASTWARD (SHOWING WESTWARD SLOPE)
1/8" = 1'-0"

- NOTES:**
1. SEE SPECIAL PROVISION SECTION 603 FOR FORE RIVER CONCRETE COLLAR FOR ADDITIONAL INFORMATION.
 2. CONCRETE SHALL BE CLASS A AND REINFORCING SHALL BE EPOXY COATED GRADE 60.
 3. REFER TO GENERAL PLAN AND CROSS SECTIONS FOR ADDITIONAL INFORMATION ON GRADING AND RIPRAP LIMITS.
 4. CONSTRUCTION JOINTS HAVE BEEN PROVIDED TO ALLOW PHASED CONSTRUCTION. COFFERDAMS MAY BE USED AND ARE TO BE PAID FOR UNDER ITEM SIGTS AND SLOPE.
 5. ALL WORK ASSOCIATED WITH THE CONCRETE COLLAR SHALL BE PAID FOR UNDER ITEM 603.02B.
 6. CONTRACTOR SHALL NOTE THAT PRESERVE LIMITS HAVE BEEN PLACED ON THE WORK THAT IMPACTS FORE RIVER AND WETLANDS SURROUNDING THE PROJECT. NO WORK IMPACTING FORE RIVER AND THE SURROUNDING WETLANDS SHALL OCCUR BEFORE JULY 15, 2018 OR UNTIL A FINAL AUTHORIZED ENVIRONMENTAL PERMIT HAS BEEN RECEIVED AS APPROVED BY THE RESIDENT.
 7. REINFORCING STEEL SHALL HAVE A CLEAR COVER OF 3".
 8. FOR CULVERT EXTENSION DETAILS SEE SHEET S-4.

Scale: AS NOTED

No.	Revision	By	Date
1	CULVERT EXTENSION	JSM	10/18

Designed	Checked	By	Date
EMC	10/18	JSM	10/18
Drawn	PEB	10/18	10/18

HNTB CORPORATION
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THE GOLD STAR
MEMORIAL HIGHWAY

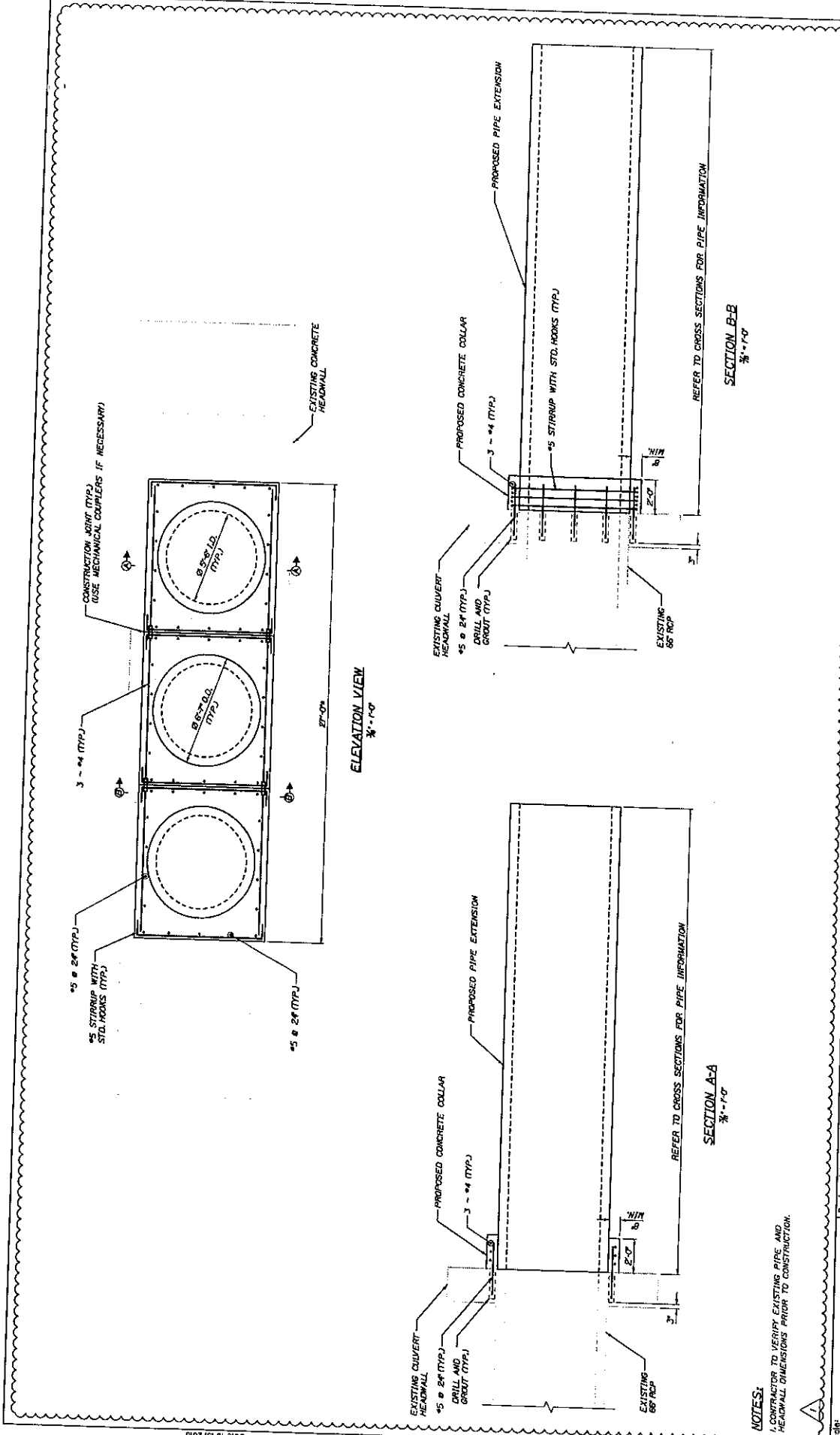
MTA PROJECT MANAGER: Kristi Van Ooyen, P.E.

SHEET NUMBER: S-40

Sections
Maine Turnpike Authority- Portland Area
Widening
NAE-2019-00701
Sheet 10 of 12

CONTRACT: BRIDGE IMPROVEMENTS
MAINE CENTRAL RAILROAD OVERPASS
FORE RIVER CULVERT I

Date: 11/15/2018



AS NOTED

Scale: _____

Designed by: _____

No.	Description	By	Date
1	CULVERT EXTENSION	JSM	10/18

CONSULTANT PROJECT MANAGER:	IMBURY R. COLI, P.E.
By	Date
Checked	10/18
Drawn	10/18

NOTES:
1. CONTRACTOR TO VERIFY EXISTING PIPE AND HEADWALL DIMENSIONS PRIOR TO CONSTRUCTION.

THE GOLD STAR MEMORIAL HIGHWAY

MAINE CENTRAL RAILROAD OVERPASS

FORE RIVER CULVERT II

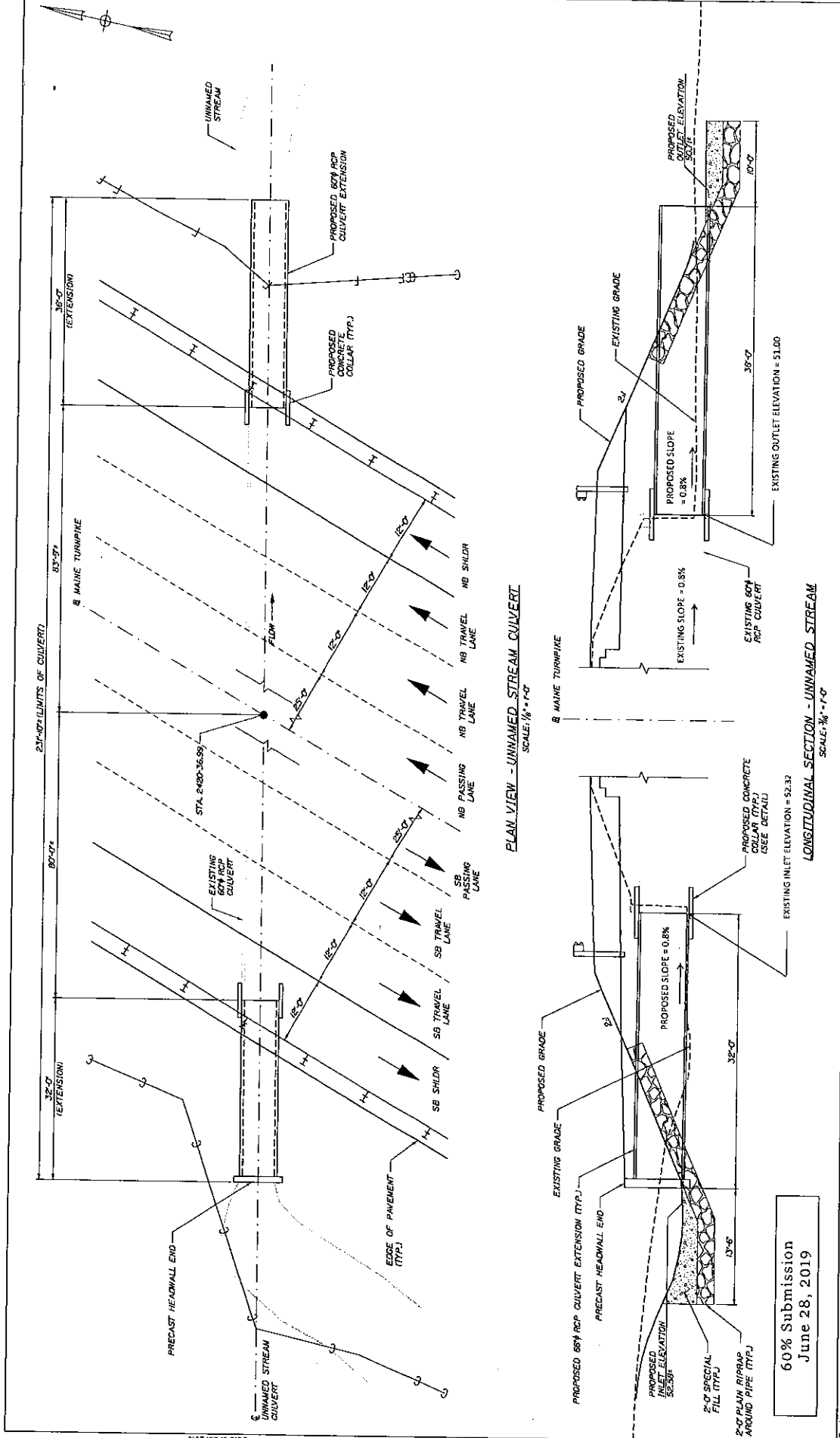
BRIDGE IMPROVEMENTS

CONTRACT NUMBER: S-41

MTA PROJECT MANAGER: Kristi Van Dyke, P.E.

HNTB CORPORATION
340 County Road, Suite 6-C
Westbrook, ME 04092
TEL (207) 774-5155
FAX (207) 228-0809

DATE: 11/15/2018



PLAN VIEW - UNNAMED STREAM CULVERT
SCALE: 1/8" = 1'-0"

LONGITUDINAL SECTION - UNNAMED STREAM
SCALE: 1/8" = 1'-0"

60% Submission
June 28, 2019

Designed by:

No.	Revision	By	Date
		DALE A. MITCHELL, P.E.	06/19
		Checked: JDN	06/19
		In Charge: RAL	06/19



HNTB CORPORATION
340 County Road, Suite 5-C
Westbrook, ME 04092
TEL (207) 774-5155
FAX (207) 228-0908



THE GOLD STAR
MEMORIAL HIGHWAY

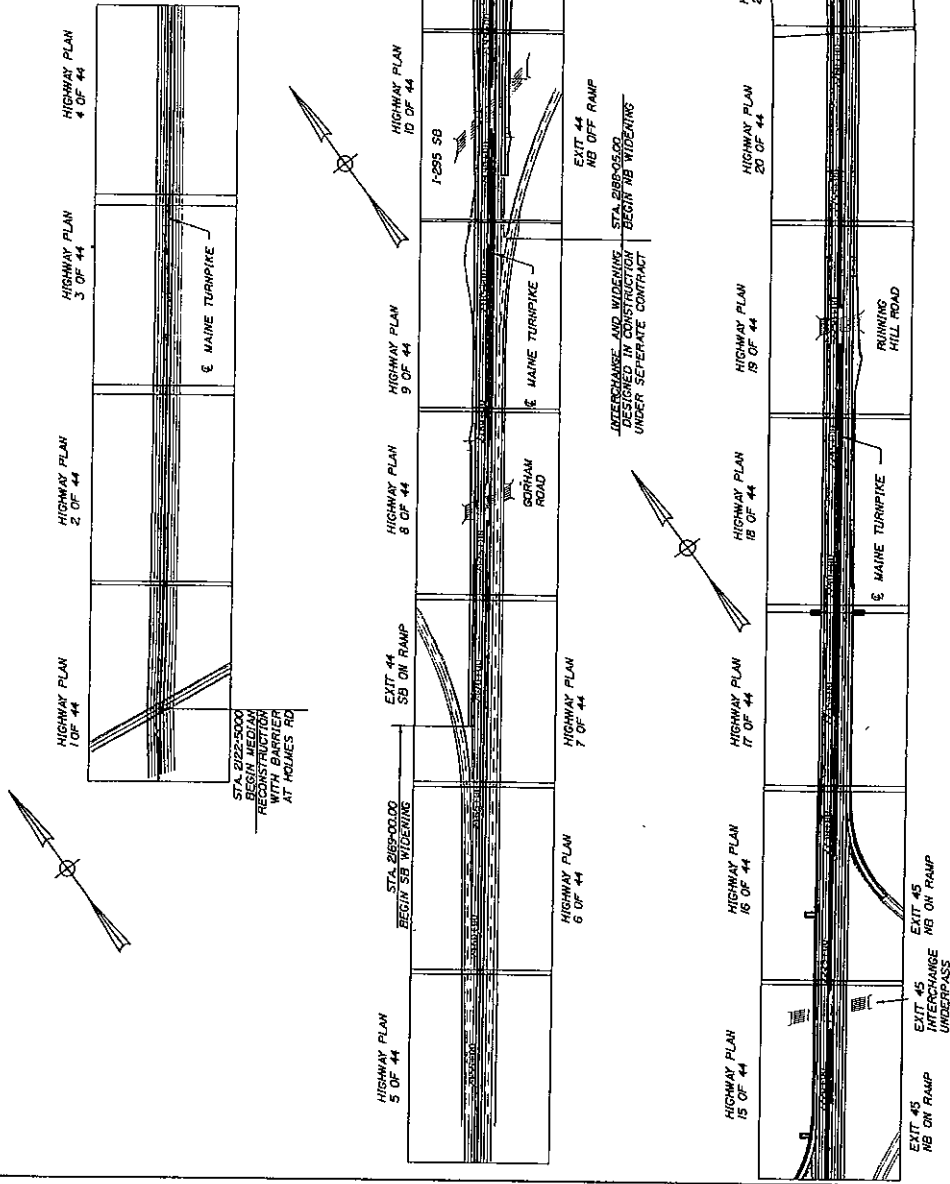
M.T.A. PROJECT MANAGER: BALEH, NORWOOD IV, P.E., P.T.O.E.

CONTRACT:

PORTLAND AREA WIDENING &
SAFETY IMPROVEMENTS
UNNAMED STREAM CULVERT MODIFICATIONS
GENERAL PLAN AND SECTION

SHEET NUMBER: 5-07

Sections
Maine Turnpike Authority- Portland Area
Widening
NAE-2019-00701
Sheet 12 of 12



Plan Legend

- Temporary stone check dam
- Wetland
- Temporary wetland impact
- Permanent wetland impact
- Stream impact
- Limit of field delineated wetland (wetland continuous)
- Limit of field delineated wetland of special significance (WSS)
- ROW line
- Silt fence
- Clearing limit



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THE GOLD STAR MEMORIAL HIGHWAY

Symbols Key

- Groundwater Recharge/ Discharge
- Floodflow Alteration (Storage & Desynchronization)
- Fish and Shellfish Habitat
- Sediment/Toxicant Retention
- Nutrient Removal/Retention/Transformation
- Production Export

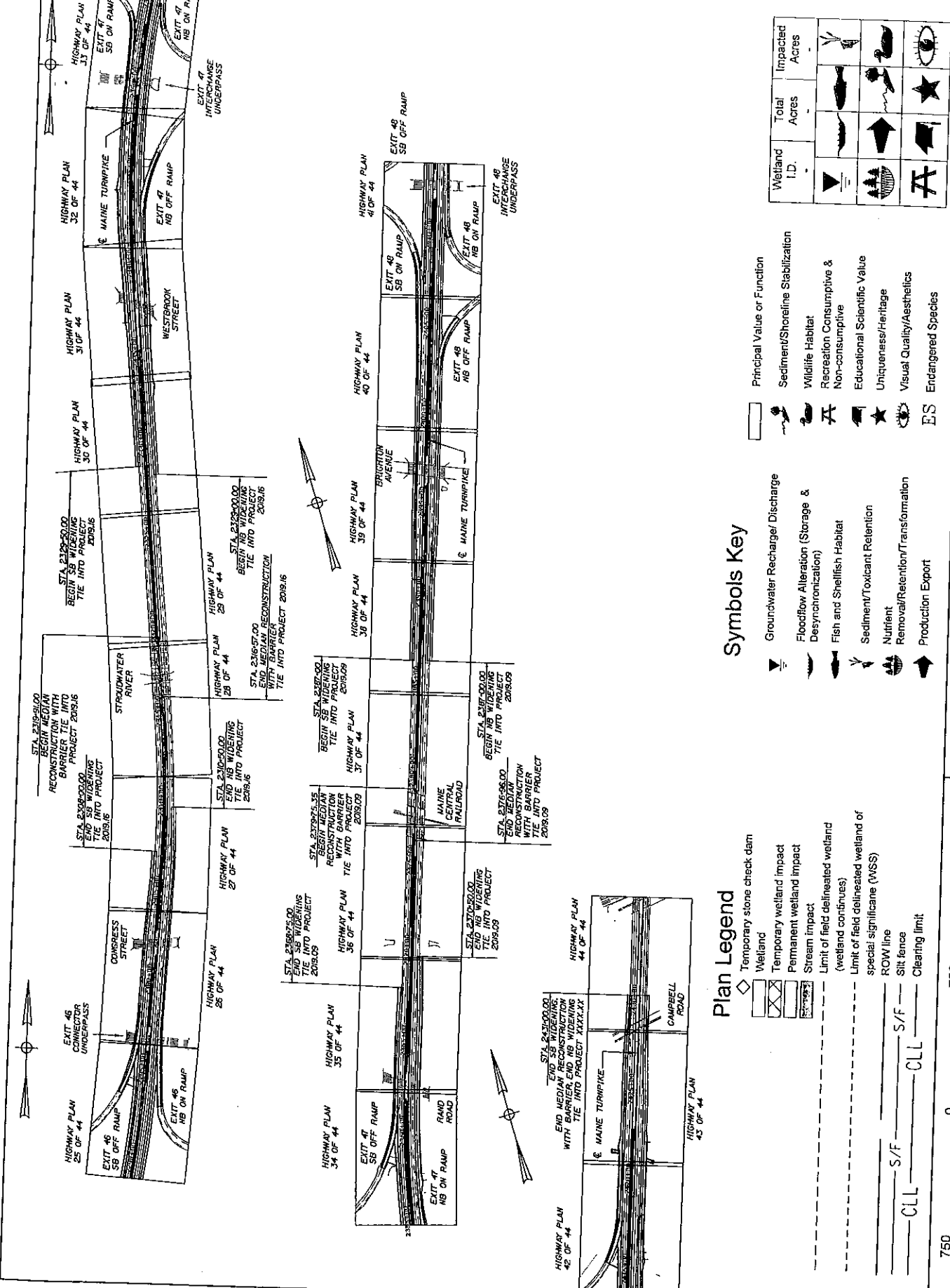
Principal Value or Function

- Sediment/Shoreline Stabilization
- Wildlife Habitat
- Recreation Consumptive & Non-consumptive
- Educational Scientific Value
- Uniqueness/Heritage
- Visual Quality/Aesthetics
- Endangered Species

Wetland I.D.	Total Acres	Impacted Acres
	-	-
	-	-
	-	-
	-	-
	-	-

WETLAND IMPACTS INDEX PLAN

PORTLAND AREA WIDENING & SAFETY IMPROVEMENTS



WETLAND IMPACTS INDEX PLAN 2

PORTLAND AREA WIDENING & SAFETY IMPROVEMENTS

DATE: FEBRUARY, 2019

SHEET 2 OF 46

Symbols Key

	Groundwater Recharge/ Discharge		Principal Value or Function
	Floodflow Alteration (Storage & Desynchronization)		Sediment/Shoreline Stabilization
	Fish and Shellfish Habitat		Wildlife Habitat
	Sediment/Toxicant Retention		Recreation Consumptive & Non-consumptive
	Nutrient Removal/Retention/Transformation		Educational Scientific Value
	Production Export		Uniqueness/Heritage
			Visual Quality/Aesthetics
			Endangered Species

Plan Legend

	Temporary stone check dam
	Wetland
	Temporary wetland impact
	Permanent wetland impact
	Stream impact
	Limit of field delineated wetland (wetland confines)
	Limit of field delineated wetland of special significance (WSS)
	ROW line
	Silt fence
	Clearing limit

750

0

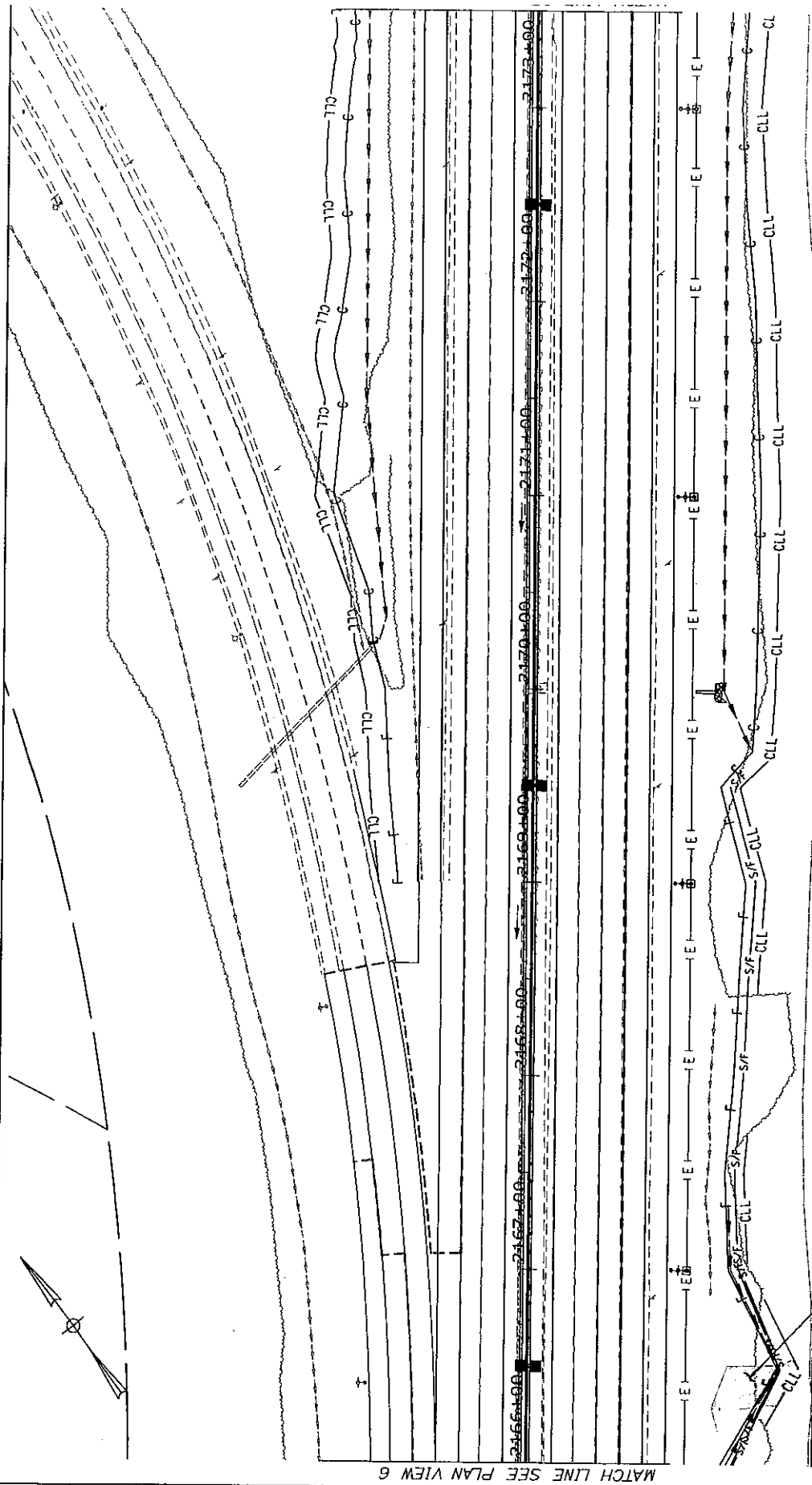
750

1500

SCALE: 1"=750'

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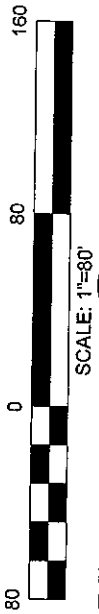
THE GOLD STAR MEMORIAL HIGHWAY



MATCH LINE SEE PLAN VIEW 6

Delineated by Stantec Consulting Services

Wetland I.D.	Total Acres	Impacted Acres
A	0.03 AC	0.02 AC



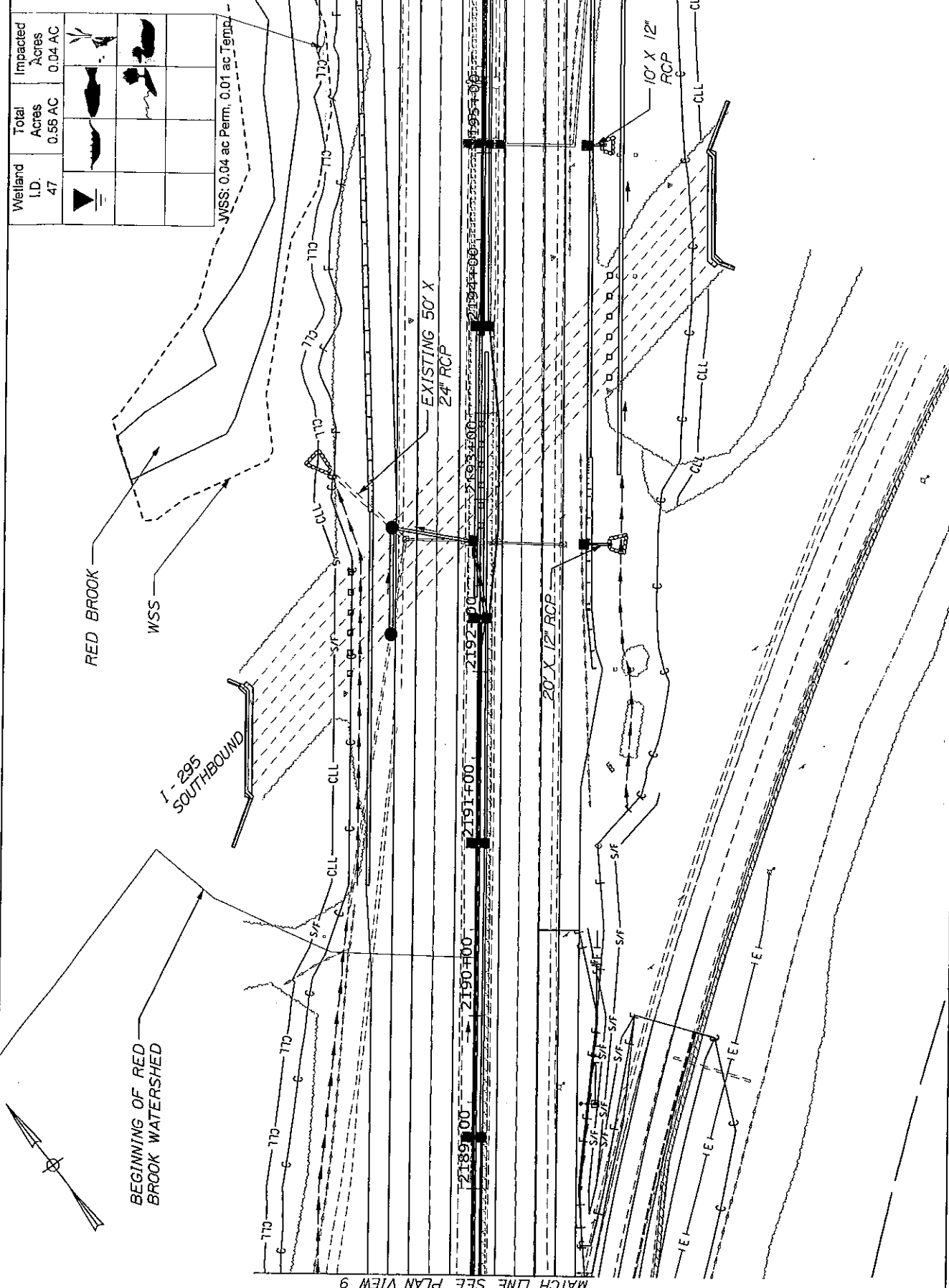
HNTB
ARCHITECTS ENGINEERS PLANNERS

WETLAND IMPACTS
PLAN VIEW 7

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

DATE: FEBRUARY, 2019

SHEET 9 OF 46



Wetland I.D.	Total Acres	Impacted Acres
47	0.55 AC	0.04 AC

WSS: 0.04 ac Perm, 0.01 ac Temp.



SCALE: 1"=80'



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ARCHITECTS ENGINEERS PLANNERS

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

WETLAND IMPACTS
PLAN VIEW 10

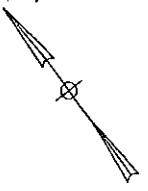
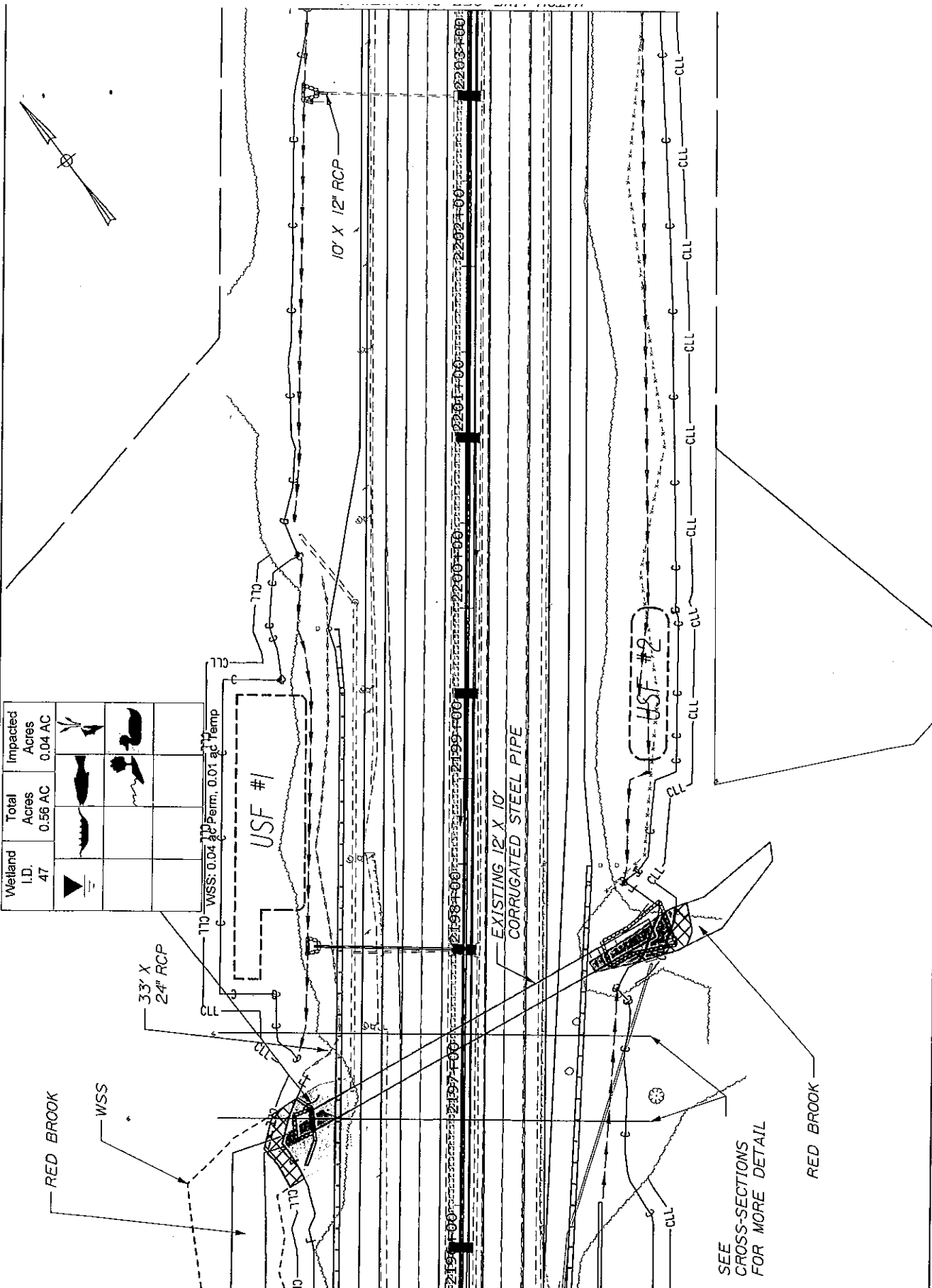
DATE: FEBRUARY, 2019

SHEET 12 OF 46

MATCH LINE SEE PLAN VIEW 10

Wetland I.D.	Total Acres	Impacted Acres
47	0.56 AC	0.04 AC

WSS: 0.04 ac Perm, 0.01 ac Temp



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ARCHITECTS ENGINEERS PLANNERS

THE GOLD STAR MEMORIAL HIGHWAY

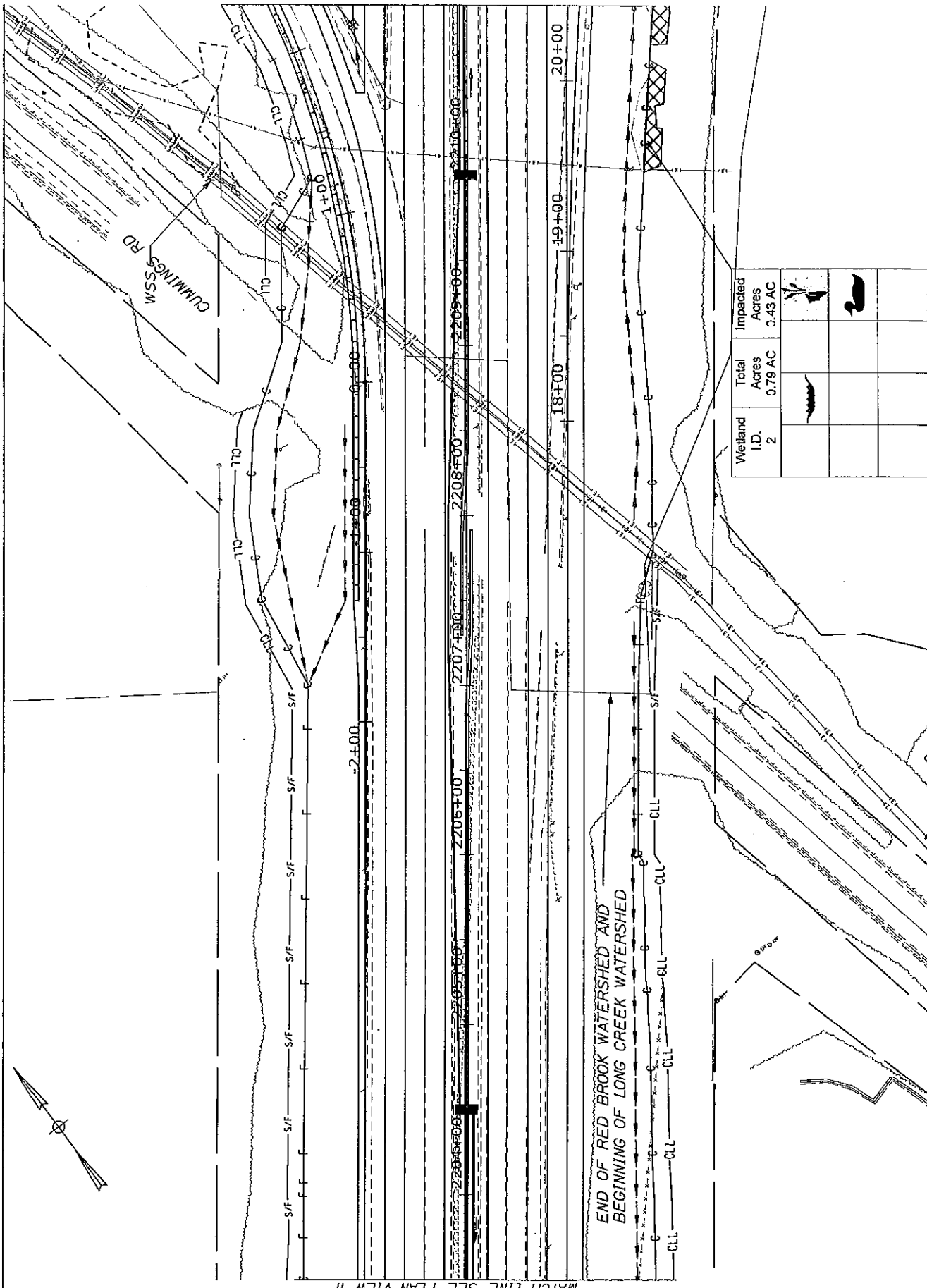
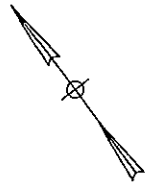
**PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS**

**WETLAND IMPACTS
PLAN VIEW 11**

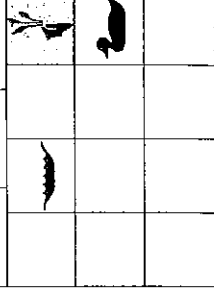
DATE: FEBRUARY, 2019

SHEET 13 OF 46

MATCH LINE SEE PLAN VIEW II



Wetland I.D.	Total Acres	Impacted Acres
2	0.79 AC	0.43 AC



THE GOLD STAR
MEMORIAL HIGHWAY

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PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

WETLAND IMPACTS
PLAN VIEW 12

DATE: FEBRUARY, 2019

SHEET 14 OF 4

MATCH LINE SEE PLAN VIEW 12

MATCH LINE SEE PLAN VIEW 14

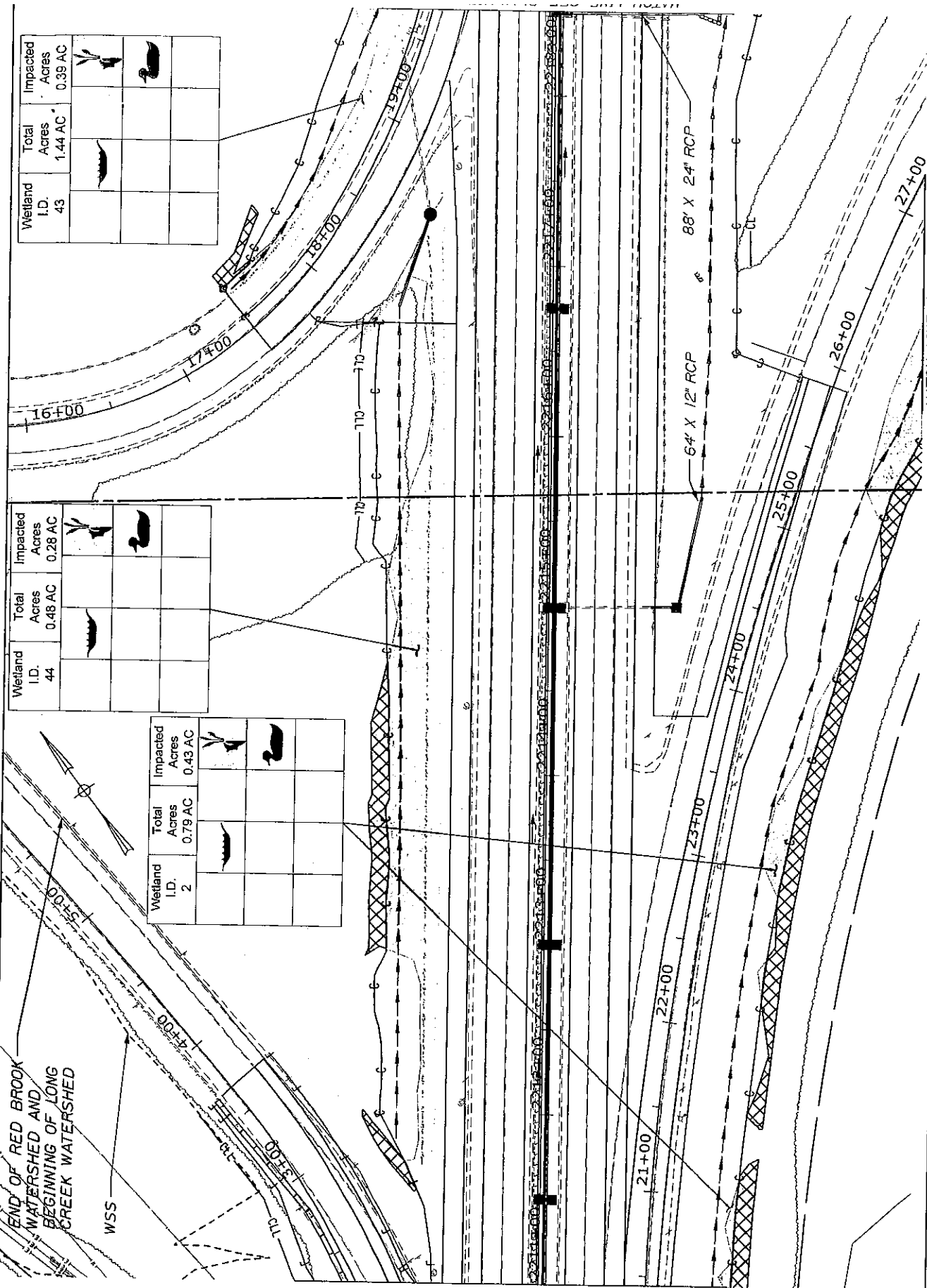
END OF RED BROOK WATERSHED AND BEGINNING OF LONG CREEK WATERSHED

WSS

Wetland I.D.	43	Total Acres	1.44 AC	Impacted Acres	0.39 AC

Wetland I.D.	44	Total Acres	0.48 AC	Impacted Acres	0.28 AC

Wetland I.D.	2	Total Acres	0.79 AC	Impacted Acres	0.43 AC



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THE GOLD STAR MEMORIAL HIGHWAY

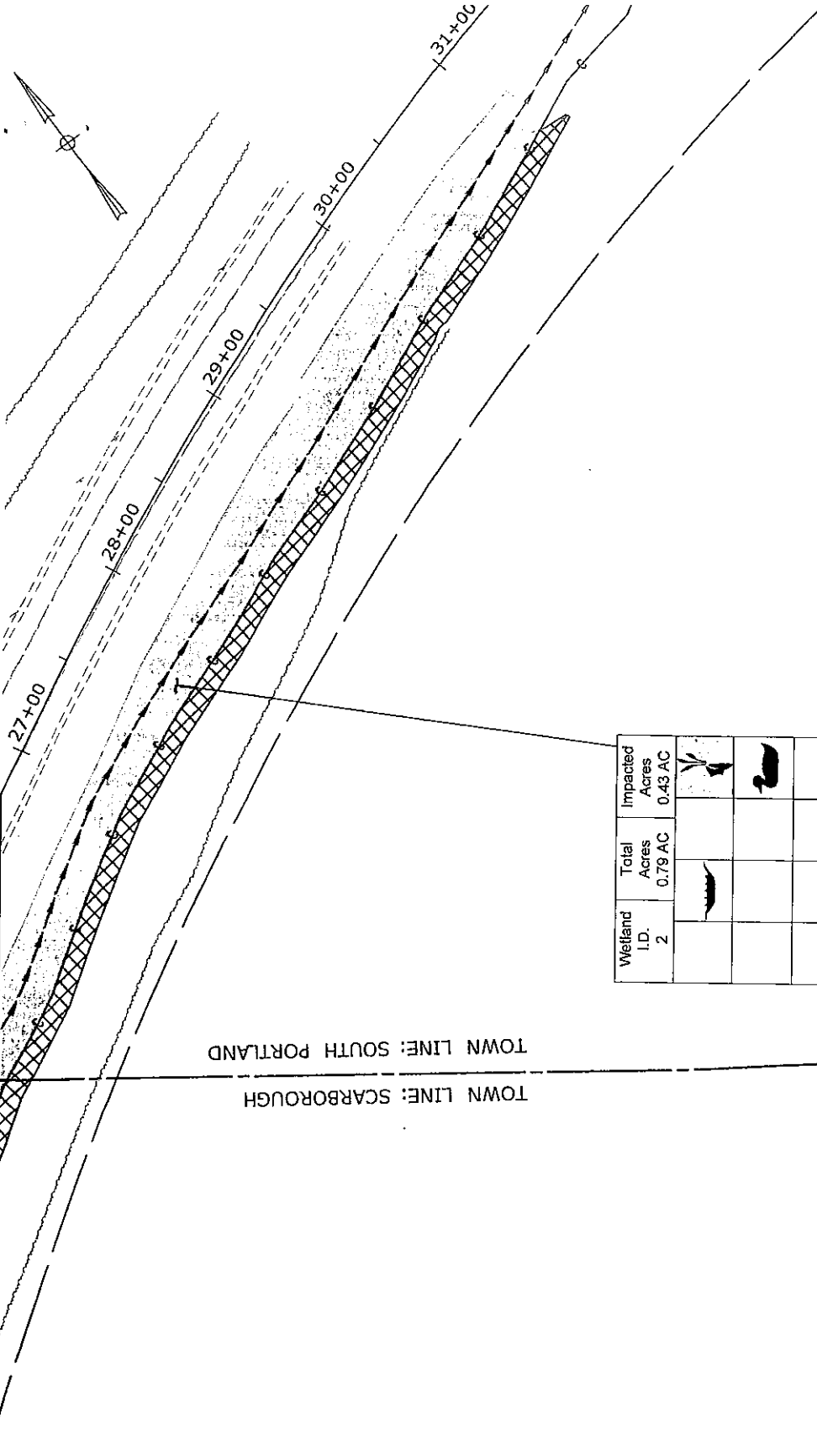
**PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS**

**WETLAND IMPACTS
PLAN VIEW 13**

DATE: FEBRUARY, 2019

SHEET 15 OF 46

MATCH LINE SEE PLAN VIEW 13



TOWN LINE: SCARBOROUGH

TOWN LINE: SOUTH PORTLAND

Wetland I.D.	Total Acres	Impacted Acres
2	0.79 AC	0.43 AC



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THE GOLD STAR MEMORIAL HIGHWAY

WETLAND IMPACTS
PLAN VIEW 14

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

MATCH LINE SEE PLAN VIEW 16

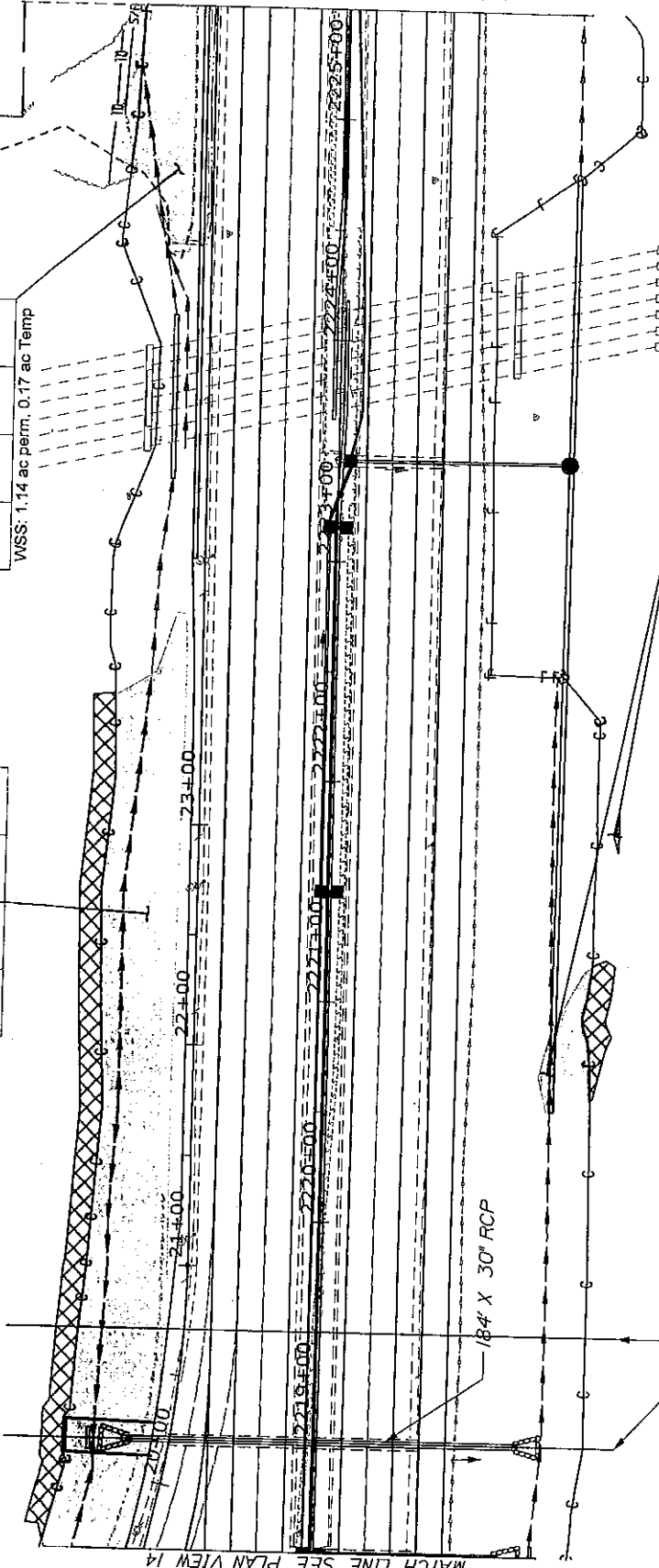
MATCH LINE SEE PLAN VIEW 14

Wetland I.D.	Total Acres	Impacted Acres
42	2.48 AC	1.14 AC

WSS: 1.14 ac perm, 0.17 ac Temp

Wetland I.D.	Total Acres	Impacted Acres
43	1.44 AC	0.39 AC

Wetland I.D.	Total Acres	Impacted Acres
4	0.22 AC	0.02 AC



SEE CROSS-SECTIONS FOR MORE DETAIL



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ARCHITECTS ENGINEERS PLANNERS

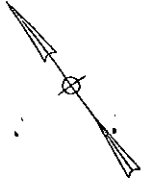
THE GOLD STAR MEMORIAL HIGHWAY

WETLAND IMPACTS
PLAN VIEW 15

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

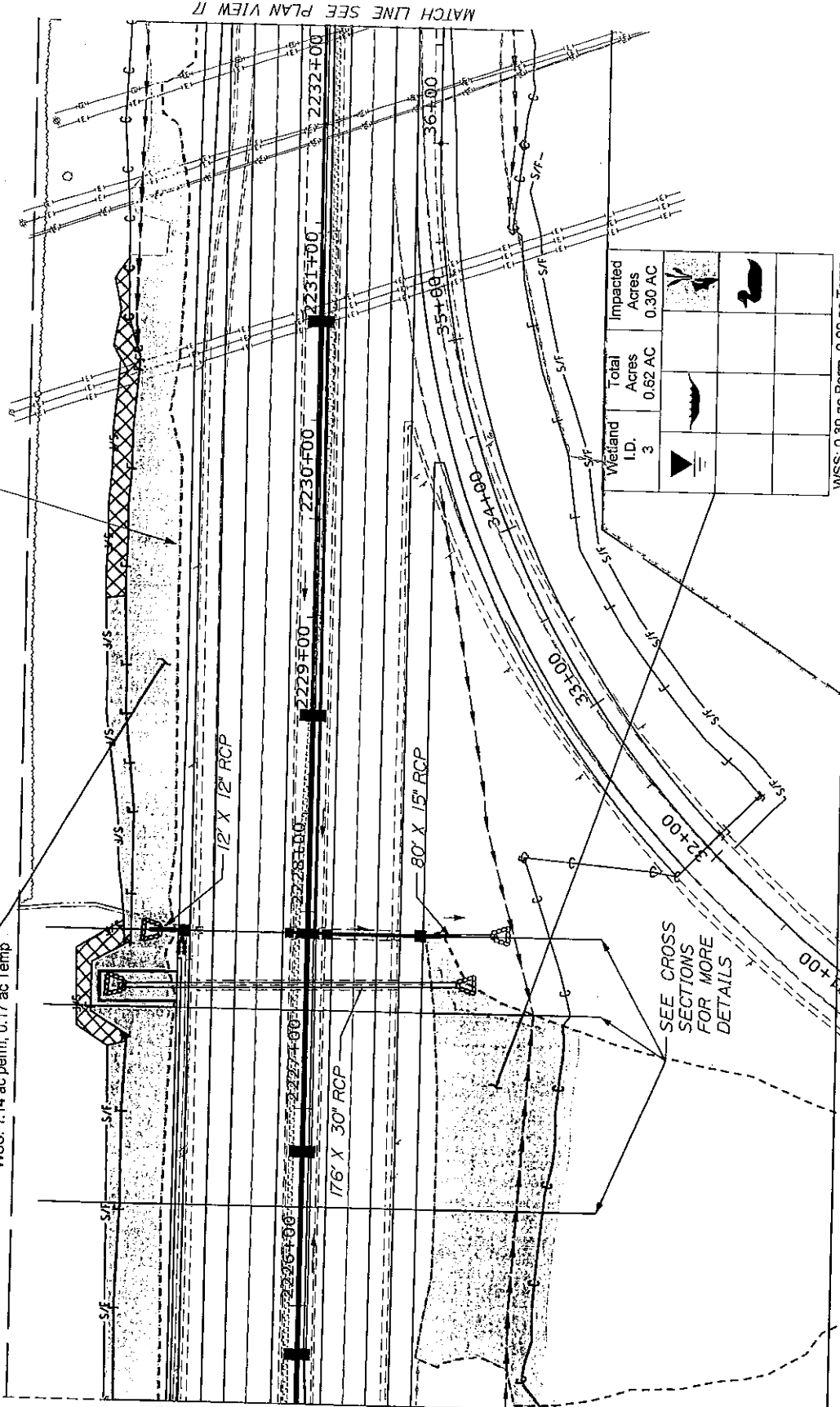
DATE: FEBRUARY, 2019

SHEET 17 OF 46



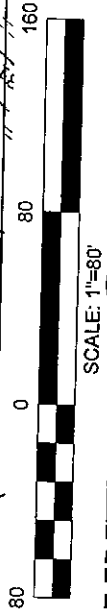
Wetland I.D.	Total Acres	Impacted Acres
42	2.48 AC	1.14 AC

WSS: 1.14 ac perm, 0.17 ac Temp



Wetland I.D.	Total Acres	Impacted Acres
3	0.62 AC	0.30 AC

WSS: 0.30 ac Perm, 0.00 ac Temp

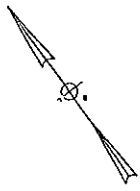


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THE GOLD STAR MEMORIAL HIGHWAY

**PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS**

**WETLAND IMPACTS
PLAN VIEW 16**



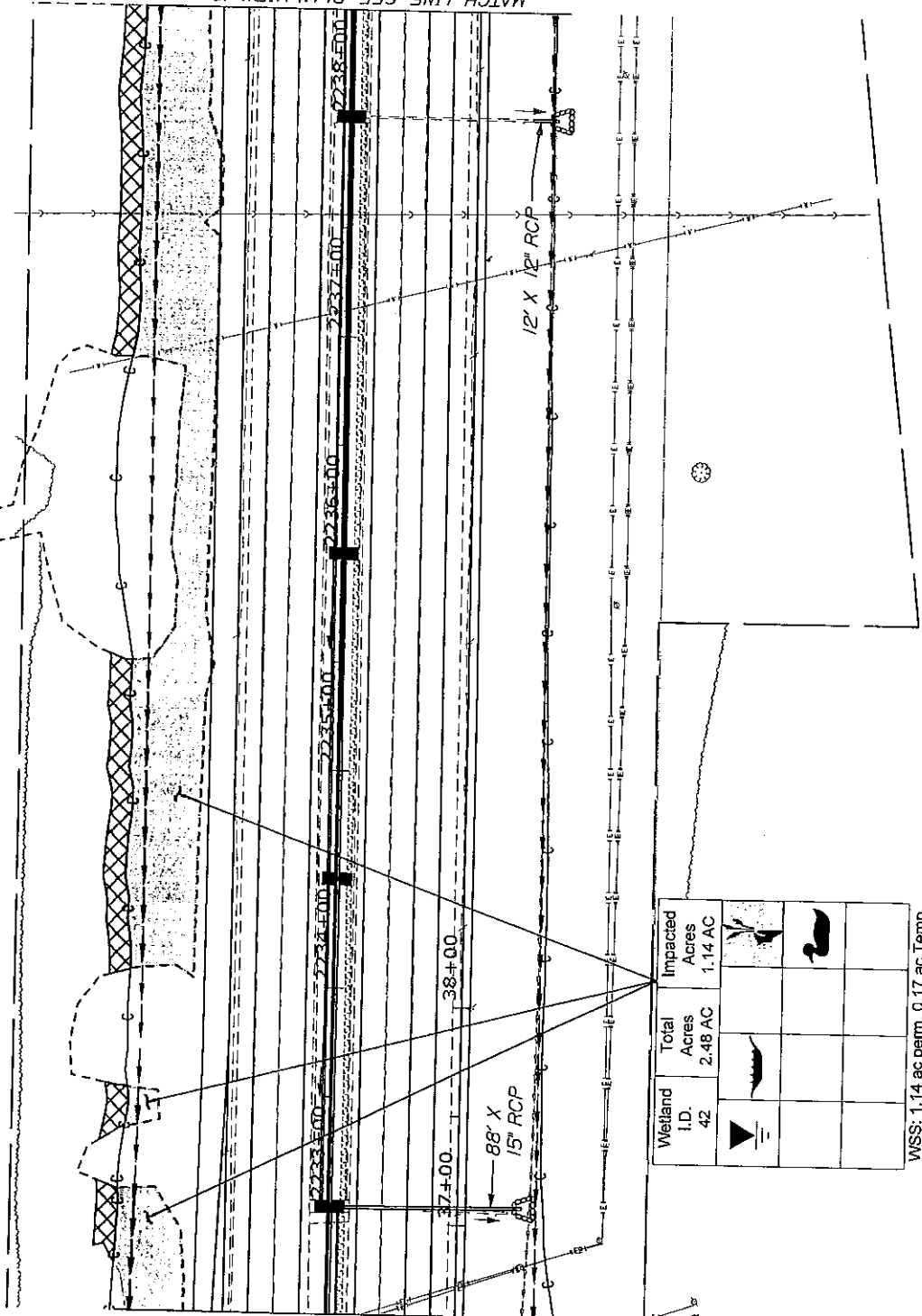
MATCH LINE SEE PLAN VIEW 18

MATCH LINE SEE PLAN VIEW 16

WSS

12" X 12" RCP

88" X 15" RCP



Wetland I.D.	Total Acres	Impacted Acres
42	2.48 AC	1.14 AC

WSS: 1.14 ac perm. 0.17 ac Temp

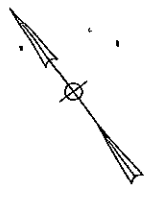


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ARCHITECTS ENGINEERS PLANNERS

THE GOLD STAR MEMORIAL HIGHWAY

**PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS**

**WETLAND IMPACTS
PLAN VIEW 17**



SEE CROSS SECTIONS FOR MORE DETAILS

WSS

36' X 18" RCP

CLL

12' X 18" RCP

32' X 12" RCP

MATCH LINE SEE PLAN VIEW 17

SEE CROSS SECTIONS FOR MORE DETAILS

Wetland I.D.	Total Acres	Impacted Acres
42	2.48 AC	1.14 AC

WSS: 1.14 ac perm, 0.17 ac Temp

Wetland I.D.	Total Acres	Impacted Acres
6	0.51 AC	0.10 AC



THE GOLD STAR MEMORIAL HIGHWAY



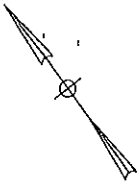
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ARCHITECTS ENGINEERS PLANNERS

PORTLAND AREA WIDENING & SAFETY IMPROVEMENTS

WETLAND IMPACTS PLAN VIEW 18

DATE: FEBRUARY, 2019

SHEET 20 OF 46



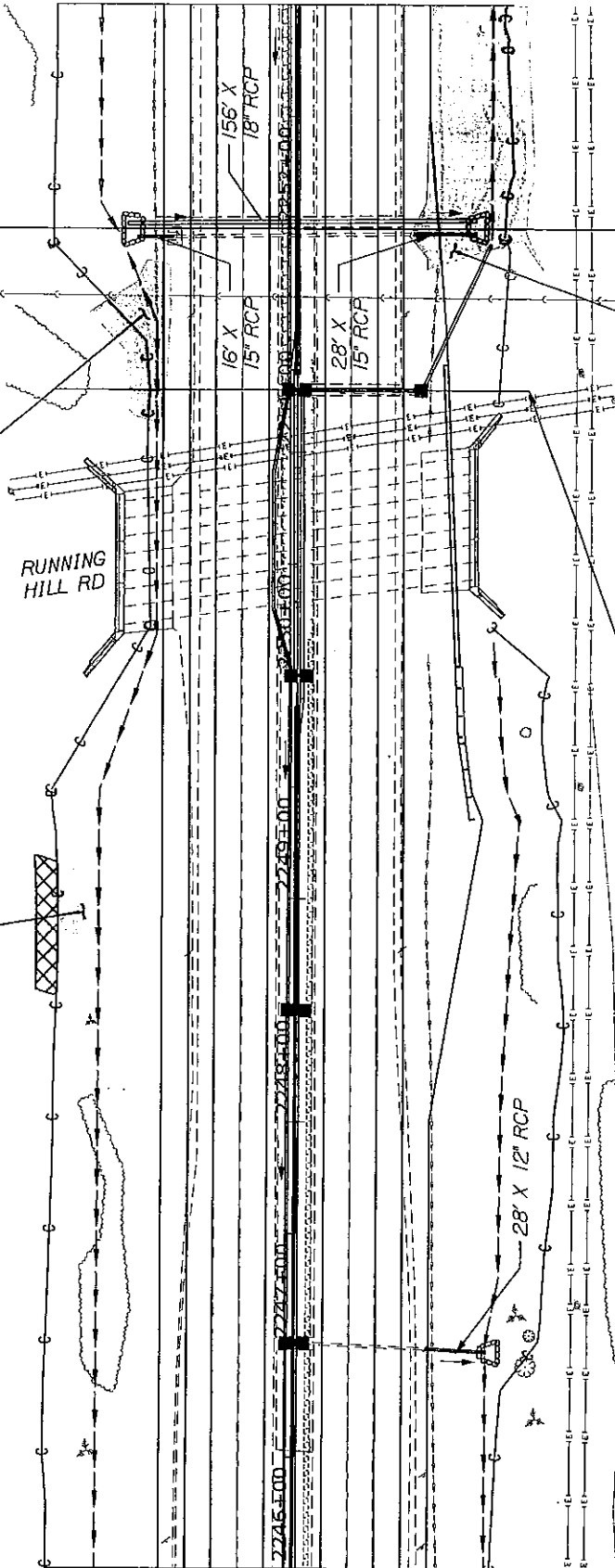
MATCH LINE SEE PLAN VIEW 20

MATCH LINE SEE PLAN VIEW 18

Wetland I.D. 41	Total Acres 0.07 AC	Impacted Acres 0.04 AC		

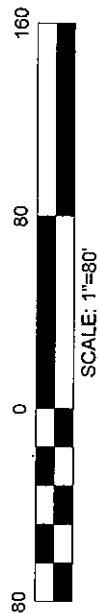
Wetland I.D. 60	Total Acres 0.07 AC	Impacted Acres 0.02 AC		

Wetland I.D. 61	Total Acres 0.89 AC	Impacted Acres 0.33 AC		



SEE CROSS SECTIONS FOR MORE DETAILS

SEE CROSS SECTIONS FOR MORE DETAILS



THE GOLD STAR
MEMORIAL HIGHWAY



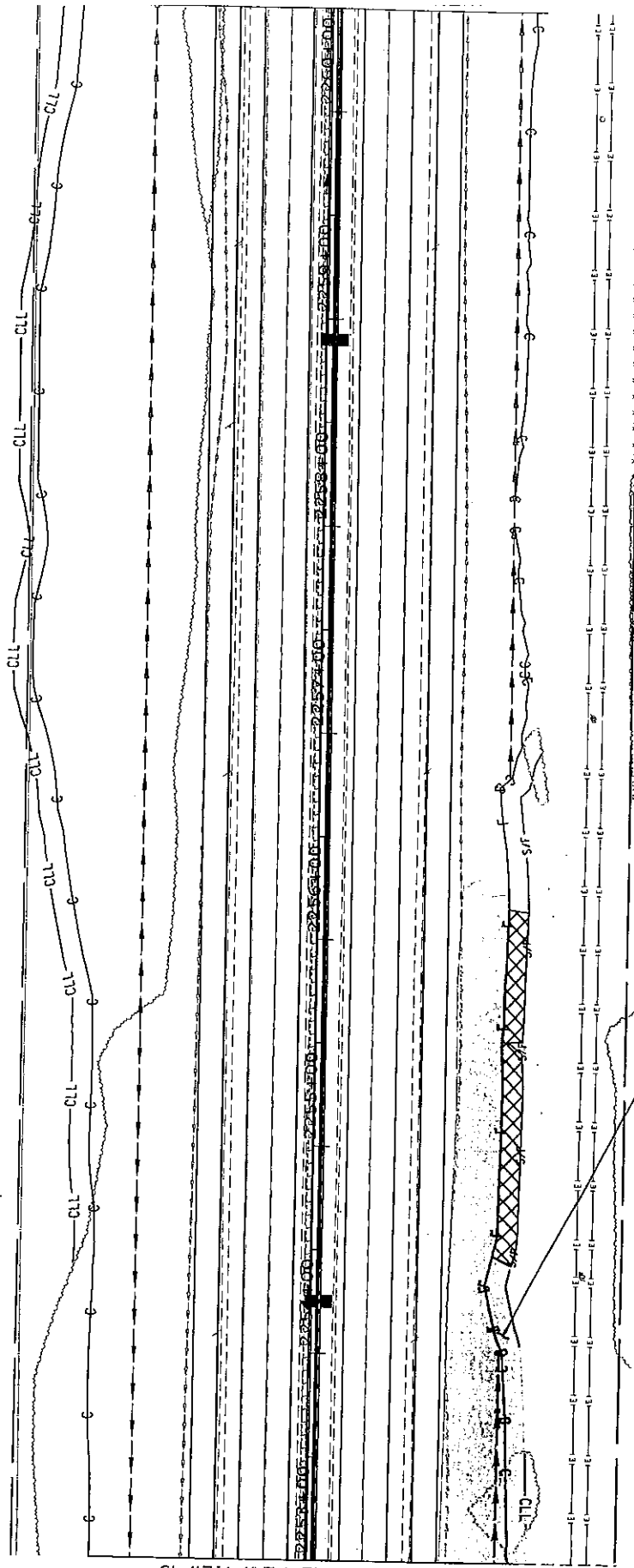
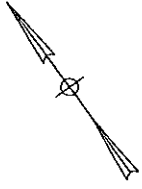
ARCHITECTS ENGINEERS PLANNERS

WETLAND IMPACTS
PLAN VIEW 19

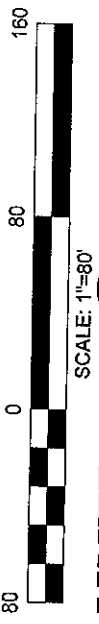
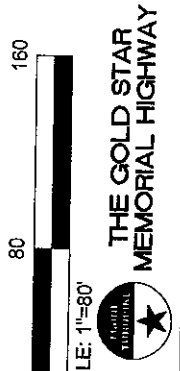
PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

DATE: FEBRUARY, 2019

SHEET 21 OF 46



Wetland I.D.	Total Acres	Impacted Acres
61	0.89 AC	0.33 AC



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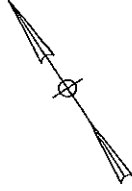
THE GOLD STAR MEMORIAL HIGHWAY

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

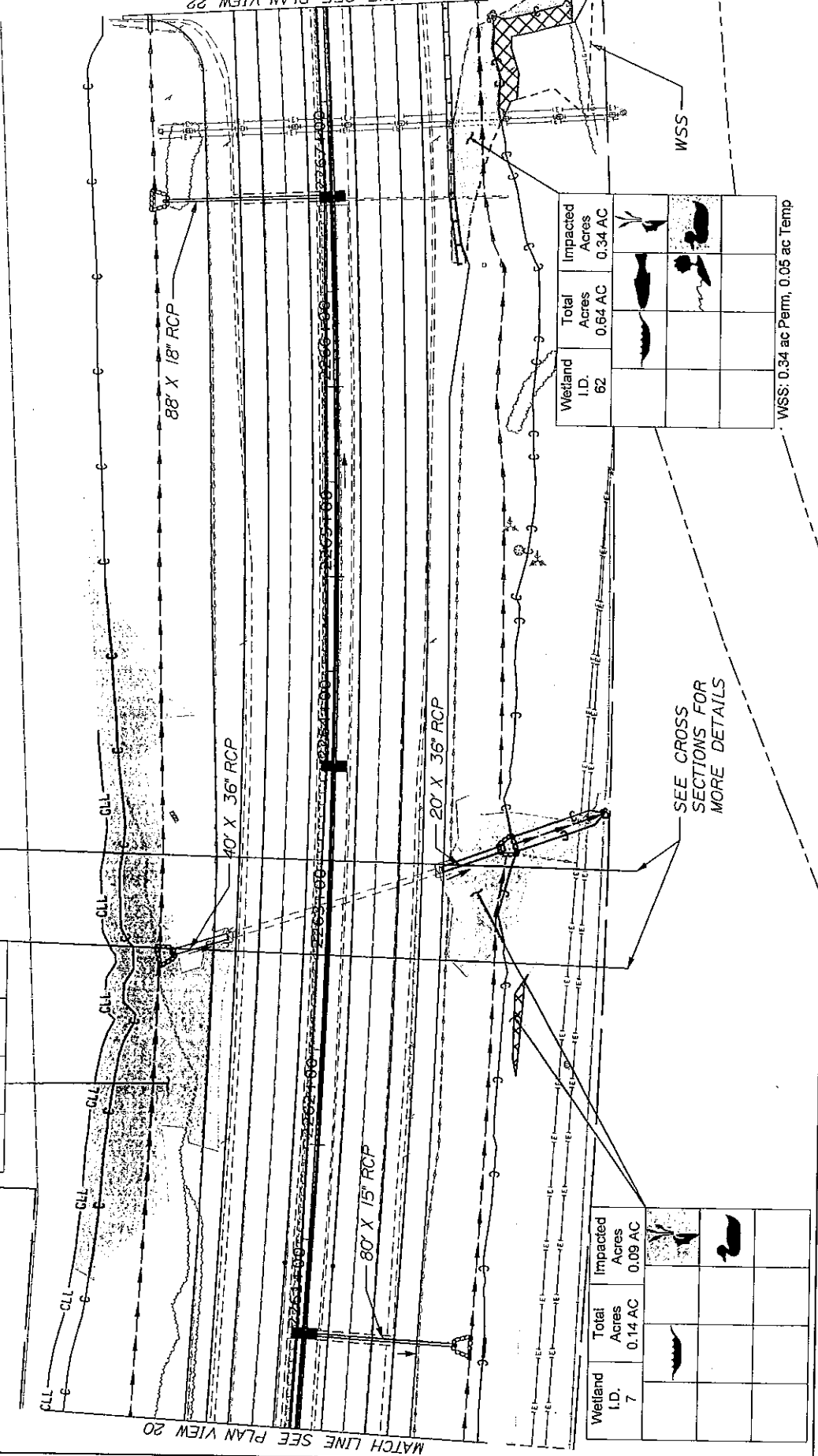
WETLAND IMPACTS
PLAN VIEW 20

DATE: FEBRUARY, 2019

SHEET 22 OF 46



Wetland I.D.	40	Total Acres	0.89 AC	Impacted Acres	0.36 AC



MATCH LINE SEE PLAN VIEW 20

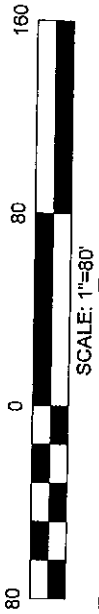
MATCH LINE SEE PLAN VIEW 22

Wetland I.D.	7	Total Acres	0.14 AC	Impacted Acres	0.09 AC

Wetland I.D.	62	Total Acres	0.64 AC	Impacted Acres	0.34 AC

WSS: 0.34 ac Perm, 0.05 ac Temp

SEE CROSS SECTIONS FOR MORE DETAILS



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ARCHITECTS ENGINEERS PLANNERS

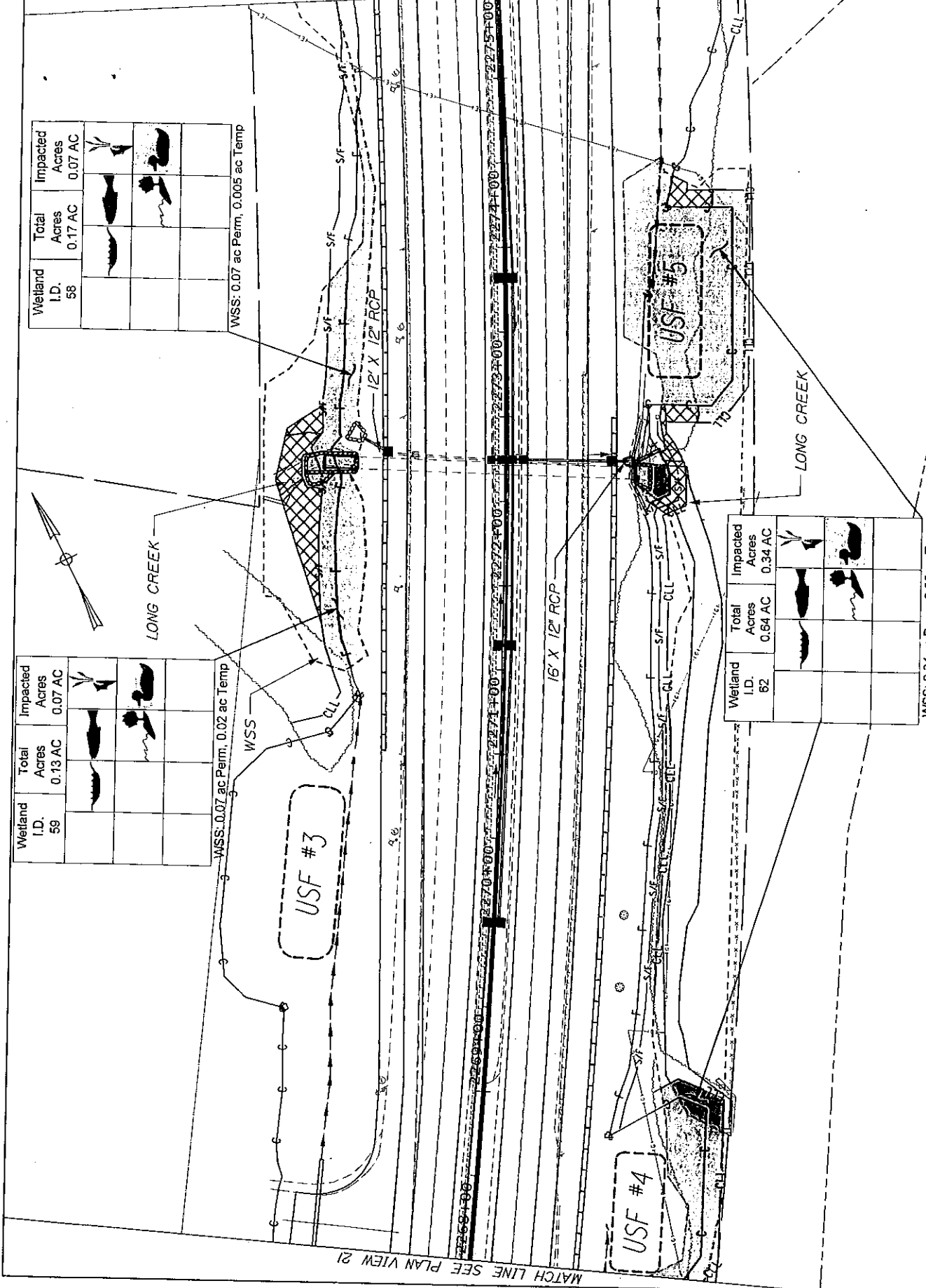
THE GOLD STAR MEMORIAL HIGHWAY

**WETLAND IMPACTS
PLAN VIEW 21**

**PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS**

MATCH LINE SEE PLAN VIEW 23

MATCH LINE SEE PLAN VIEW 21



Wetland I.D.	Total Acres	Impacted Acres
59	0.13 AC	0.07 AC

Wetland I.D.	Total Acres	Impacted Acres
58	0.17 AC	0.07 AC

Wetland I.D.	Total Acres	Impacted Acres
62	0.64 AC	0.34 AC

WSS: 0.07 ac Perm, 0.005 ac Temp

WSS: 0.07 ac Perm, 0.02 ac Temp

WSS: 0.34 ac Perm, 0.05 ac Temp



HNTB
ARCHITECTS ENGINEERS PLANNERS

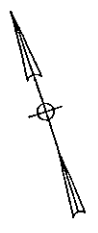
THE GOLD STAR MEMORIAL HIGHWAY

**PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS**

**WETLAND IMPACTS
PLAN VIEW 22**

MATCH LINE SEE PLAN VIEW 22

MATCH LINE SEE PLAN VIEW 24



Wetland I.D.	Total Acres	Impacted Acres
58	0.17 AC	0.07 AC

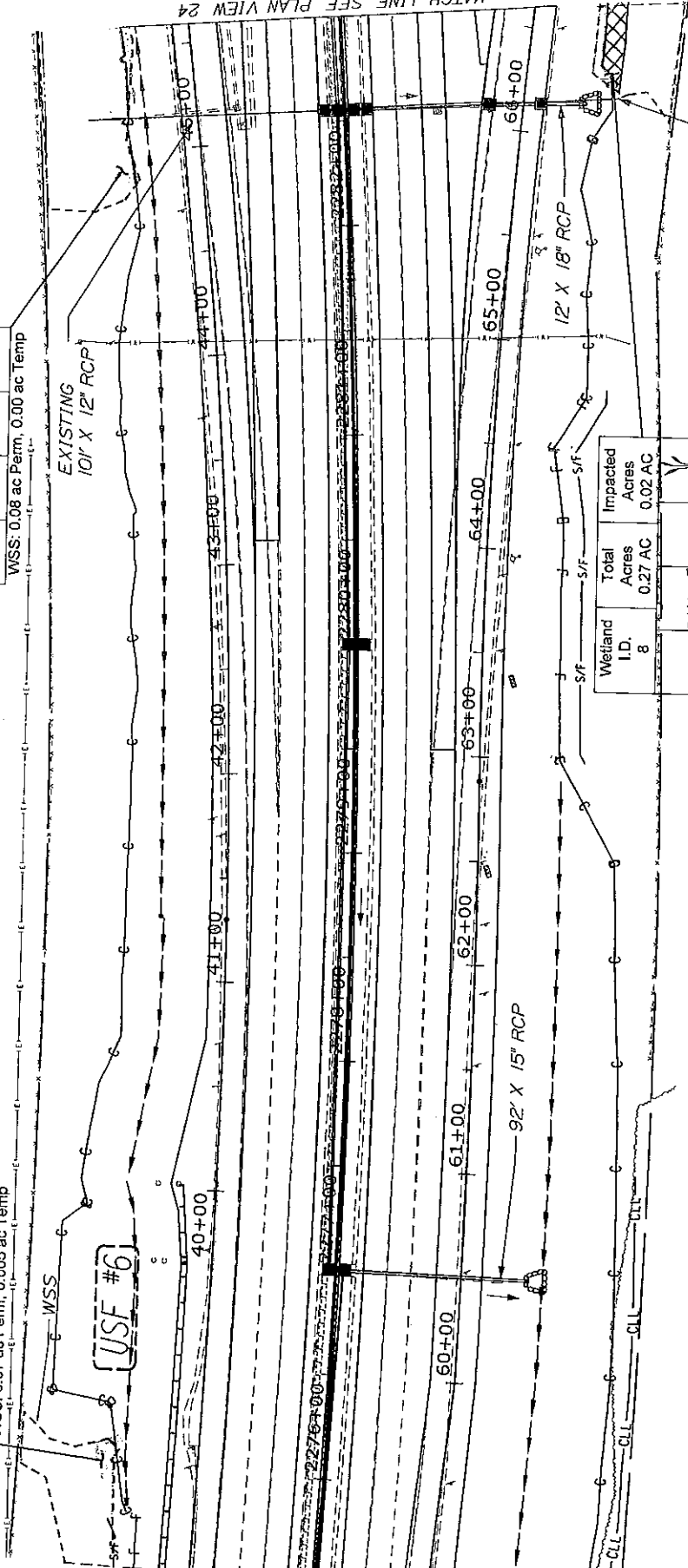
WSS: 0.07 ac Perm, 0.005 ac Temp

USF #6

WSS: 0.08 ac Perm, 0.00 ac Temp

Wetland I.D.	Total Acres	Impacted Acres
39	0.25 AC	0.08 AC

EXISTING 10' X 12" RCP



Wetland I.D.	Total Acres	Impacted Acres
8	0.27 AC	0.02 AC

WSS: 0.02 ac Perm, 0.02 ac Temp

SEE CROSS SECTIONS FOR MORE DETAILS



SCALE: 1"=80'



THE GOLD STAR MEMORIAL HIGHWAY

PORTLAND AREA WIDENING & SAFETY IMPROVEMENTS

WETLAND IMPACTS PLAN VIEW 23

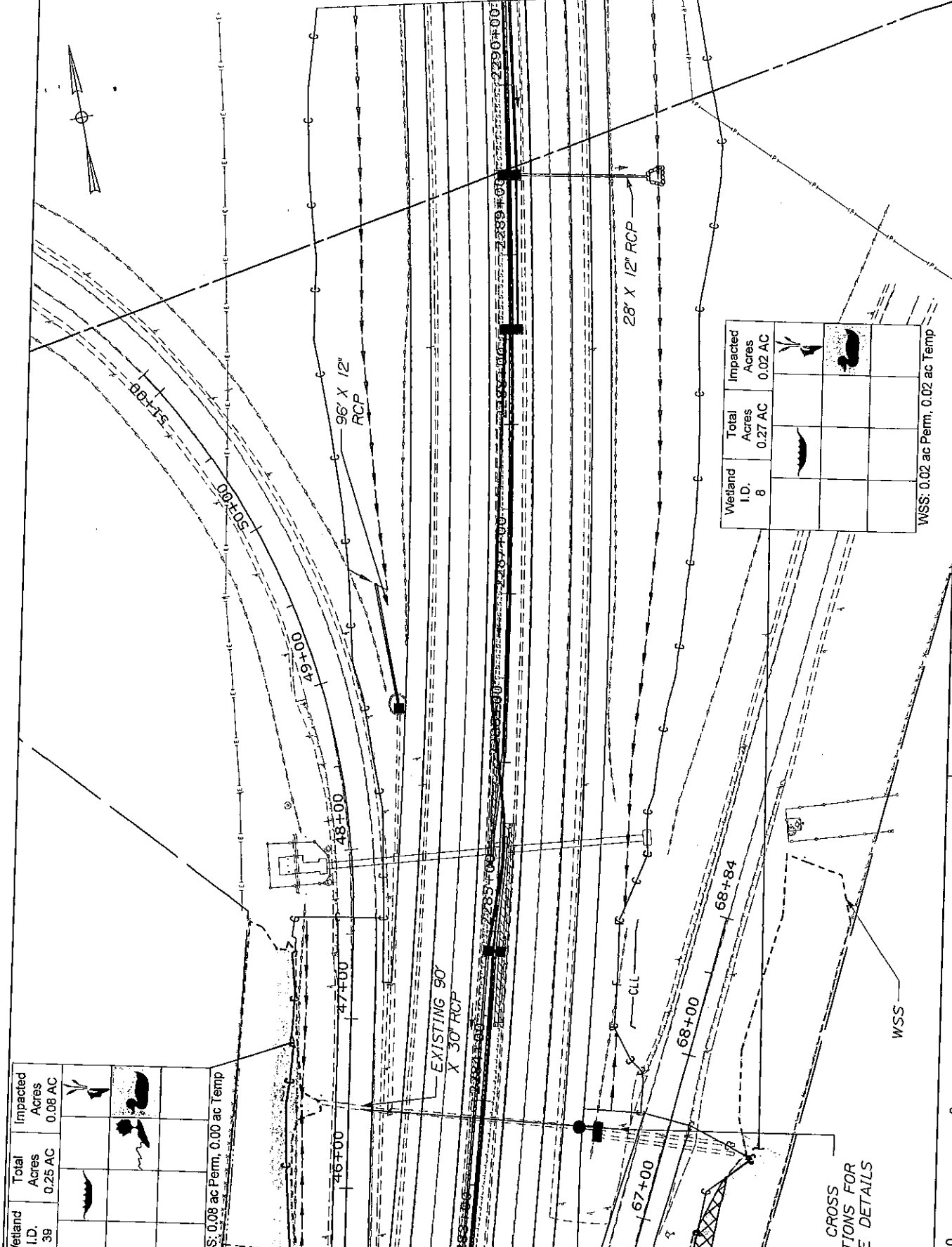
DATE: FEBRUARY, 2019

SHEET 25 OF 46

Wetland I.D.	Total Acres	Impacted Acres
39	0.25 AC	0.08 AC

WSS: 0.08 ac Perm, 0.00 ac Temp

MATCH LINE SEE PLAN VIEW 23



Wetland I.D.	Total Acres	Impacted Acres
8	0.27 AC	0.02 AC

WSS: 0.02 ac Perm, 0.02 ac Temp



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THE GOLD STAR
MEMORIAL HIGHWAY

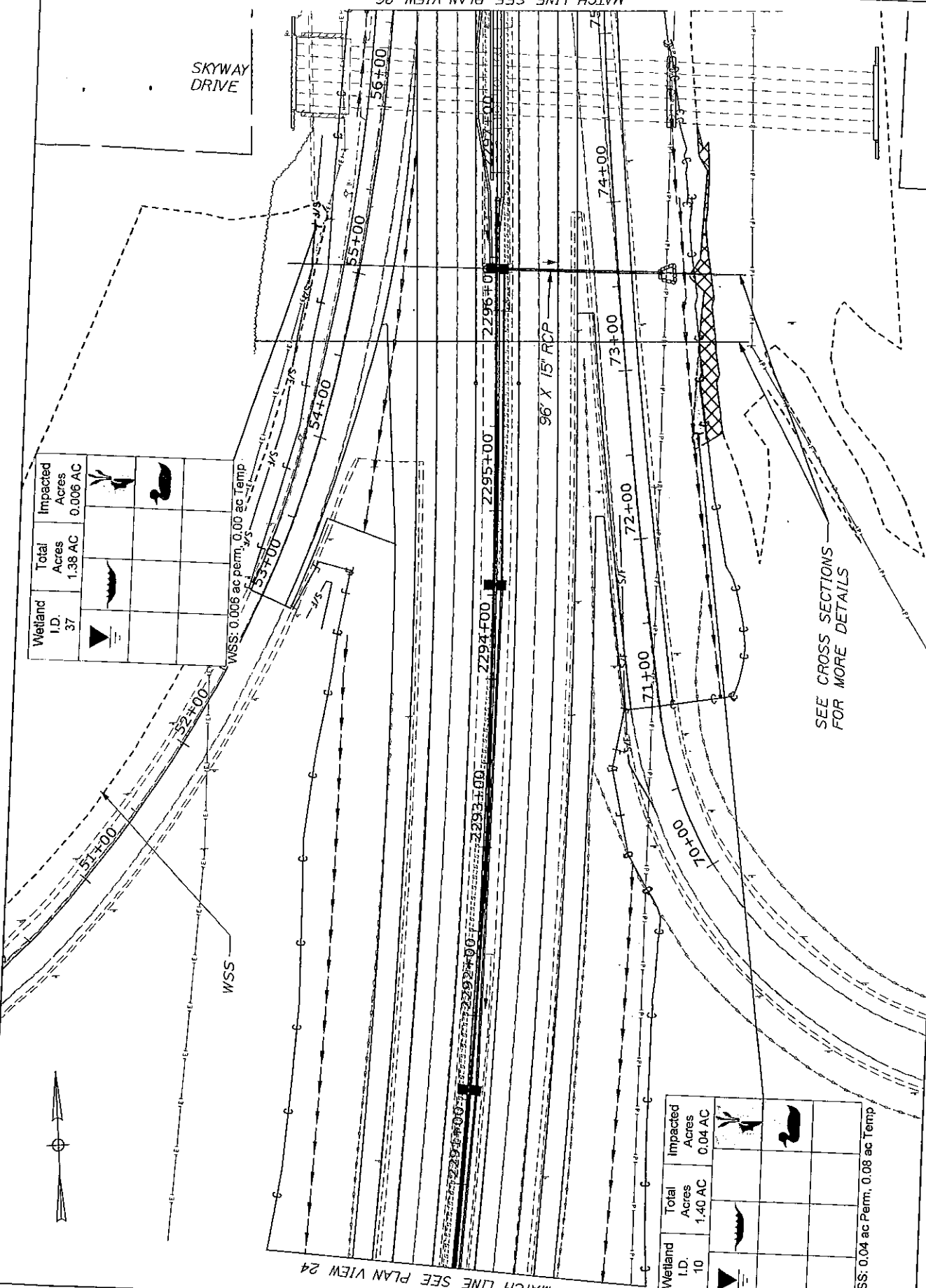
PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

WETLAND IMPACTS
PLAN VIEW 24

SKYWAY DRIVE

Wetland I.D.	37	Total Acres	1.38 AC	Impacted Acres	0.006 AC

WSS: 0.006 ac perm, 0.00 ac Temp



SEE CROSS SECTIONS FOR MORE DETAILS

MATCH LINE SEE PLAN VIEW 24

Wetland I.D.	10	Total Acres	1.40 AC	Impacted Acres	0.04 AC

WSS: 0.04 ac Perm, 0.08 ac Temp



SCALE: 1"=80'



ARCHITECTS ENGINEERS PLANNERS

THE GOLD STAR MEMORIAL HIGHWAY

PORTLAND AREA WIDENING & SAFETY IMPROVEMENTS

WETLAND IMPACTS PLAN VIEW 25

MATCH LINE SEE PLAN VIEW 25

Wetland I.D.	Total Acres	Impacted Acres
36	0.63 AC	0.13 AC

Wetland I.D.	Total Acres	Impacted Acres
10	1.40 AC	0.04 AC

WSS: 0.04 ac Perm, 0.08 ac Temp



SCALE: 1"=80'

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ARCHITECTS ENGINEERS PLANNERS

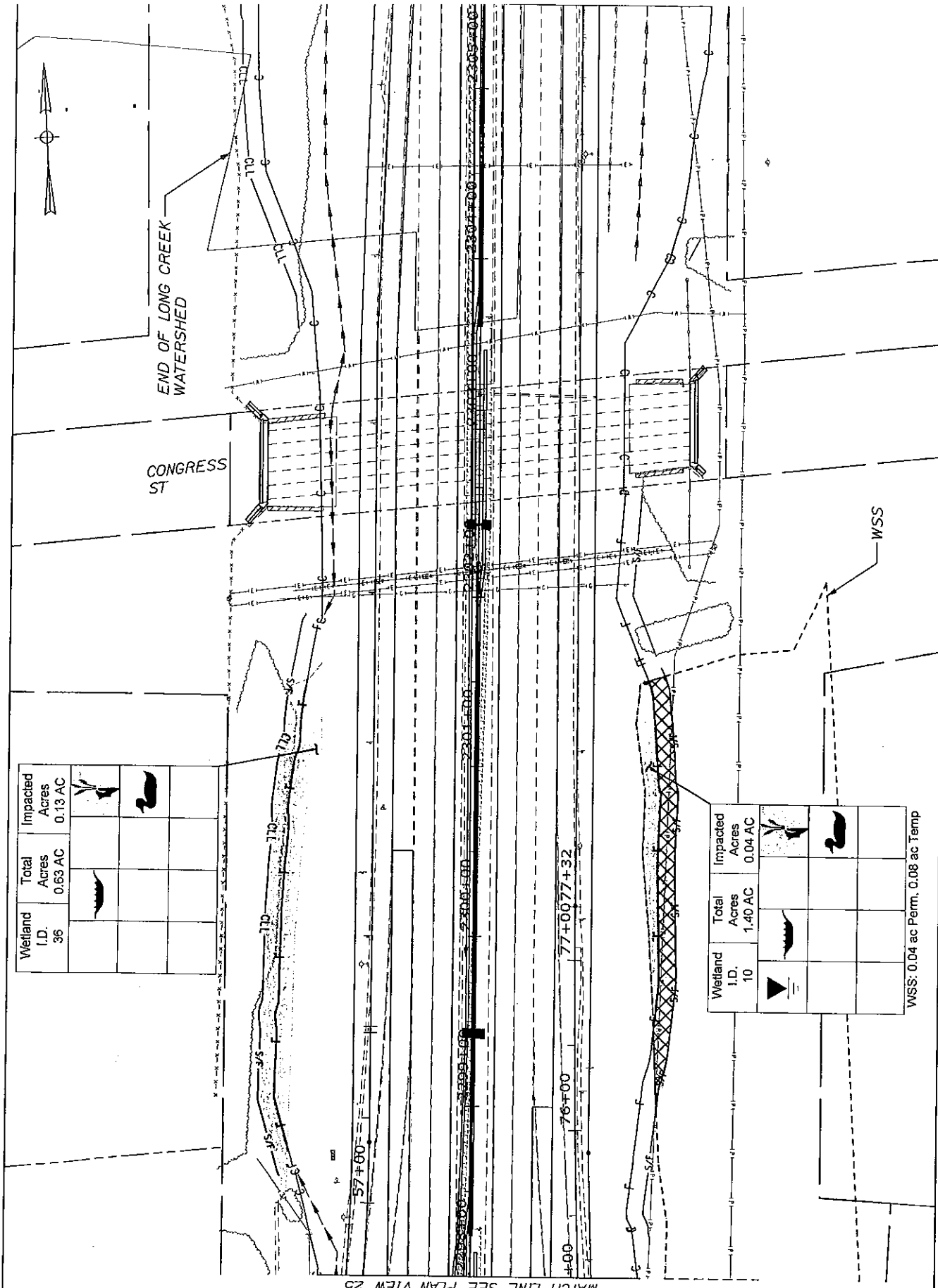


PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

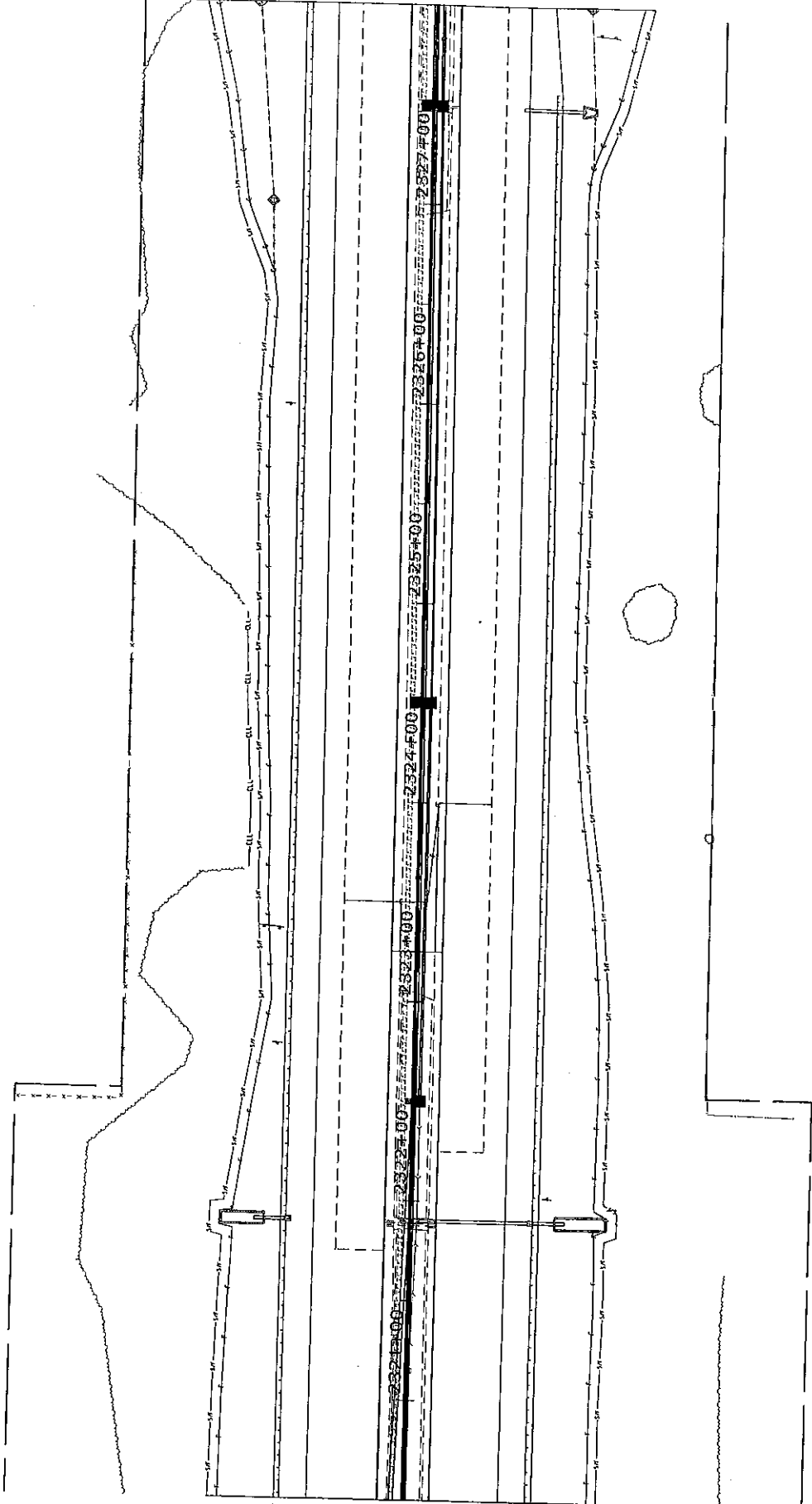
WETLAND IMPACTS
PLAN VIEW 26

DATE: FEBRUARY, 2019

SHEET 28 OF 40



MATCH LINE SEE PLAN VIEW 28



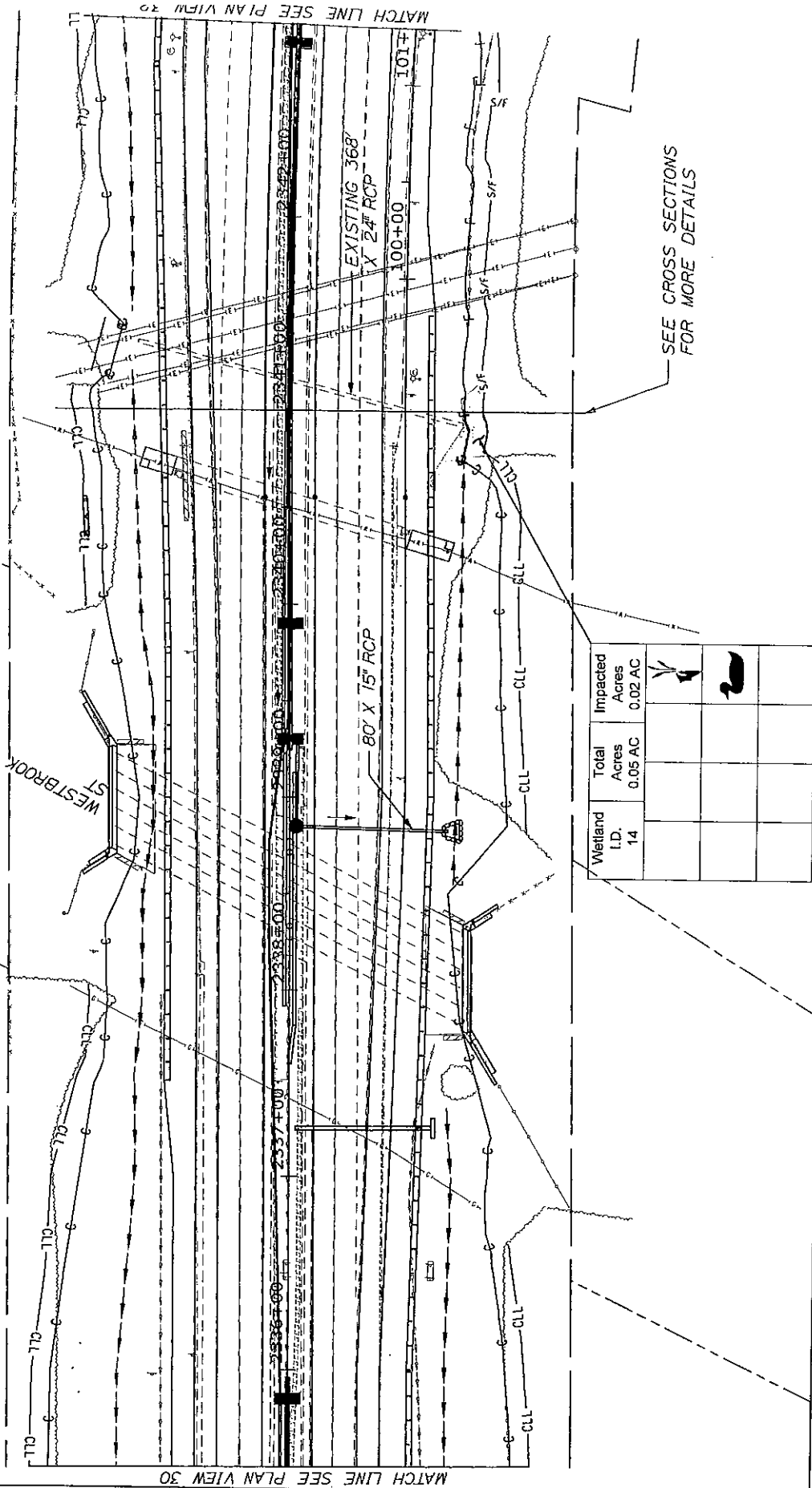
HNTB
ARCHITECTS ENGINEERS PLANNERS

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

WETLAND IMPACTS
PLAN VIEW 29

DATE: FEBRUARY, 2019

SHEET 31 OF 46



Wetland I.D.	Total Acres	Impacted Acres
14	0.05 AC	0.02 AC



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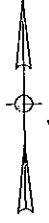


**PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS**

**WETLAND IMPACTS
PLAN VIEW 31**

DATE: FEBRUARY, 2019

SHEET 33 OF 46



Wetland I.D.	Total Acres	Impacted Acres
31	0.11 AC	0.03 AC

BEGINNING OF MASON'S BROOK WATERSHED



THE GOLD STAR MEMORIAL HIGHWAY



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ARCHITECTS ENGINEERS PLANNERS

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

DATE: FEBRUARY, 2019

WETLAND IMPACTS
PLAN VIEW 32

SHEET 34 OF 40

Wetland I.D.	Total Acres	Impacted Acres
57	0.35 AC	0.00 AC

EXIT 47 BRIDGE

VERNAL POOL 3



BEGINNING OF
MASON'S BROOK
WATERSHED

EXISTING 15" X 24" RCP

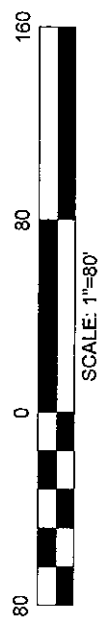
88' X 15" RCP

EXISTING 170" X 24" RCP

MATCH LINE SEE PLAN VIEW 32

MATCH LINE SEE PLAN VIEW 33

Wetland I.D.	Total Acres	Impacted Acres
30	0.64 AC	0.26 AC



THE GOLD STAR
MEMORIAL HIGHWAY

HNTB
ARCHITECTS ENGINEERS PLANNERS

WETLAND IMPACTS
PLAN VIEW 33

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

DATE: FEBRUARY, 2019

SHEET 35 OF 46

VERNAL POOL 3



EXISTING 90' x 24" CMP

EXISTING 48' x 24" RCP

8' x 18" RCP

8' x 12" RCP

SEE CROSS SECTIONS FOR MORE DETAILS

WESTBROOK ARTERIAL

BEGINNING OF NASON'S BROOK WATERSHED

MATCH LINE SEE PLAN VIEW 33

Wetland I.D. 30	Total Acres 0.84 AC	Impacted Acres 0.26 AC		

Wetland I.D. 50	Total Acres 0.11 AC	Impacted Acres 0.00 AC		

Wetland I.D. 17	Total Acres 0.12 AC	Impacted Acres 0.03 AC		ES

Wetland I.D. 18	Total Acres 0.33 AC	Impacted Acres 0.05 AC		



SCALE: 1"=80'



THE GOLD STAR MEMORIAL HIGHWAY

HNTB
ARCHITECTS ENGINEERS PLANNERS

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

WETLAND IMPACTS
PLAN VIEW 34

DATE: FEBRUARY, 2019

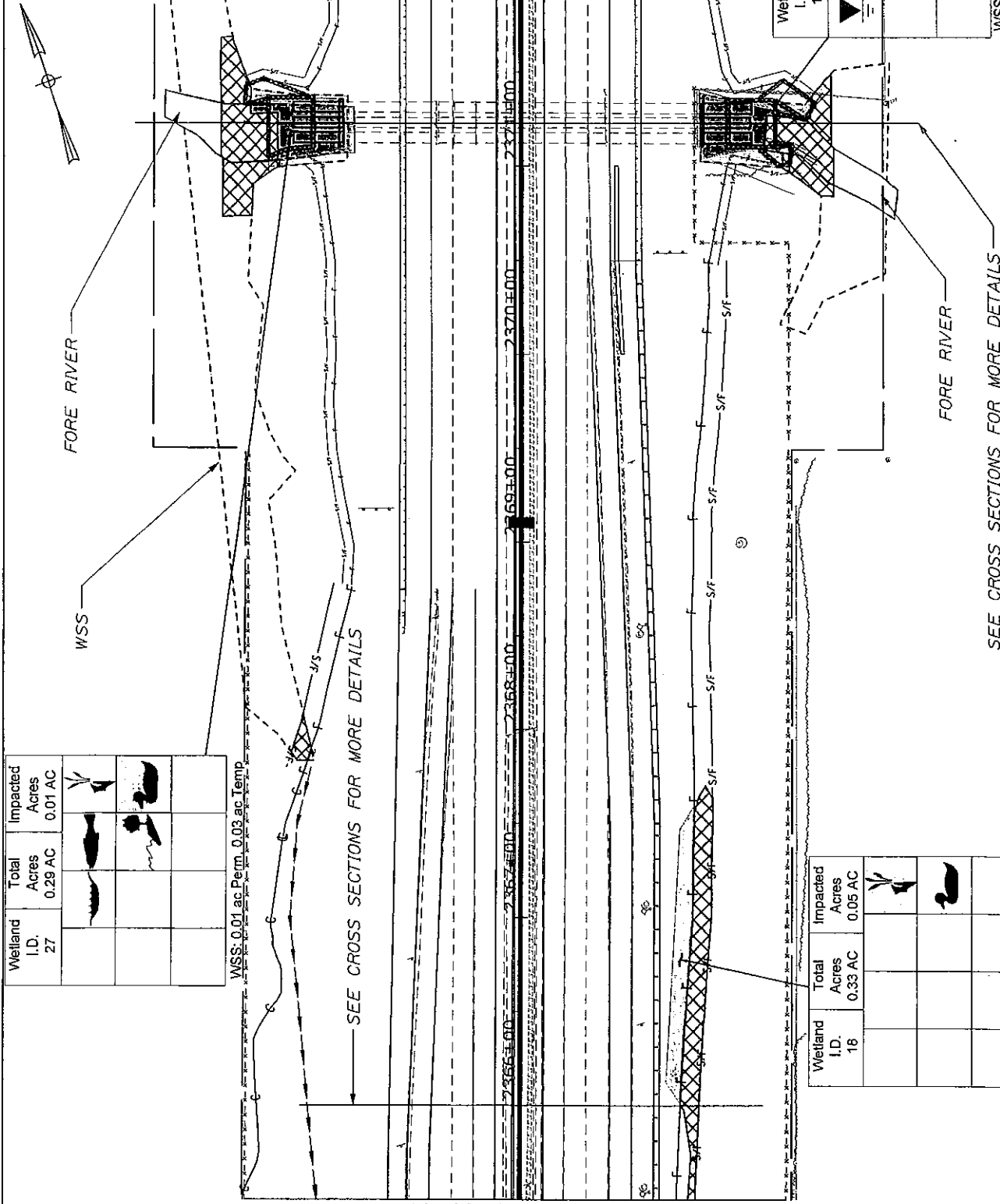
SHEET 36 OF 46

Wetland I.D.	27	Total Acres	0.28 AC	Impacted Acres	0.01 AC

WSS: 0.01 ac Perm, 0.03 ac Temp

SEE CROSS SECTIONS FOR MORE DETAILS

MATCH LINE SEE PLAN VIEW 34



MATCH LINE SEE PLAN VIEW 36

Wetland I.D.	18	Total Acres	0.33 AC	Impacted Acres	0.05 AC

Wetland I.D.	19	Total Acres	0.12 AC	Impacted Acres	0.01 AC

SEE CROSS SECTIONS FOR MORE DETAILS

WSS: 0.01 ac Perm, 0.01 ac Temp



HNTB
ARCHITECTS ENGINEERS PLANNERS

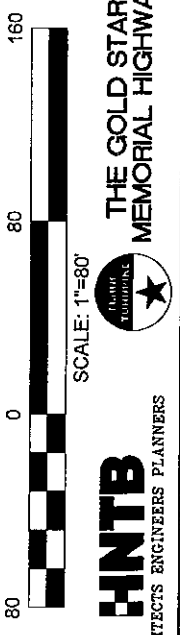
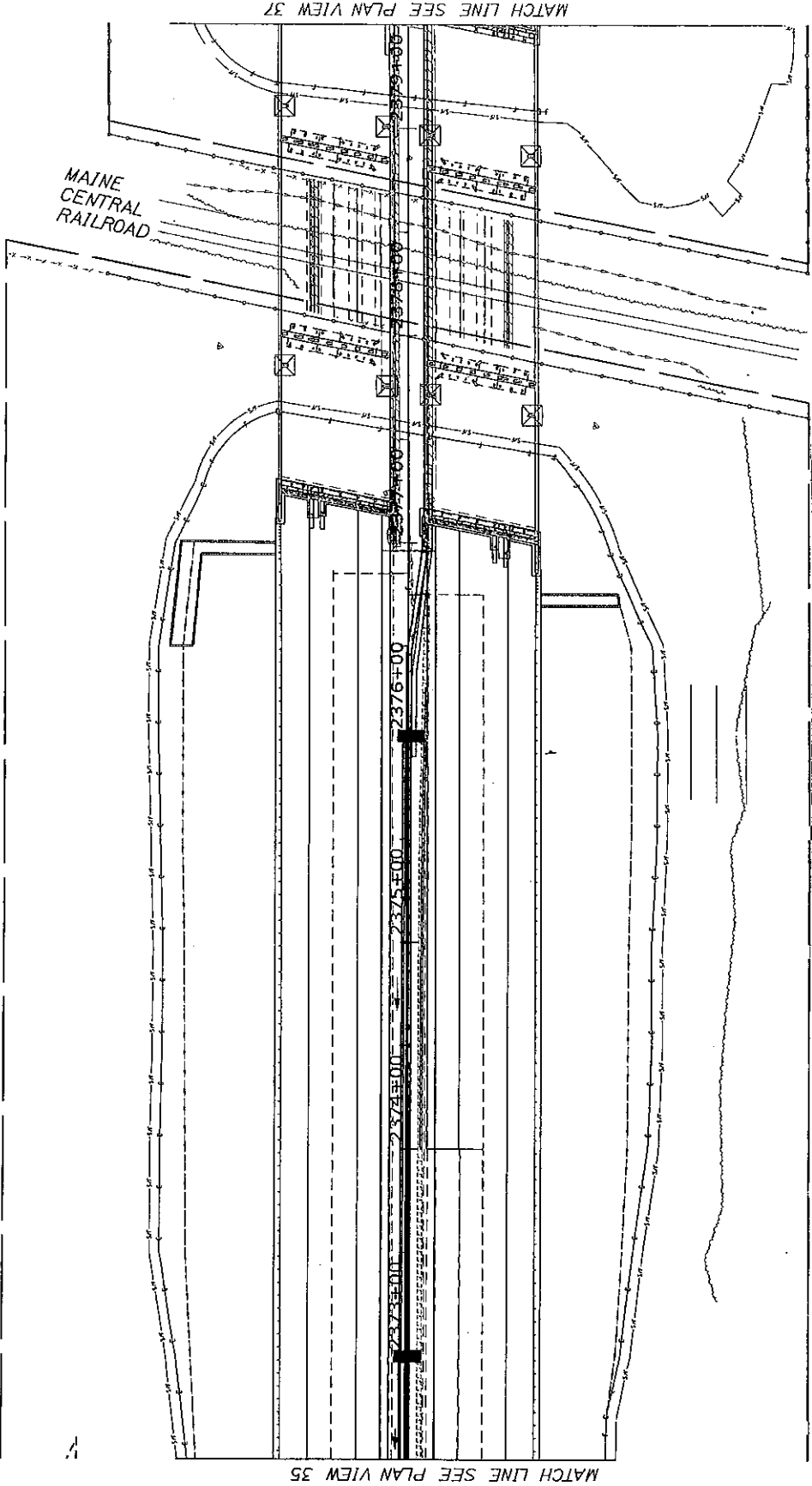
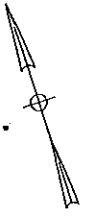
THE GOLD STAR
MEMORIAL HIGHWAY

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

WETLAND IMPACTS
PLAN VIEW 35

DATE: FEBRUARY, 2019

SHEET 37 OF 46



THE GOLD STAR
MEMORIAL HIGHWAY

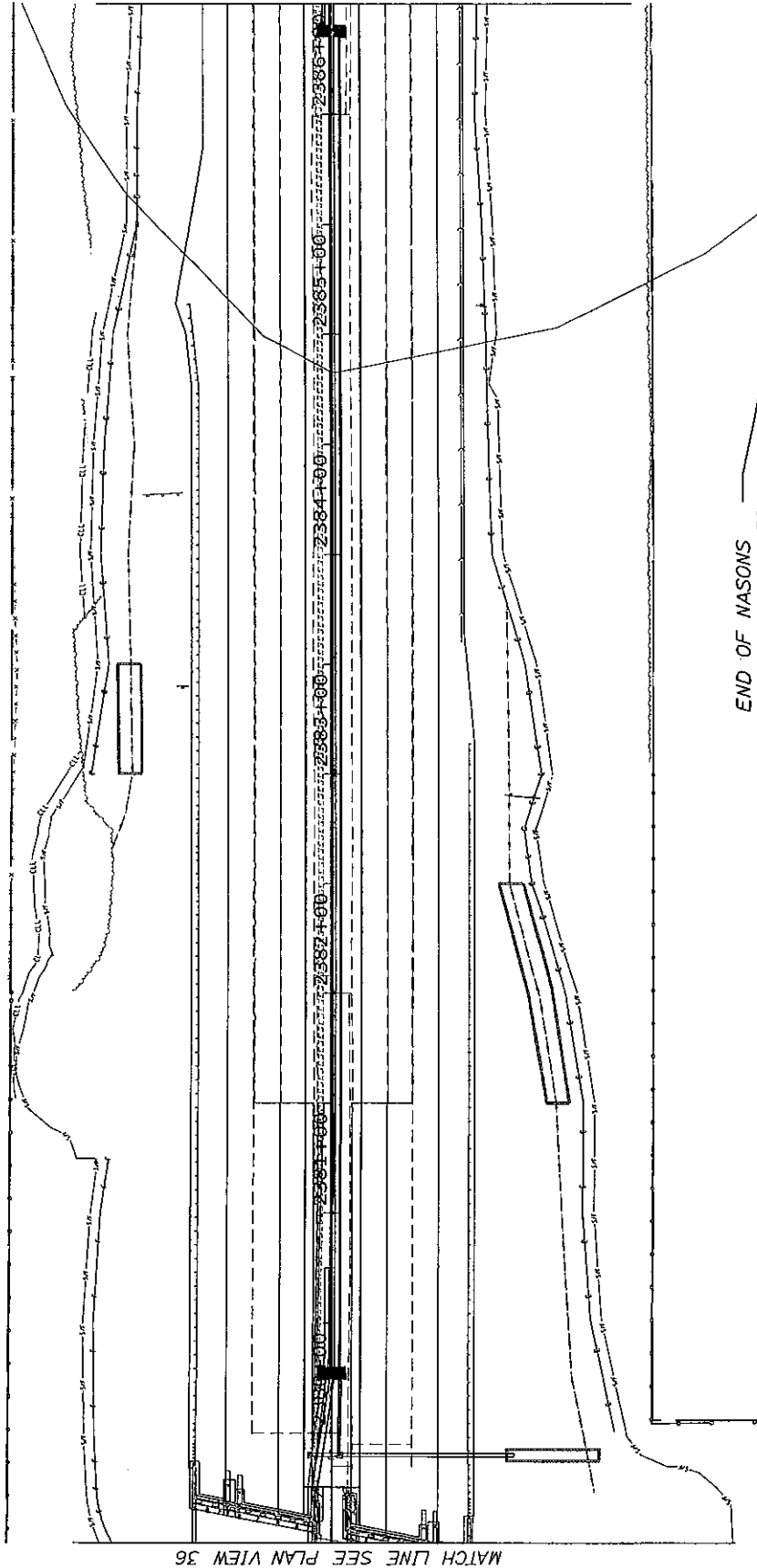
HNTB
ARCHITECTS ENGINEERS PLANNERS

WETLAND IMPACTS
PLAN VIEW 36

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

DATE: FEBRUARY, 2019

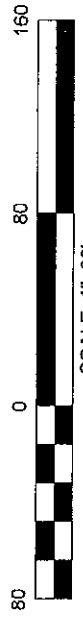
SHEET 38 OF 46



MATCH LINE SEE PLAN VIEW 36

MATCH LINE SEE PLAN VIEW 38

END OF NASONS
BROOK WATERSHED
AND BEGINNING OF
CAPISIC BROOK
WATERSHED



THE GOLD STAR
MEMORIAL HIGHWAY

HNTB

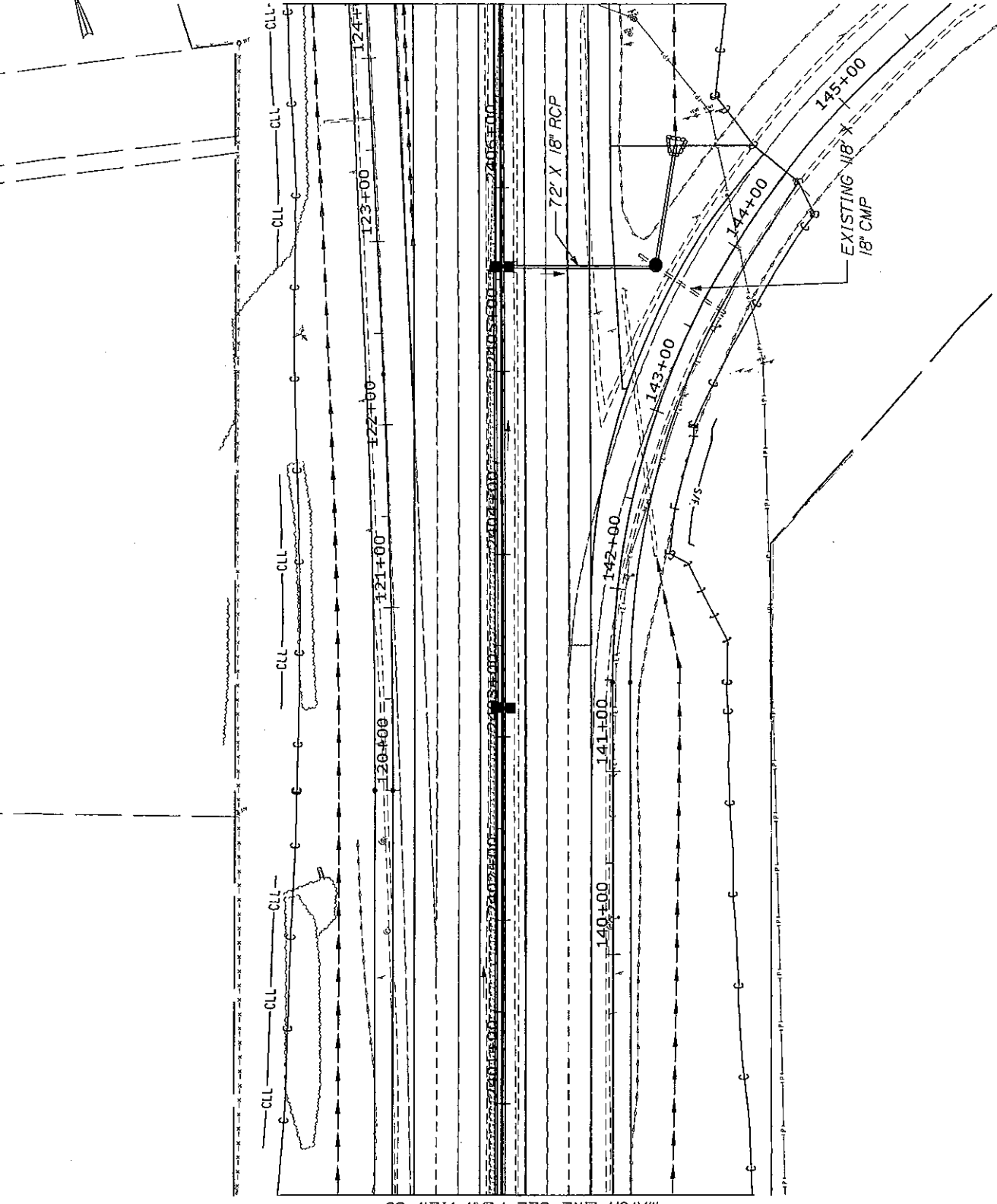
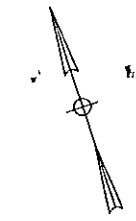
ARCHITECTS ENGINEERS PLANNERS

WETLAND IMPACTS
PLAN VIEW 37

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

DATE: FEBRUARY, 2019

SHEET 39 OF 46

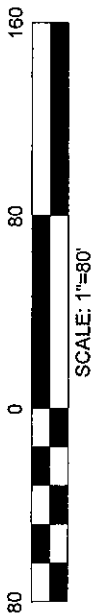


MATCH LINE SEE PLAN VIEW 41

MATCH LINE SEE PLAN VIEW 39

WETLAND IMPACTS
PLAN VIEW 40

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS



THE GOLD STAR
MEMORIAL HIGHWAY



HNTB

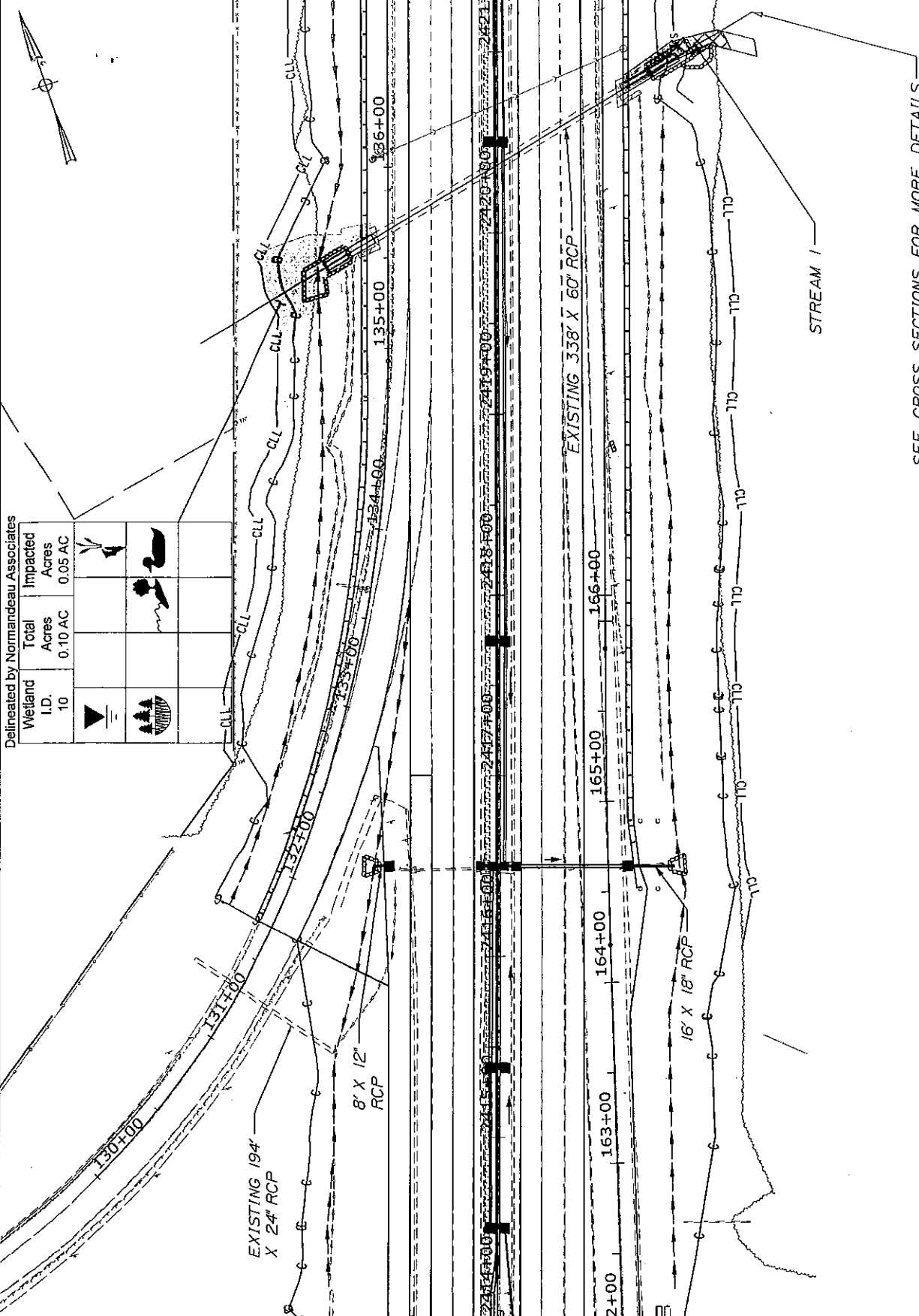
ARCHITECTS ENGINEERS PLANNERS

DATE: FEBRUARY, 2019

SHEET 42 OF 46

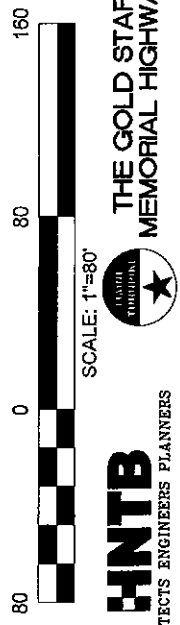
MATCH LINE SEE PLAN VIEW 41

MATCH LINE SEE PLAN VIEW 42



Delineated by Normandeau Associates

Wetland I.D.	Total Acres	Impacted Acres
10	0.10 AC	0.05 AC



THE GOLD STAR
MEMORIAL HIGHWAY



HNTB
ARCHITECTS ENGINEERS PLANNERS

WETLAND IMPACTS
PLAN VIEW 42

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

DATE: FEBRUARY, 2019

SHEET 44 OF 46

MATCH LINE SEE PLAN VIEW 42

SEE CROSS SECTIONS FOR MORE DETAILS

Delineated by Normandeau Associates

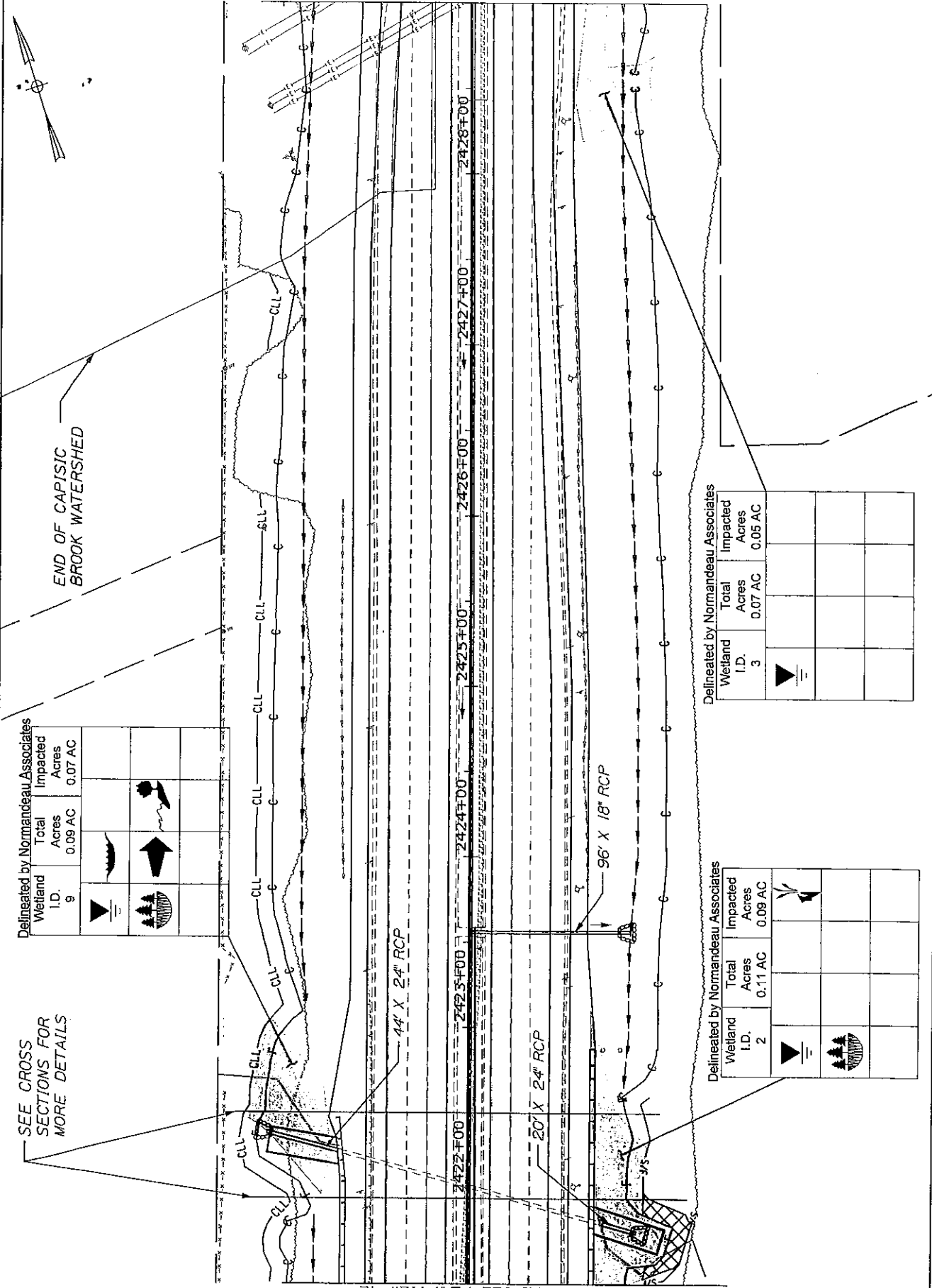
Wetland I.D.	Total Acres	Impacted Acres
9	0.09 AC	0.07 AC

Delineated by Normandeau Associates

Wetland I.D.	Total Acres	Impacted Acres
2	0.11 AC	0.09 AC

Delineated by Normandeau Associates

Wetland I.D.	Total Acres	Impacted Acres
3	0.07 AC	0.05 AC



HNTB
ARCHITECTS ENGINEERS PLANNERS

THE GOLD STAR MEMORIAL HIGHWAY

WETLAND IMPACTS
PLAN VIEW 43

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

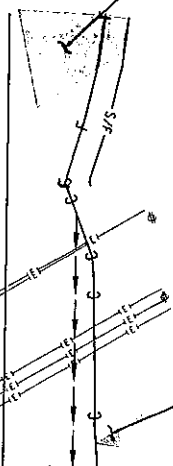
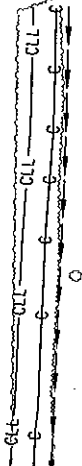
DATE: FEBRUARY, 2019

SHEET 45 OF 46

WARREN
• AVE



MATCH LINE SEE PLAN VIEW 43



2429+00 2430+00 2431+00 2432+00 2433+00 2434+00 2435+00

Delineated by Normandeau Associates

Wetland I.D.	Total Acres	Impacted Acres
4	0.007 AC	0.001 AC

Delineated by Normandeau Associates

Wetland I.D.	Total Acres	Impacted Acres
5	0.23 AC	0.03 AC

END OF CARISIC
BROOK WATERSHED



SCALE: 1"=80'



THE GOLD STAR
MEMORIAL HIGHWAY

HNTB
ARCHITECTS ENGINEERS PLANNERS

WETLAND IMPACTS
PLAN VIEW 44

PORTLAND AREA
WIDENING & SAFETY
IMPROVEMENTS

DATE: FEBRUARY, 2019

SHEET 46 OF 46



**US Army Corps
of Engineers**®
New England District

(Minimum Notice: Permittee must sign and return notification
within one month of the completion of work.)

COMPLIANCE CERTIFICATION FORM

USACE Project Number: NAE-2019-00701

Name of Permittee: Maine Turnpike Authority c/o Sean Donohue

Permit Issuance Date: August 21, 2019

Please sign this certification and return it to the following address upon completion of the activity and any mitigation required by the permit. You must submit this after the mitigation is complete, but not the mitigation monitoring, which requires separate submittals.

* MAIL TO: U.S. Army Corps of Engineers, New England District *
* Policy Analysis/Technical Support Branch, ATTN: Marie Farese *
* Regulatory Division *
* 696 Virginia Road *
* Concord, Massachusetts 01742-2751 *

Please note that your permitted activity is subject to a compliance inspection by an U.S. Army Corps of Engineers representative. If you fail to comply with this permit you are subject to permit suspension, modification, or revocation.

I hereby certify that the work authorized by the above referenced permit was completed in accordance with the terms and conditions of the above referenced permit, and any required mitigation was completed in accordance with the permit conditions.

Signature of Permittee

Date

Printed Name

Date of Work Completion

() _____

() _____

Telephone Number

Telephone Number



**US Army Corps
of Engineers** ®
New England District

WORK-START NOTIFICATION FORM
(Minimum Notice: Two weeks before work begins)

EMAIL TO: colin.m.greenan@usace.army.mil and cenae-r@usace.army.mil

or

MAIL TO:

Colin M. Greenan
Maine Project Office
U.S. Army Corps of Engineers, New England District
442 Civic Center Drive, Suite 350
Augusta, Maine 04330

A Corps of Engineers Permit (number NAE-2019-00701) was issued to the Maine Turnpike Authority c/o Sean Donohue on August 21, 2019. The permit authorized the permittee to place temporary and permanent fill below the ordinary high water marks of Red Brook, Long Creek, Nason's Brook, and an unnamed tributary to Capisic Brook and in adjacent freshwater wetlands along the Maine Turnpike (Interstate 95) from Holmes Road at Scarborough, north 5.7 mi. to approximately 0.2 mile north of Exit 48 at Portland, Maine all in order to upgrade the Turnpike to current safety and capacity standards and to accommodate projected traffic volumes.

The people (e.g., contractor) listed below will do the work, and they understand the permit's conditions and limitations.

PLEASE PRINT OR TYPE

Name of Person/Firm: _____

Business Address: _____

Phone & email: () _____ () _____

Proposed Work Dates: Start: _____ Finish: _____

Permittee/Agent Signature: _____ Date: _____

Printed Name: _____ Title: _____

Date Permit Issued: _____ Date Permit Expires: _____

FOR USE BY THE CORPS OF ENGINEERS

PM: Colin M. Greenan

Submittals Required: Payment of \$803,816.63 to the Maine Natural Resource Conservation Program

Inspection Recommendation: Random Individual Permit Compliance



**NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND
REQUEST FOR APPEAL**

Applicant: Maine Turnpike Authority c/o Sean Donohue		File Number: NAE-2019-00701	Date: August 21, 2019
Attached is:			See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)		A
X	PROFFERED PERMIT (Standard Permit or Letter of permission)		B
	PERMIT DENIAL		C
	APPROVED JURISDICTIONAL DETERMINATION		D
X	PRELIMINARY JURISDICTIONAL DETERMINATION		E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at <http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/appeals.aspx> or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **OBJECT:** If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **APPEAL:** If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- **ACCEPT:** You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- **APPEAL:** If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:

If you only have questions regarding the appeal process you may also contact:

Mr. James W. Haggerty
Regulatory Program Manager (CENAD-PD-OR)
U.S. Army Corps of Engineers
Fort Hamilton Military Community
301 General Lee Avenue
Brooklyn, New York 11252-6700
Telephone number: 347-370-4650

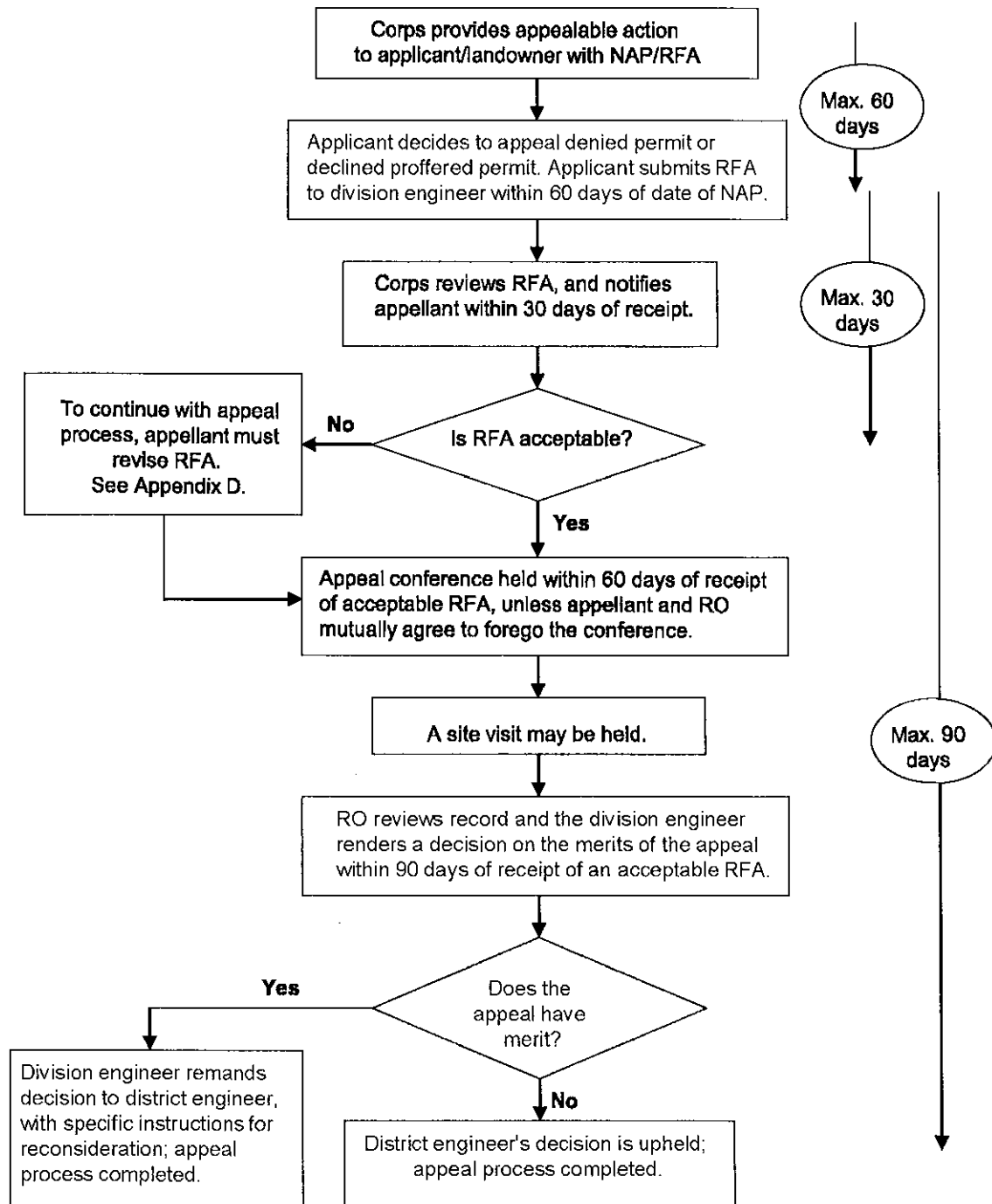
RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

Signature of appellant or agent.

Date:

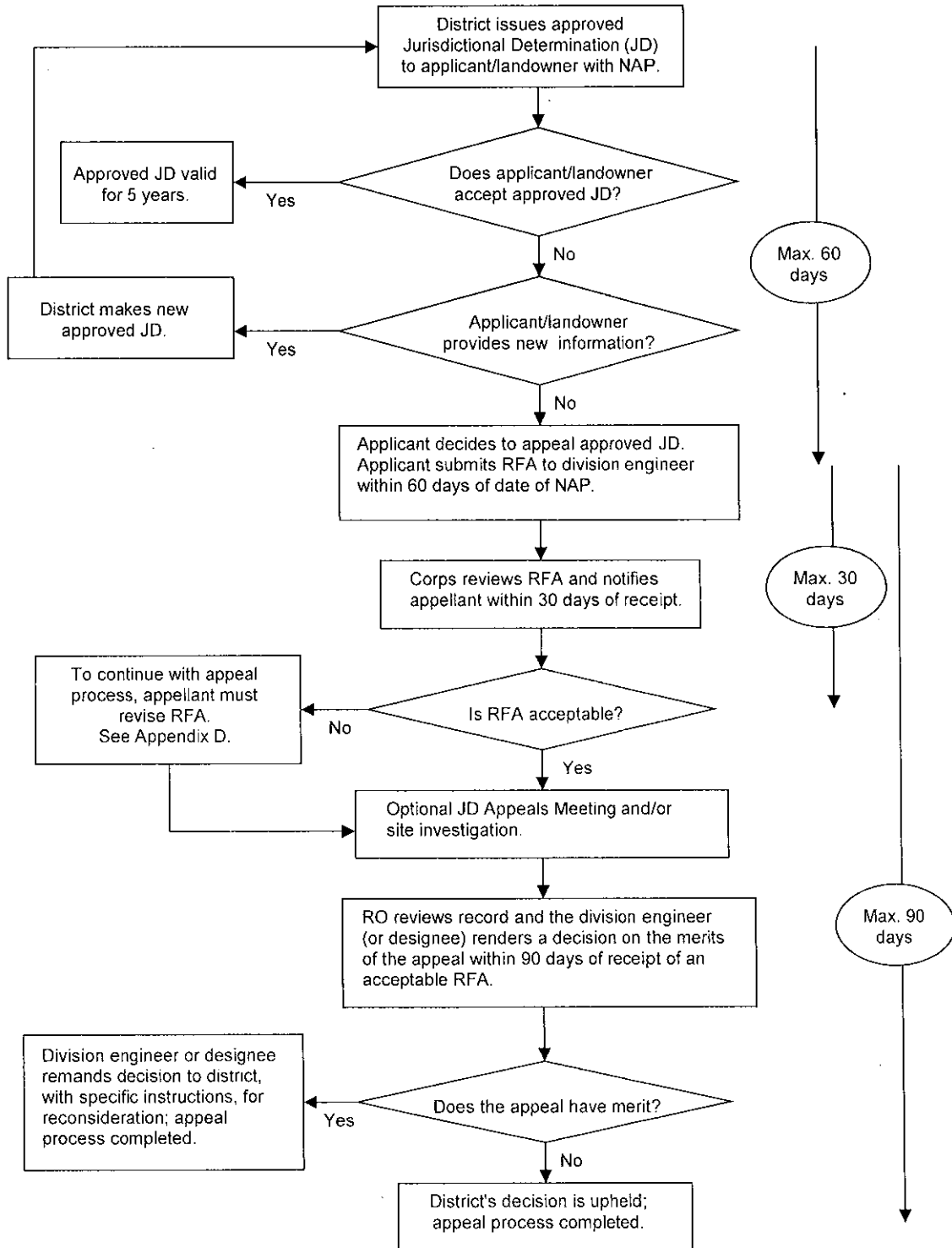
Telephone number:

Administrative Appeal Process for Permit Denials and Proffered Permits



NOTE: If new information is provided to the Corps, the applicant will be asked if the applicant wishes to revise the project or record. If so, the appeal will be withdrawn and the case returned to the District for appropriate action. If not, then the Division Engineer will rule on the merits of the appeal based on the administrative record without consideration of the new information. However, the new information may cause the District Engineer to take action under 33 CFR 325.7, independent of the appeal process.

Administrative Appeal Process for Approved Jurisdictional Determination



Appendix C

APPENDIX D

MS4 Stormwater Awareness Plan
MS4 Targeted BMP Adoption Plan

Maine Turnpike Authority

MS4 Stormwater Awareness Plan

Developing and implementing a Best Management Plan (BMP) Adoption Plan is a requirement of the Maine Department of Environmental Protection's (DEP's) *General Permit for the Discharge of Stormwater from Maine Department of Transportation (MaineDOT) and Maine Turnpike Authority (MTA) Municipal Separate Storm Sewer Systems (MS4s)*. Since MTA is subject to this MS4 permit and its six *Minimum Control Measures (MCMs)*, *Part IV(H)(1)(a)(ii)* requires MTA to conduct Public Education and Outreach (MCM #1) efforts that **encourage “employees and contractors to utilize BMPs that minimize stormwater pollution.”**

1.0 PERMIT LANGUAGE

Part IV(H)(1) of the MS4 Permit establishes three goals for *MCM #1 - Public Education and Outreach on Stormwater Impacts*. These include the following:

1. *To raise awareness that polluted stormwater runoff is one of the most significant sources of water quality problems for Maine's waters;*
2. *To motivate staff and contractors to use Best Management Practices (BMPs) which reduce polluted stormwater runoff; and*
3. *To reduce polluted stormwater runoff as a result of increased awareness and utilization of BMPs.*

In addition to continuing outreach efforts from the previous MS4 Permit (e.g., 5-year cycle)¹, MTA must satisfy these three goals by encouraging employees and contractors to use BMPs that minimize stormwater pollution as part of this Targeted BMP Adoption Plan. The progress and effectiveness of the Plan and associated efforts must then be evaluated and included in each annual report submitted to Maine DEP in accordance with *Part IV(J)* of the MS4 Permit. As part of this evaluation, MTA must include an assessment of process indicators and impact indicators to evaluate efforts in meeting these goals. In the fifth annual report, the BMP Adoption Plan shall be reviewed fully and include analysis of the process and impact indicators.

2.0 COVERAGE AREA

This plan has been developed for implementation by MTA to meet MS4 Permit requirements for Urbanized Areas (UAs) within MTA's right-of-way (ROW).

Process indicators are related to the execution of the program, such as (1) percent or number of employees who attend a training session; or (2) completion of a particular action item (e.g., distributing posters to employee work place and/or contractor job site).

Impact indicators are related to the achievement of the goals and objectives of the program, such as (1) observable/measurable effects on behavior; or (2) percent or number of employees to describe sources of storm water pollution, proper spill response, or maintenance of a BMP.

¹ Public education and outreach efforts continued from the previous MS4 permit cycle include (but are not limited to) conducting annual stormwater pollution prevention/spill prevention control and countermeasures (SPCC) training to MTA maintenance and engineering employees, as well as other Measurable Goals that can be found in MTA's Stormwater Program Management Plan (SPMP) dated December 2013.

3.0 OBJECTIVE

The objective of this Stormwater Awareness Plan is to raise awareness among MTA employees and contractors regarding stormwater issues. For example, stormwater runoff is one of the most significant sources of water quality problems for Maine's waters.

The goal of the Stormwater Awareness Plan is to provide information relative to stormwater impacts in an effort to raise awareness of MTA employees. For example, 100% of Highway Maintenance employees and Engineering Inspectors will attend training sessions at which stormwater issues and impacts will be addressed. Additionally, MTA will also work to raise awareness among MTA employees in other departments, such as Fare Collections by providing abbreviated Stormwater/Spill Prevention and Response training to supervisors and managers who will in turn inform additional employees regarding stormwater issues relative to MTA operations.

The goal of this Plan is to also raise awareness of contractors by providing this Plan, as well as the Targeted BMP Adoption Plan (which is designed to motivate employees and contractors to use BMPs to reduce polluted stormwater runoff), prior to starting work on MTA projects.

4.0 MESSAGE

The message MTA will strive to impart on employees and contractors will relate to the potential impacts their activities may have on stormwater runoff and water quality in Maine. The message statement is:

“The effect stormwater runoff has on the water quality of Maine waters is impacted by the level of effort put into the construction, operation, and maintenance of MTA’s stormwater infrastructure. Polluted water entering the storm drain system and discharged untreated directly to waterbodies is used for drinking, fishing, and swimming, which impacts everyone in Maine.”

In addition to the Stormwater Awareness Plan message, the target audience will be informed of authorized non-stormwater discharges allowed by the permit provided they do not contribute to a violation of water quality standards, as determined by the DEP. These include the following:

- Landscape irrigation
- Diverted stream flows
- Rising ground waters
- Uncontaminated ground water infiltration (as defined at 40 CFR 35.2005(20))
- Uncontaminated pumped ground water
- Uncontaminated flows from foundation drains
- Air conditioning and compressor condensate
- Irrigation water
- Flows from uncontaminated springs
- Uncontaminated water from crawl space pumps
- Uncontaminated flows from footing drains
- Lawn watering runoff
- Flows from riparian habitats and wetlands
- Residual street wash water (where spills/leaks of toxic or hazardous materials have not occurred, unless all spilled material has been removed and detergents are not used)
- Hydrant flushing and fire fighting activity runoff
- Water line flushing and discharges from potable water sources

4.1 OUTREACH TOOL(S) AND DISTRIBUTION

This Stormwater Awareness Plan and message will be provided to each MTA employee at annual training sessions and also to each contractor before commencement of work, in addition to the Targeted BMP Adoption Plan.

MTA has established or will rely on a number of outreach tools including the following:

- Existing stormwater training programs
 - For MTA employees, the internal training program will be evaluated annually (and updated, as needed) to include storm water topics in order to assess process and impact indicators; and
 - For contractors, MTA continues to require an On-Site Responsible Party (OSRP) certified by DEP's NPS Training Program to be knowledgeable of stormwater, specifically erosion prevention, sedimentation control and other potential impacts to water quality in Maine.
- Stormwater information packages to raise awareness and encourage utilization of targeted BMPs
 - For MTA employees, information will be provided during annual and supplemental training sessions. Informational packages may also be provided via MTA's newsletters and memos posted to employee bulletin boards, as well as through employee meetings, including quarterly Environmental Health & Safety Committee meetings.
 - For contractors, MTA will continue to include contractual requirements provided in the standard contract language that establishes the anticipated expectations for performance and payment. Stormwater information will be discussed or provided to contractors prior to starting work (e.g., at Pre-Construction meetings).

4.2 TIMELINE AND IMPLEMENTATION SCHEDULE

The timeline and implementation schedule is determined by:

- The training schedule established each year for MTA employees; and
- The solicitation and project award notices each year.

MTA has established a representative training schedule for each year and is similar to the table below:

Date	Training Type
April	Erosion and Sediment Control (ESC) and Stormwater Pollution Prevention for highway maintenance Supervisors and Foremen
May - June	Spill Prevention Control and Countermeasures Plan (SPCC), Stormwater and Erosion and Sediment Control (ESC) for MTA maintenance and engineering employees.
October	Spill Prevention Control and Countermeasures Plan (SPCC) and Stormwater for Fare Collections

The training sessions are designed to meet the goal of increasing awareness, as well as encouraging utilization of targeted BMPs to reduce stormwater runoff and potential impacts. In addition to these training sessions, there may be supplemental training sessions as needed and/or new information posters about stormwater BMPs posted at MTA facilities. Newsletters including stormwater information may also be sent each year to employees.

For contractors, MTA's requirement to have an OSRP certified by DEP's NPS Program ensures that the contractor is aware of stormwater related issues. In addition, MTA distributes this Stormwater Awareness Plan to contractors.

4.3 RESPONSIBLE PARTY

The primary responsible party at MTA is the Environmental Services Coordinator, John Branscom. The Environmental Services Coordinator may also rely on the following:

- MTA Supervisors, Foremen, Inspectors and/or other personnel to inform MTA employees and contractors of the targeted BMPs to be utilized;
- An environmental consulting firm, such as GZA GeoEnvironmental, Inc, to ensure MTA’s employees are trained as defined by the Plan; and
- A design engineering firm, such as HNTB, who administer construction contracts, to ensure the Plan is properly implemented by the contractors.

4.4 EVALUATION PROTOCOL

MTA training is documented with attendance sign-in sheets, exam scores, in-class workshops and evaluation forms. A training database is maintained with information gathered from employees during each training session.

Process Indicators: Assessment of the program execution will be included in the annual report. The following topics will be reported for MTA employees:

1. Number of employees that attended training; and
2. Average exam scores for attendees.

Impact Indicators: Gauging the achievement of goals and objectives of the program will be included in the annual report. These will be addressed by the following behavioral change questions:

1. Number or percentage of employees to identify the goals of MCM #1 correctly;
2. Number or percentage of employees to identify source(s) of storm water pollution;
3. Number or percentage of employees to identify and differentiate between structural and non-structural BMPs; and
4. Number or percentage of employees to demonstrate an applied knowledge of BMP-specific information.

Process and impact indicators for contractors will be tracked by documenting the pre-construction meetings when this Plan and the Targeted BMP Adoption Plan are provided to each contractor and the contractor, in turn, provides MTA with the certification for their OSRP for the project.

4.5 PLAN MODIFICATION

This Stormwater Awareness Plan may require modification if evaluation data shows that efforts are not effective. Should modifications be needed, the plan will be revised or a new plan will be developed.

I have read and accept the policies outlined in this Stormwate Awareness Plan as required by MTA’s MS4 Permit.

Contractor Signature of Acknowledgement

Date

Printed Name

Project Number

Maine Turnpike Authority

MS4 Targeted BMP Adoption Plan

Developing and implementing a Best Management Plan (BMP) Adoption Plan is a requirement of the Maine Department of Environmental Protection's (DEP's) *General Permit for the Discharge of Stormwater from Maine Department of Transportation (MaineDOT) and Maine Turnpike Authority (MTA) Municipal Separate Storm Sewer Systems (MS4s)*. Since MTA is subject to this MS4 permit and its six *Minimum Control Measures (MCMs)*, *Part IV(H)(1)(a)(ii)* requires MTA to conduct Public Education and Outreach (MCM #1) efforts that **encourage** "*employees and contractors to utilize BMPs that minimize stormwater pollution.*"

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- 3. To reduce polluted stormwater runoff as a result of increased awareness and utilization of BMPs.*

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2.0 COVERAGE AREA

This plan has been developed for implementation by MTA to meet MS4 Permit requirements for Urbanized Areas (UAs) within MTA's right-of-way (ROW).

Process indicators are related to the execution of the program, such as (1) percent or number of employees who attend a training session; or (2) completion of a particular action item (e.g., distributing posters to employee work place and/or contractor job site).

Impact indicators are related to the achievement of the goals and objectives of the program, such as (1) observable/measurable effects on behavior; or (2) percent or number of employees to describe sources of storm water pollution, proper spill response, or maintenance of a BMP.

¹ Public education and outreach efforts continued from the previous MS4 permit cycle include (but are not limited to) conducting annual stormwater pollution prevention/spill prevention control and countermeasures (SPCC) training to MTA maintenance and engineering employees, as well as other Measurable Goals that can be found in MTA's Stormwater Program Management Plan (SPMP) dated December 2013.

3.0 OBJECTIVE

The objective of this Targeted BMP Adoption Plan is to educate MTA's employees and contractors to use BMPs which reduce polluted stormwater runoff within UA.

The goal of the BMP Adoption Plan is to target BMPs in the MaineDOT BMP Manual to be utilized by employees and contractors that minimize stormwater pollution during construction activities, such as:

- (1) Installing silt fence prior to land disturbance; and
- (2) Ensuring that hay mulch is applied to soil at the end of each work day.

For MTA employees, focus will also be given to targeting BMPs relevant to transportation-related maintenance and good housekeeping activities, such as:

- (1) Regular sweeping of the mainline and peripheral facilities;
- (2) Annual catch basin clean-outs and sediment removal;
- (3) As needed ditch cleaning and repair;
- (4) On-going culvert maintenance and litter removal.

Contractors are also encouraged to utilize BMPs in accordance with standard construction contract language (e.g., Special Provision 656), as well as the MaineDOT BMP Manual.

4.0 MESSAGE

The message MTA will strive to impart on employees and contractors will relate to the impacts their activities have on stormwater runoff and the importance of BMPs. The message statement is:

“Implementing appropriate BMPs, as described in MaineDOT’s Stormwater BMPs Manual, to all MTA related activities will help to minimize stormwater pollutants introduced to Maine’s waterbodies.”

4.1 OUTREACH TOOL(S) AND DISTRIBUTION

Targeted BMPs are included in the MaineDOT BMP Manual that is available at each MTA maintenance facility and referenced in standard contract language for contractors.

MTA has established or will rely on a number of outreach tools including the following:

- Existing stormwater training programs
 - For MTA employees, the internal training program will be evaluated annually (and updated, as needed) to include storm water topics in order to assess process and impact indicators; and
 - For contractors, MTA continues to require an On-Site Responsible Party (OSRP) certified by DEP’s NPS Training Program to be knowledgeable in erosion prevention and sedimentation control.
- Existing standard contract language
 - Requires contractors to maintain a certified OSRP on-site who has authority to implement BMPs appropriately; and
 - Specifies that contractors must utilize MaineDOT’s BMP Manual, as well as other BMPs, to ensure construction site runoff is minimized.
- Stormwater information packages to raise awareness and encourage utilization of targeted BMPs
 - For MTA employees, information will be provided during annual and supplemental training sessions. Informational packages may also be provided via MTA’s newsletters

and memos posted to employee bulletin boards, as well as through employee meetings, including quarterly Environmental Health & Safety Committee meetings.

- For contractors, MTA will continue to include contractual requirements provided in the standard contract language that establishes the anticipated expectations for performance and payment. This Target BMP Adoption Plan will also be provided to contractors prior to starting work (e.g., at Pre-Construction meetings).

4.2 TIMELINE AND IMPLEMENTATION SCHEDULE

The timeline and implementation schedule is determined by:

- The training schedule established each year for MTA employees; and
- The solicitation and project award notices each year.

MTA has established a representative training schedule for each year and is similar to the table below.

Date	Training Type
April	Erosion and Sediment Control (ESC) and Stormwater Pollution Prevention for Highway Maintenance Supervisors and Foremen
May - June	Spill Prevention Control and Countermeasures Plan (SPCC), Stormwater and Erosion and Sediment Control (ESC) for MTA maintenance and engineering employees.

In addition to the training sessions above, there may be supplemental training sessions as needed and/or new information posters about stormwater BMPs posted at MTA facilities. Newsletters including stormwater information may also be sent each year to employees.

For contractors, targeted BMPs are already being implemented in accordance with contract language and the MaineDOT BMP Manual. In addition, MTA distributes this Targeted BMP Adoption Plan to contractors.

4.3 RESPONSIBLE PARTY

The primary responsible party at MTA is the Environmental Services Coordinator, John Branscom. The Environmental Services Coordinator may also rely on the following:

- MTA Supervisors, Foremen, Inspectors and/or other personnel to inform MTA employees and contractors of the targeted BMPs to be utilized;
- An environmental consulting firm, such as GZA GeoEnvironmental, Inc, to ensure MTA’s employees are trained as defined by the Plan; and
- A design engineering firm, such as HNTB, who administer construction contracts, to ensure the Plan is properly implemented by the contractors.

5.0 EVALUATION PROTOCOL

MTA training is documented with attendance sign-in sheets, exam scores, in-class workshops and evaluation forms. A training database is maintained with information gathered from employees during each training session.

Process Indicators: Assessment of the program execution will be included in the annual report. The following topics will be reported for MTA employees:

1. Number of employees that attended training; and
2. Average exam scores for attendees.

Impact Indicators: Gauging the achievement of goals and objectives of the program will be included in the annual report. These will be addressed by the following behavioral change questions:

1. Number or percentage of employees to identify the goals of MCM #1 correctly;

2. Number or percentage of employees to identify source(s) of storm water pollution;
3. Number or percentage of employees to identify and differentiate between structural and non-structural BMPs; and
4. Number or percentage of employees to demonstrate an applied knowledge of BMP-specific information.

Process and impact indicators for contractors will be tracked and evaluated based on daily and/or weekly inspections conducted on-site.

6.0 PLAN MODIFICATION

This Targeted BMP Adoption Plan may require modification if evaluation data shows that efforts are not effective. Should modifications be needed, the plan will be revised or a new plan will be developed.

I have read and accept the policies outlined in this Stormwater Awareness Plan as required by MTA's MS4 Permit.

Contractor Signature of Acknowledgement

Date

Printed Name

Project Number

APPENDIX E

SUBSURFACE WASTEWATER
DISPOSAL SYSTEM APPLICATION

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Maine Dept. Health & Human Services
Div of Environmental Health, 11 SHS
(207) 287-2070 FAX (207) 287-4172

PROPERTY LOCATION

City, Town, or Plantation SCARBOROUGH

Street or Road EXIT 45; INTERSTATE 95

Subdivision, Lot # SOUTHBOUND ENTRY TOLL PLAZA

>>CAUTION: LPI APPROVAL REQUIRED<<

Town/City _____ Permit # _____

Date Permit Issued ___ / ___ / ___ Fee \$ _____ Double Fee Charged []

_____ L.P.I.# _____

Local Plumbing Inspector Signature _____

Fee \$ _____ State Fee _____ Fee \$ _____ Locally Adopted Fee _____

Copy: [] Owner [] Town [] State

OWNER/APPLICANT INFORMATION

Name (last, first, MI) HNTB CORPORATION Owner Applicant

Mailing Address of HNTB CORPORATION
BRUCE MUMGER
340 COUNTY ROAD; SUITE 6-C
WESTBROOK, ME 04092
Applicant

Daytime Tel. # 228-0896 BMUNGER@HNTB.COM

The Subsurface Wastewater Disposal System shall not be installed until a Permit is issued by the Local Plumbing Inspector. The Permit shall authorize the owner or installer to install the disposal system in accordance with this application and the Maine Subsurface Wastewater Disposal Rules.

Municipal Tax Map # _____ Lot # _____

OWNER OR APPLICANT STATEMENT

I state and acknowledge that the information submitted is correct to the best of my knowledge and understand that any falsification is reason for the Department and/or Local Plumbing Inspector to deny a permit.

CAUTION: INSPECTION REQUIRED

I have inspected the installation authorized above and found it to be in compliance with the Subsurface Wastewater Disposal Rules Application.

(1st) Date Approved _____

Signature of Owner/Applicant _____

Date _____

Local Plumbing Inspector Signature _____

(2nd) Date Approved _____

PERMIT INFORMATION

TYPE OF APPLICATION <input checked="" type="checkbox"/> 1. First Time System <input type="checkbox"/> 2. Replacement System Type Replaced: _____ Year Installed: _____ <input type="checkbox"/> 3. Expanded System <input type="checkbox"/> a. <25% Expansion <input type="checkbox"/> b. >25% Expansion <input type="checkbox"/> 4. Experimental System <input type="checkbox"/> 5. Seasonal Conversion	THIS APPLICATION REQUIRES <input checked="" type="checkbox"/> 1.No Rule Variance <input type="checkbox"/> 2.First Time System Variance <input type="checkbox"/> a. Local Plumbing Inspector Approval <input type="checkbox"/> b. State & Local Plumbing Inspector Approval <input type="checkbox"/> 3.Replacement System Variance <input type="checkbox"/> a. Local Plumbing Inspector Approval <input type="checkbox"/> b. State & Local Plumbing Inspector Approval <input type="checkbox"/> 4.Minimum Lot Size Variance <input type="checkbox"/> 5.Seasonal Conversion Permit	DISPOSAL SYSTEM COMPONENTS <input checked="" type="checkbox"/> 1. Complete Non-Engineered System <input type="checkbox"/> 2. Primitive System(graywater & alt toilet) <input type="checkbox"/> 3. Alternative Toilet, specify: _____ <input type="checkbox"/> 4. Non-Engineered Treatment Tank (only) <input type="checkbox"/> 5. Holding Tank, _____ gallons <input type="checkbox"/> 6. Non-Engineered Disposal Field (only) <input type="checkbox"/> 7. Separated Laundry System <input type="checkbox"/> 8. Complete Engineered System(2000gpd+) <input type="checkbox"/> 9. Engineered Treatment Tank (only) <input type="checkbox"/> 10. Engineered Disposal Field (only) <input type="checkbox"/> 11. Pre-treatment, specify: _____ <input type="checkbox"/> 12. Miscellaneous components
SIZE OF PROPERTY N/A <input type="checkbox"/> SQ. FT. <input checked="" type="checkbox"/> ACRES	DISPOSAL SYSTEM TO SERVE <input type="checkbox"/> 1. Single Family Dwelling Unit, No. of Bedrooms: _____ <input type="checkbox"/> 2. Multiple Family Dwelling, No of Units: _____ <input checked="" type="checkbox"/> 3. Other: <u>TOLL BOOTH</u> (specify) Current Use <input type="checkbox"/> Seasonal <input type="checkbox"/> Year Round <input checked="" type="checkbox"/> Undeveloped	TYPE OF WATER SUPPLY <input type="checkbox"/> 1. Drilled Well <input type="checkbox"/> 2. Dug Well <input type="checkbox"/> 3. Private <input checked="" type="checkbox"/> 4. Public <input type="checkbox"/> 5. Other: _____
SHORELAND ZONING <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

DESIGN DETAILS (SYSTEM LAYOUT SHOWN ON PAGE 3)

TREATMENT TANK H-20 RATED IF IN PARKING <input checked="" type="checkbox"/> 1. Concrete <input type="checkbox"/> a. Regular <input type="checkbox"/> b. Low Profile <input type="checkbox"/> 2. Plastic <input type="checkbox"/> 3. Other: _____ CAPACITY: <u>1000</u> GAL. SEE NOTE ON PAGE 3	DISPOSAL FIELD TYPE & SIZE <input type="checkbox"/> 1. Stone Bed <input type="checkbox"/> 2. Stone Trench <input checked="" type="checkbox"/> 3. Proprietary Device <input checked="" type="checkbox"/> a. Cluster array <input type="checkbox"/> c.Linear <input type="checkbox"/> b. Regular <input checked="" type="checkbox"/> d. H-20 loaded <input type="checkbox"/> 4. Other: _____ SIZE: <u>256</u> sq. ft. <input type="checkbox"/> lin. ft. 4 H-20 RATED CONCRETE CHAMBER UNITS	GARBAGE DISPOSAL UNIT <input checked="" type="checkbox"/> 1. No <input type="checkbox"/> 2. Yes <input type="checkbox"/> 3. Maybe If Yes or Maybe, specify one below: <input type="checkbox"/> a. Multi-compartment tank <input type="checkbox"/> b. _____ tanks in series <input type="checkbox"/> c. Increase in tank capacity <input type="checkbox"/> d. Filter on tank outlet	DESIGN FLOW <u>60</u> gallons per day BASED ON: <input type="checkbox"/> 1. Table 4A (dwelling unit(s)) <input checked="" type="checkbox"/> 2. Table 4C (other facilities) SHOW CALCULATIONS for other facilities PROPOSED TOLL BOOTH UP TO 4 EMPLOYEES AT 15 GALLONS PER DAY EACH
SOIL DATA & DESIGN CLASS PROFILE <u>12</u> / <u>B</u> CONDITION _____ at Observation Hole # <u>TB 7A</u> Depth _____ " of Most Limiting Soil Factor _____	DISPOSAL FIELD SIZING <input checked="" type="checkbox"/> 1. Medium - 2.6 sq.ft./gpd <input type="checkbox"/> 2. Medium-Large - 3.3 sq.ft./gpd <input type="checkbox"/> 3. Large - 4.1 sq.ft./gpd <input type="checkbox"/> 4. Extra-Large - 5.0 sq.ft./gpd	EFFLUENT/EJECTOR PUMP H-20 RATED IF IN PARKING <input type="checkbox"/> 1. Not required <input type="checkbox"/> 2. May be required <input checked="" type="checkbox"/> 3. Required Specify only for engineered systems: SEE NOTE ON PAGE 3 DOSE: _____ gallons	<input type="checkbox"/> 3. Section 4G (meter readings) ATTACH WATER-METER DATA LATITUDE AND LONGITUDE at center of disposal area Lat. <u>N43</u> d <u>37</u> m <u>46.89</u> s Lon. <u>W70</u> d <u>20</u> m <u>50.60</u> s if g.p.s., state margin of error

SITE EVALUATOR STATEMENT

I certify that on 4/29/2020 (date) I completed a site evaluation on this property and state that the data reported are accurate and that the proposed system is in compliance with the Subsurface Wastewater Disposal Rules (10-144A CMR 241).

Site Evaluator Signature _____

352
SE #

Date 7/28/2020

BRADY A. FRICK

(207) 839-5563

BRADY@ALBERTFRICK.COM

Site Evaluator Name Printed

Telephone Number

E-mail Address

ALBERT FRICK ASSOCIATES - 380B MAIN STREET, GORHAM, MAINE 04038 - (207) 839-5563
 Note: Changes to or deviations from the design should be confirmed with the Site Evaluator

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SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Department of Health and Human Services
 Division of Environmental Health
 (207) 287-2070 FAX (207) 287-4172

Town, City, Plantation
SCARBOROUGH

Street, Road Subdivision
EXIT 45; INTERSTATE 95 (SOUTHBOUND ENTRY)

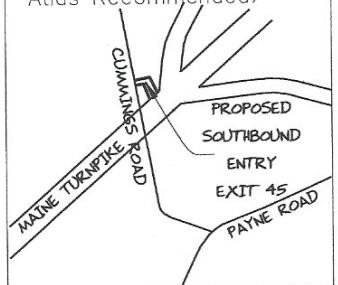
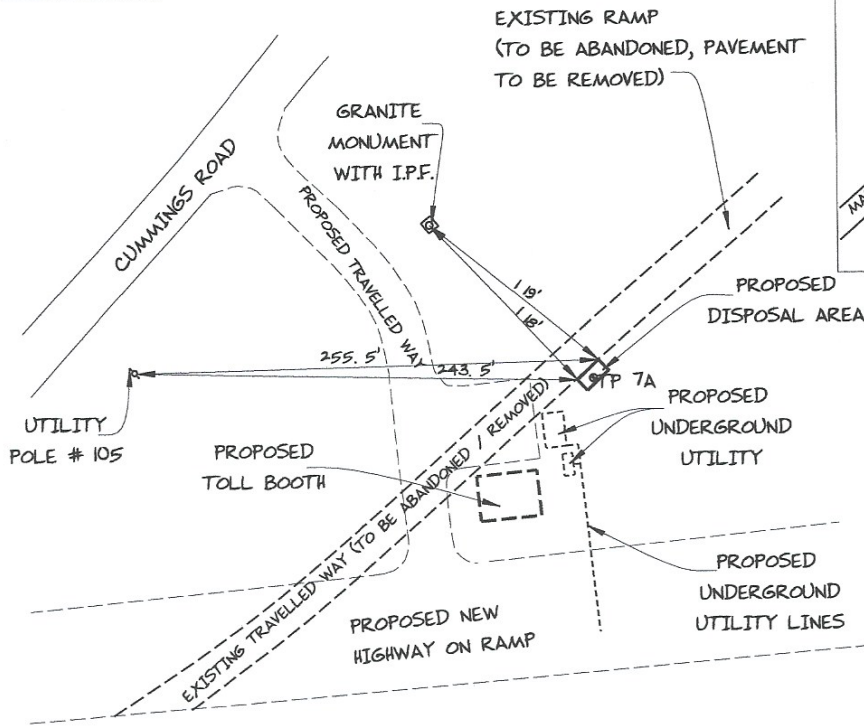
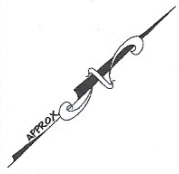
Owner's Name
HNTB CORPORATION

PROPERTY INFORMATION AND
 TIE POINTS PROVIDED BY HNTB.

SITE PLAN

Scale 1" = 100 Ft.
 or as shown

SITE LOCATION PLAN
 (Attach Map from Maine
 Atlas Recommended)



SOIL DESCRIPTION AND CLASSIFICATION (Location of Observation Holes Shown Above)

Observation Hole TP 7A Test Pit Boring
 " Depth of Organic Horizon Above Mineral Soil

Observation Hole _____ Test Pit Boring
 " Depth of Organic Horizon Above Mineral Soil

FILL PRE-DATES 1995

DEPTH BELOW MINERAL SOIL SURFACE (inches)	Texture	Consistency	Color	Mottling
0	GRAVEL	COMPACTED	DARK BROWN	
10	SAND (FILL)	FRIABLE TO LOOSE	LIGHT YELLOWISH BROWN	NONE EVIDENT
20				
30				
40				
50				

Soil Classification 12 Profile	Slope B Condition	Limiting Factor 0-3 %	<input type="checkbox"/> Ground Water <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock <input type="checkbox"/> Pit Depth
---	--------------------------------	---------------------------------	---

DEPTH BELOW MINERAL SOIL SURFACE (inches)	Texture	Consistency	Color	Mottling
0				
10				
20				
30				
40				
50				

Soil Classification	Slope	Limiting Factor	<input type="checkbox"/> Ground Water <input type="checkbox"/> Restrictive Layer <input type="checkbox"/> Bedrock <input type="checkbox"/> Pit Depth
Profile	Condition	%	

Site Evaluator Signature

352
SE #

Date

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SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Department of Health and Human Services
 Division of Environmental Health
 (207) 287-2070 FAX (207) 287-4172

Town, City, Plantation

Street, Road, Subdivision

Owner's Name

SCARBOROUGH

EXIT 45; INTERSTATE 95 (SOUTHBOUND ENTRY)

HNTB CORPORATION

SCALE 1" = 20 FT.

NOTE: THOROUGHLY SCARIFY UNDER ENTIRE DISPOSAL FIELD, SHOULDER AREA, & FILL EXTENSION AREA PRIOR TO FILL PLACEMENT; THEN BLEND FIRST 6" LIFT OF FILL INTO EXISTING SOIL SURFACE TO PROMOTE MIXING

SUBSURFACE WASTEWATER DISPOSAL PLAN

PROVIDE RISERS AND COVERS OVER SEPTIC TANK AND PUMP STATION ACCESS PORTS (GROUT ALL SEAMS TO PREVENT SURFACE WATER INFILTRATION)

NEW 1000 GALLON CONCRETE SEPTIC TANK LOCATE WHERE FEASIBLE, 8' MIN. FROM BUILDING STRUCTURE (ASSURE WATERTIGHTNESS) IF SUBJECT TO VEHICULAR TRAFFIC, ASSURE H-20 RATING

EXISTING RAMP (TO BE ABANDONED, PAVEMENT TO BE REMOVED)

PROVIDE BOTTOM FEED DISTRIBUTION BOX, INSULATE WITH MIN. 2" INSULATION PER CODE

CROSS SECTION

EXISTING GRADE AT CORNER

PROPOSED PAVED PARKING

PROPOSED UNDERGROUND UTILITY

PROPOSED TOLL BOOTH

PUMP STATION: 3' DIAMETER CONCRETE PUMP TANK WITH SUBMERSIBLE SEWAGE PUMP SIZED PER MANUFACTURER'S SPECIFICATIONS FOR FRICTION/HEAD LOSS. PROVIDE RISER(S) & COVER TO THE SURFACE OF THE GROUND (ASSURE WATERTIGHTNESS)

1 1/2" TO 2" DIA. EFFLUENT LINE BURIED BELOW FROST OR INSULATE TO PROTECT FROM FREEZING (SLEEVE WITH 4" DIA. SCHED 80)

PROPOSED DISPOSAL AREA (4 ROWS OF 4 H-20 RATED CONCRETE CHAMBER UNITS)

UNDERGROUND UTILITY LINES

PROPERTY INFORMATION, TIE POINTS AND CORNER ELEVATIONS PROVIDED BY HNTB.

0 10 20 GRAPHIC SCALE

FILL REQUIREMENTS

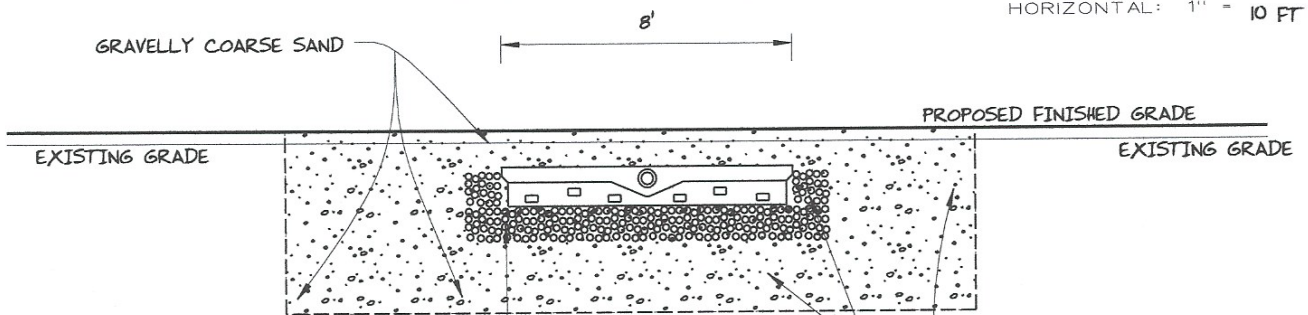
Depth of Fill (Upslope) : 5"
 Depth of Fill (Downslope) : 5"
 DEPTHS AT CROSS-SECTION (shown below)

CONSTRUCTION ELEVATIONS

Finished Grade Elevation
 Top of Distribution Pipe or Proprietary Device
 Bottom of Disposal Area

ELEVATION REFERENCE POINT
 SEE DETAIL BELOW
 Location & Description
 ELEVATIONS PER PLAN BY HNTB
 Reference Elevation is: 0.0" or -----

DISPOSAL AREA CROSS SECTION



SCALE:
 VERTICAL: 1" = 5 FT
 HORIZONTAL: 1" = 10 FT

SCARIFY (SEE NOTE ABOVE)

1 1/2 INCH CLEAN CRUSHED STONE PLACE 12" THICKNESS OF CRUSHED STONE AROUND ENTIRE PERIMETER AND 12" BENEATH CHAMBER UNITS

REMOVE ALL PORTIONS OF UNCONTROLLED FILL MATERIAL ENCOUNTERED TO A MINIMUM DEPTH OF 2' UNDERNEATH STONE AND 5' ALONGSIDE DISPOSAL AREA AND REPLACE WITH CLEAN GRAVELLY COARSE SAND FILL

Site Evaluator Signature

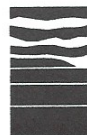
352 SE *

Date

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TOWN	LOCATION	APPLICANT'S NAME
SCARBOROUGH	EXIT 45, INTERSTATE 95	HNTB CORPORATION

- 7) The actual waste water flow or number of bedrooms shall not exceed the design criteria indicated on this application without a re-evaluation of the system as proposed
- 8) The general minimum setbacks between a well (public or private) and septic system serving a single family residence is 100-300 feet, unless the local municipality has a more stringent requirement. A well installed by an abutter within the minimum setback distances prior to the issuance of a permit for the proposed disposal system may void this design.
- 9) When a gravity system is proposed: BEFORE CONSTRUCTION/INSTALLATION BEGINS, the system installer or building contractor shall review the elevations of all points given in this application and the elevation of the existing and/or proposed building drain and septic tank inverts for compatibility to minimum pitch requirements. In gravity systems, the invert of the septic tank(s) outlet(s) should be at least 4 inches above the invert of the distribution box outlet at the disposal area.
- 10) When an effluent pump is required: Pump stations should be sized per manufacturer's specifications to meet lift requirements and friction loss. Provisions shall be made to make certain that surface and ground water does not enter the septic tank or pump station, by sealing/grouting all seams and connections, and by placement of a riser and lid at or above grade. An alarm device warning of a pump failure shall be installed. Also, when pumping is required of a chamber system, install a 'T' connection in the distribution box and place 3 inches of stone or a splash plate in the first chamber. Insulate gravity pipes, pump lines and the distribution box as necessary to prevent freezing.
- 11) On all systems, remove the vegetation, organic duff and old fill material from under the disposal area and any fill extension. Additional fill beyond indicated on plan may be necessary to replace organic matter. On sites where the proposed system is to be installed in natural soil, scarify the bottom and sides of the excavated disposal area with a rake. Do not use wheeled equipment on the scarified soil surface. For systems installed in fill, scarify the native soil by roto-tilling or scarifying with teeth of backhoe to a depth of at least 8 inches over the entire disposal and fill extension area to prevent glazing and to promote fill bonding. Place fill in loose layers no deeper than 8 inches and compact before placing more fill (this ensures that voids and loose pockets are eliminated to minimize the chance of leakage or differential settling). Do not use wheeled equipment on the scarified soil area until after 12 inches of fill is in place. Keep equipment off proprietary devices. Divert the surface water away from the disposal area by ditching or shallow landscape swales.
- 12) Unless noted otherwise, fill shall be gravelly coarse sand, which contains no more than 5% fines (silt and clay). Crushed stone shall be clean and free of any rock dust from the crushing process.
- 13) Do not install systems on loamy, silty, or clayey soils during wet periods since soil smearing/glazing may seal off the soil interface.
- 14) Seed all filled and disturbed surfaces with perennial grass seed, with 4" min. soil or soil amendment mix suitable for growing, then mulch with hay or equivalent material to prevent erosion. Alternatively, bark or permanent landscape mulch may be used to cover system. Woody trees or shrubs are not permitted on the disposal area or fill extensions.
- 15) If an advanced wastewater treatment unit is part of the design, the system shall be operated and maintained per manufacturer's specifications.



Albert Frick Associates, Inc.
 Soil Scientists & Site Evaluators
 380B Main Street Gorham, Maine 04038
 (207) 839-5563



TOWN	LOCATION	APPLICANT'S NAME
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1) The Plumbing and Subsurface Wastewater Disposal Rules adopted by the State of Maine, Division of Health and Human Services pursuant to 22 M.R.S.A. § 42 (the "Rules") are incorporated herein by reference and made a part of this application and shall be consulted by the owner/applicant, the system installer and/or building contractor for further construction details and material specifications. The system Installer should contact Albert Frick Associates, Inc. 839-5563, if there are any questions concerning materials, procedures or designs. The system installer and/or building contractor installing the system shall be solely responsible for compliance with the Rules and with all state and municipal laws and ordinances pertaining to the permitting, inspection and construction of subsurface wastewater disposal systems.

2) This application is intended to represent facts pertinent to the Rules only. It shall be the responsibility of the owner/applicant, system Installer and/or building contractor to determine compliance with and to obtain permits under all applicable local, state and/or federal laws and regulations (including, without limitation, Natural Resources Protection Act, wetland regulations, zoning ordinances, subdivision regulations, Site Location of Development Act and Minimum Lot Size law) before installing this system or considering the property on which the system is to be installed a "buildable" lot. It is recommended that a wetland scientist be consulted regarding wetland regulations. Prior to the commencement of construction/installation, the local plumbing inspector or Code Enforcement Officer shall inform the owner/applicant and Albert Frick Associates, Inc of any local ordinances which are more restrictive than the Rules in order that the design may be amended. All designs are subject to review by local, state and/or federal authorities. Albert Frick Associates, Inc.'s liability shall be limited to revisions required by regulatory agencies pursuant to laws or regulations in effect at the time of preparation of this application.

3) All information shown on this application relating to property lines, well locations, subsurface structures and underground facilities (such as utility lines, drains, septic systems, water lines, etc.) are based upon information provided by the owner/applicant and has been relied upon by Albert Frick Associates, Inc. in preparing this application. The owner/applicant shall review this application prior to the start of construction and confirm this information. Well locations on abutting properties but not readily visible above grade should be confirmed by the owner/applicant prior to system installation to assure minimum setbacks.

4) Installation of a garbage (grinder) disposal is not recommended. If one is installed, an additional 1000 gallon septic tank or a septic tank filter shall be connected in series to the proposed septic tank. Risers and covers should be installed over the septic tank outlet per the "Rules" to allow for easy maintenance of filter.

5) The septic tank should be pumped within two years of installation and subsequently as recommended by the pump service, but in no event should the septic tank be pumped less often than every three years.

The system user shall avoid introducing kitchen grease or fats into this system. Chemicals such as septic tank cleaners and/or chlorine or water treatment backwash and controlled or hazardous substances shall not be disposed of in this system. Additives such as yeast or enzymes are discouraged, since they have not been proven to extend system life.

6) All septic tanks, pump stations and additional treatment tanks shall be installed to prevent ground water and surface water infiltration. Risers and covers should be properly installed to provide access while preventing surface water intrusion to within 6" of a finished ground surface.

Vehicular traffic over disposal system is prohibited unless specifically designed with H-20 rated components.

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Maine Dept. Health & Human Services
Div of Environmental Health, 11 SHS
(207) 287-2070 FAX (207) 287-4172

PROPERTY LOCATION		>>CAUTION: LPI APPROVAL REQUIRED<<	
City, Town, or Plantation	SOUTH PORTLAND	Town/City _____	Permit # _____
Street or Road	EXIT 45; INTERSTATE 95	Date Permit Issued ___/___/___	Fee \$ _____ Double Fee Charged []
Subdivision, Lot #		_____	L.P.I.# _____
OWNER/APPLICANT INFORMATION		Local Plumbing Inspector Signature _____	
Name (last, first, MI)	HNTB CORPORATION <input type="checkbox"/> Owner <input checked="" type="checkbox"/> Applicant	Fee \$ _____ State Fee _____	Fee \$ _____ Locally Adopted Fee _____
Mailing Address of Applicant	HNTB CORPORATION BRUCE MUNGER 340 COUNTY ROAD, SUITE 6-C WESTBROOK, ME 04092	Copy: [] Owner [] Town [] State	
Daytime Tel. #	228-0896 BMUNGER@HNTB.COM	The Subsurface Wastewater Disposal System shall not be installed until a Permit is issued by the Local Plumbing Inspector. The Permit shall authorize the owner or installer to install the disposal system in accordance with this application and the Maine Subsurface Wastewater Disposal Rules.	
OWNER OR APPLICANT STATEMENT		CAUTION: INSPECTION REQUIRED	
I state and acknowledge that the information submitted is correct to the best of my knowledge and understand that any falsification is reason for the Department and/or Local Plumbing Inspector to deny a permit.		I have inspected the installation authorized above and found it to be in compliance with the Subsurface Wastewater Disposal Rules Application.	
Signature of Owner/Applicant _____ Date _____		Municipal Tax Map # _____ Lot # _____	
		(1st) Date Approved _____	
		Local Plumbing Inspector Signature _____ (2nd) Date Approved _____	

PERMIT INFORMATION		
TYPE OF APPLICATION <input checked="" type="checkbox"/> 1. First Time System <input type="checkbox"/> 2. Replacement System Type Replaced: _____ Year Installed: _____ <input type="checkbox"/> 3. Expanded System <input type="checkbox"/> a. <25% Expansion <input type="checkbox"/> b. >25% Expansion <input type="checkbox"/> 4. Experimental System <input type="checkbox"/> 5. Seasonal Conversion	THIS APPLICATION REQUIRES <input checked="" type="checkbox"/> 1.No Rule Variance <input type="checkbox"/> 2.First Time System Variance <input type="checkbox"/> a. Local Plumbing Inspector Approval <input type="checkbox"/> b. State & Local Plumbing Inspector Approval <input type="checkbox"/> 3.Replacement System Variance <input type="checkbox"/> a. Local Plumbing Inspector Approval <input type="checkbox"/> b. State & Local Plumbing Inspector Approval <input type="checkbox"/> 4.Minimum Lot Size Variance <input type="checkbox"/> 5.Seasonal Conversion Permit	DISPOSAL SYSTEM COMPONENTS <input checked="" type="checkbox"/> 1. Complete Non-Engineered System <input type="checkbox"/> 2. Primitive System(graywater & alt toilet) <input type="checkbox"/> 3. Alternative Toilet, specify: _____ <input type="checkbox"/> 4. Non-Engineered Treatment Tank (only) <input type="checkbox"/> 5. Holding Tank, _____ gallons <input type="checkbox"/> 6. Non-Engineered Disposal Field (only) <input type="checkbox"/> 7. Separated Laundry System <input type="checkbox"/> 8. Complete Engineered System(2000gpd+) <input type="checkbox"/> 9. Engineered Treatment Tank (only) <input type="checkbox"/> 10. Engineered Disposal Field (only) <input type="checkbox"/> 11. Pre-treatment, specify: _____ <input type="checkbox"/> 12. Miscellaneous components
SIZE OF PROPERTY N/A <input type="checkbox"/> SQ. FT. <input checked="" type="checkbox"/> ACRES	DISPOSAL SYSTEM TO SERVE <input type="checkbox"/> 1. Single Family Dwelling Unit, No. of Bedrooms: _____ <input type="checkbox"/> 2. Multiple Family Dwelling, No of Units: _____ <input checked="" type="checkbox"/> 3. Other: <u>TOLL BOOTH</u> (specify) Current Use <input type="checkbox"/> Seasonal <input type="checkbox"/> Year Round <input checked="" type="checkbox"/> Undeveloped	TYPE OF WATER SUPPLY <input type="checkbox"/> 1. Drilled Well <input type="checkbox"/> 2. Dug Well <input type="checkbox"/> 3. Private <input checked="" type="checkbox"/> 4. Public <input type="checkbox"/> 5. Other: _____
SHORELAND ZONING <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

DESIGN DETAILS (SYSTEM LAYOUT SHOWN ON PAGE 3)			
TREATMENT TANK H-20 RATED IF IN PARKING <input checked="" type="checkbox"/> 1. Concrete <input type="checkbox"/> a. Regular <input type="checkbox"/> b. Low Profile <input type="checkbox"/> 2. Plastic <input type="checkbox"/> 3. Other: _____ CAPACITY: <u>1000</u> GAL. SEE NOTE ON PAGE 3	DISPOSAL FIELD TYPE & SIZE <input type="checkbox"/> 1. Stone Bed <input type="checkbox"/> 2. Stone Trench <input checked="" type="checkbox"/> 3. Proprietary Device <input checked="" type="checkbox"/> a. Cluster array <input type="checkbox"/> c.Linear <input type="checkbox"/> b. Regular <input checked="" type="checkbox"/> d. H-20 loaded <input type="checkbox"/> 4. Other: _____ SIZE: <u>256</u> sq. ft. <input type="checkbox"/> lin. ft. 4 H-20 RATED CONCRETE CHAMBER UNITS	GARBAGE DISPOSAL UNIT <input checked="" type="checkbox"/> 1. No <input type="checkbox"/> 2. Yes <input type="checkbox"/> 3. Maybe If Yes or Maybe, specify one below: <input type="checkbox"/> a. Multi-compartment tank <input type="checkbox"/> b. _____ tanks in series <input type="checkbox"/> c. Increase in tank capacity <input type="checkbox"/> d. Filter on tank outlet	DESIGN FLOW <u>60</u> gallons per day BASED ON: <input type="checkbox"/> 1. Table 4A (dwelling unit(s)) <input checked="" type="checkbox"/> 2. Table 4C (other facilities) SHOW CALCULATIONS for other facilities PROPOSED TOLL BOOTH UP TO 4 EMPLOYEES AT 15 GALLONS PER DAY EACH
SOIL DATA & DESIGN CLASS PROFILE <u>12</u> / <u>B</u> CONDITION _____ at Observation Hole # <u>TP 3A</u> Depth _____" of Most Limiting Soil Factor _____	DISPOSAL FIELD SIZING <input checked="" type="checkbox"/> 1. Medium - 2.6 sq.ft./gpd <input type="checkbox"/> 2. Medium-Large - 3.3 sq.ft./gpd <input type="checkbox"/> 3. Large - 4.1 sq.ft./gpd <input type="checkbox"/> 4. Extra-Large - 5.0 sq.ft./gpd	EFFLUENT/EJECTOR PUMP H-20 RATED IF IN PARKING <input type="checkbox"/> 1. Not required <input type="checkbox"/> 2. May be required <input checked="" type="checkbox"/> 3. Required Specify only for engineered systems: SEE NOTE ON PAGE 3 DOSE: _____ gallons	<input type="checkbox"/> 3. Section 4G (meter readings) ATTACH WATER-METER DATA LATITUDE AND LONGITUDE at center of disposal area Lat. <u>N43</u> d <u>37</u> m <u>58.07</u> s Lon. <u>W70</u> d <u>20</u> m <u>33.41</u> s if g.p.s., state margin of error _____

SITE EVALUATOR STATEMENT		
I certify that on <u>4/29/2020</u> (date) I completed a site evaluation on this property and state that the data reported are accurate and that the proposed system is in compliance with the Subsurface Wastewater Disposal Rules (10-144A CMR 241).		
Site Evaluator Signature BRADY A. FRICK Site Evaluator Name Printed	SE # <u>352</u> Telephone Number <u>(207) 839-5563</u>	Date <u>6/26/2020</u> E-mail Address <u>BRADY@ALBERTFRICK.COM</u>
ALBERT FRICK ASSOCIATES - 380B MAIN STREET, GORHAM, MAINE 04038 - (207) 839-5563 Note: Changes to or deviations from the design should be confirmed with the Site Evaluator		

SUBSURFACE WASTEWATER DISPOSAL SYSTEM APPLICATION

Department of Health and Human Services
Division of Environmental Health
(207) 287-2070 FAX (207) 287-4172

Town, City, Plantation
SOUTH PORTLAND

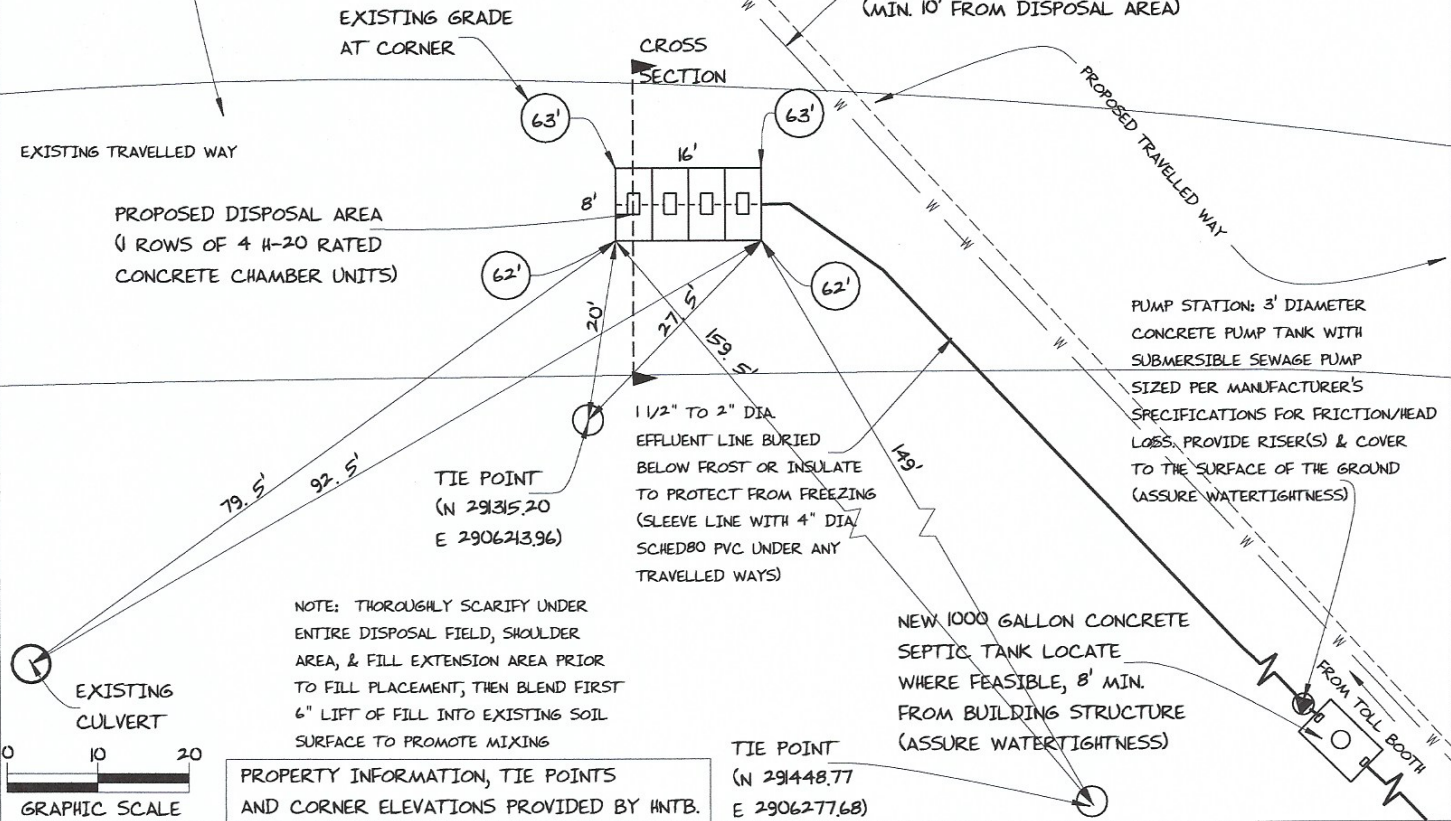
Street, Road, Subdivision
EXIT 45; INTERSTATE 95

Owner's Name
HNTB CORPORATION

EXISTING OFF RAMP
(TO BE ABANDONED, PAVEMENT
TO BE REMOVED)

SUBSURFACE WASTEWATER DISPOSAL PLAN

SCALE 1" = 20' FT.



FILL REQUIREMENTS

Depth of Fill (Upslope) = 0"
Depth of Fill (Downslope) = 0"
DEPTHS AT CROSS-SECTION (shown below)

CONSTRUCTION ELEVATIONS

Finished Grade Elevation
Top of Distribution Pipe or Proprietary Device
Bottom of Disposal Area

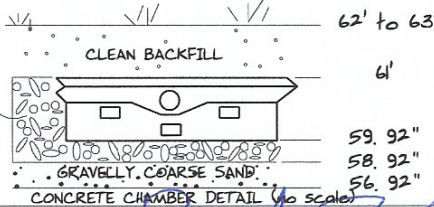
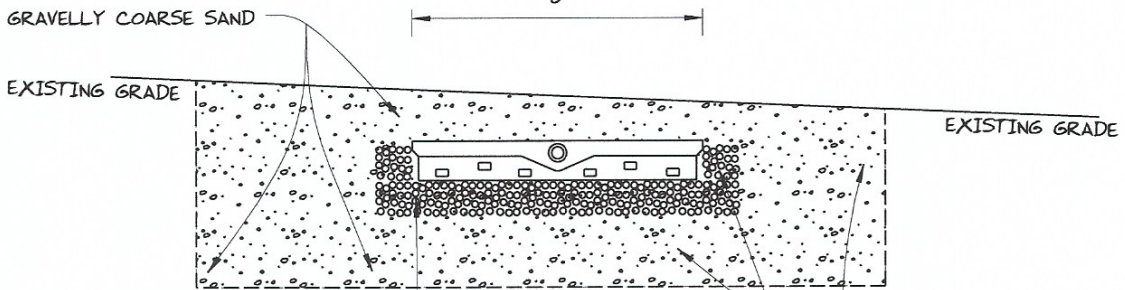
SEE
DETAIL
BELOW

ELEVATION REFERENCE POINT

Location & Description
ELEVATIONS PER PLAN BY HNTB
Reference Elevation is: 0.0' or -----

DISPOSAL AREA CROSS SECTION

SCALE:
VERTICAL: 1" = 5 FT
HORIZONTAL: 1" = 10 FT



Site Evaluator Signature

352
SE *

Date

Page 3 of 3
HHE-200 Rev. 02/11



TOWN	LOCATION	APPLICANT'S NAME
1)	<p>The Plumbing and Subsurface Wastewater Disposal Rules adopted by the State of Maine, Division of Health and Human Services pursuant to 22 M.R.S.A. § 42 (the "Rules") are incorporated herein by reference and made a part of this application and shall be consulted by the owner/applicant, the system installer and/or building contractor for further construction details and material specifications. The system Installer should contact Albert Frick Associates, Inc. 839-5563, if there are any questions concerning materials, procedures or designs. The system installer and/or building contractor installing the system shall be solely responsible for compliance with the Rules and with all state and municipal laws and ordinances pertaining to the permitting, inspection and construction of subsurface wastewater disposal systems.</p>	
2)	<p>This application is intended to represent facts pertinent to the Rules only. It shall be the responsibility of the owner/applicant, system Installer and/or building contractor to determine compliance with and to obtain permits under all applicable local, state and/or federal laws and regulations (including, without limitation, Natural Resources Protection Act, wetland regulations, zoning ordinances, subdivision regulations, Site Location of Development Act and Minimum Lot Size law) before installing this system or considering the property on which the system is to be installed a "buildable" lot. It is recommended that a wetland scientist be consulted regarding wetland regulations. Prior to the commencement of construction/installation, the local plumbing inspector or Code Enforcement Officer shall inform the owner/applicant and Albert Frick Associates, Inc of any local ordinances which are more restrictive than the Rules in order that the design may be amended. All designs are subject to review by local, state and/or federal authorities. Albert Frick Associates, Inc.'s liability shall be limited to revisions required by regulatory agencies pursuant to laws or regulations in effect at the time of preparation of this application.</p>	
3)	<p>All information shown on this application relating to property lines, well locations, subsurface structures and underground facilities (such as utility lines, drains, septic systems, water lines, etc.) are based upon information provided by the owner/applicant and has been relied upon by Albert Frick Associates, Inc. in preparing this application. The owner/applicant shall review this application prior to the start of construction and confirm this information. Well locations on abutting properties but not readily visible above grade should be confirmed by the owner/applicant prior to system installation to assure minimum setbacks.</p>	
4)	<p>Installation of a garbage (grinder) disposal is not recommended. If one is installed, an additional 1000 gallon septic tank or a septic tank filter shall be connected in series to the proposed septic tank. Risers and covers should be installed over the septic tank outlet per the "Rules" to allow for easy maintenance of filter.</p>	
5)	<p>The septic tank should be pumped within two years of installation and subsequently as recommended by the pump service, but in no event should the septic tank be pumped less often than every three years.</p> <p>The system user shall avoid introducing kitchen grease or fats into this system. Chemicals such as septic tank cleaners and/or chlorine or water treatment backwash and controlled or hazardous substances shall not be disposed of in this system. Additives such as yeast or enzymes are discouraged, since they have not been proven to extend system life.</p>	
6)	<p>All septic tanks, pump stations and additional treatment tanks shall be installed to prevent ground water and surface water infiltration. Risers and covers should be properly installed to provide access while preventing surface water intrusion to within 6" of a finished ground surface.</p> <p>Vehicular traffic over disposal system is prohibited unless specifically designed with H-20 rated components.</p>	

TOWN

LOCATION

APPLICANT'S NAME

- 7) The actual waste water flow or number of bedrooms shall not exceed the design criteria indicated on this application without a re-evaluation of the system as proposed
- 8) The general minimum setbacks between a well (public or private) and septic system serving a single family residence is 100-300 feet, unless the local municipality has a more stringent requirement. A well installed by an abutter within the minimum setback distances prior to the issuance of a permit for the proposed disposal system may void this design.
- 9) When a gravity system is proposed: BEFORE CONSTRUCTION/INSTALLATION BEGINS, the system installer or building contractor shall review the elevations of all points given in this application and the elevation of the existing and/or proposed building drain and septic tank inverts for compatibility to minimum pitch requirements. In gravity systems, the invert of the septic tank(s) outlet(s) should be at least 4 inches above the invert of the distribution box outlet at the disposal area.
- 10) When an effluent pump is required: Pump stations should be sized per manufacturer's specifications to meet lift requirements and friction loss. Provisions shall be made to make certain that surface and ground water does not enter the septic tank or pump station, by sealing/grouting all seams and connections, and by placement of a riser and lid at or above grade. An alarm device warning of a pump failure shall be installed. Also, when pumping is required of a chamber system, install a 'T' connection in the distribution box and place 3 inches of stone or a splash plate in the first chamber. Insulate gravity pipes, pump lines and the distribution box as necessary to prevent freezing.
- 11) On all systems, remove the vegetation, organic duff and old fill material from under the disposal area and any fill extension. Additional fill beyond indicated on plan may be necessary to replace organic matter. On sites where the proposed system is to be installed in natural soil, scarify the bottom and sides of the excavated disposal area with a rake. Do not use wheeled equipment on the scarified soil surface. For systems installed in fill, scarify the native soil by roto-tilling or scarifying with teeth of backhoe to a depth of at least 8 inches over the entire disposal and fill extension area to prevent glazing and to promote fill bonding. Place fill in loose layers no deeper than 8 inches and compact before placing more fill (this ensures that voids and loose pockets are eliminated to minimize the chance of leakage or differential settling). Do not use wheeled equipment on the scarified soil area until after 12 inches of fill is in place. Keep equipment off proprietary devices. Divert the surface water away from the disposal area by ditching or shallow landscape swales.
- 12) Unless noted otherwise, fill shall be gravelly coarse sand, which contains no more than 5% fines (silt and clay). Crushed stone shall be clean and free of any rock dust from the crushing process.
- 13) Do not install systems on loamy, silty, or clayey soils during wet periods since soil smearing/glazing may seal off the soil interface.
- 14) Seed all filled and disturbed surfaces with perennial grass seed, with 4" min. soil or soil amendment mix suitable for growing, then mulch with hay or equivalent material to prevent erosion. Alternatively, bark or permanent landscape mulch may be used to cover system. Woody trees or shrubs are not permitted on the disposal area or fill extensions.
- 15) If an advanced wastewater treatment unit is part of the design, the system shall be operated and maintained per manufacturer's specifications.

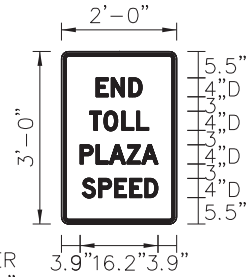


Albert Frick Associates, Inc.
 Soil Scientists & Site Evaluators
 380B Main Street Garham, Maine 04038
 (207) 839-5563

APPENDIX F

SIGN DETAILS

SIGN DETAIL
1:40



BORDER
R=1.13"
TH=0.63"
IN=0.38"

Panel Style: regulatory.ssi
M.U.T.C.D.: 2009 Edition

SIGN NUMBER	CS-9
WIDTH x HGHT.	2'-0" x 3'-0"
BORDER WIDTH	0.63"
CORNER RADIUS	0"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: White
LEGEND/BORDER	TYPE: Non-Reflective
	COLOR: Black/Black

SYMBOL	ROT	X	Y	WID	HT

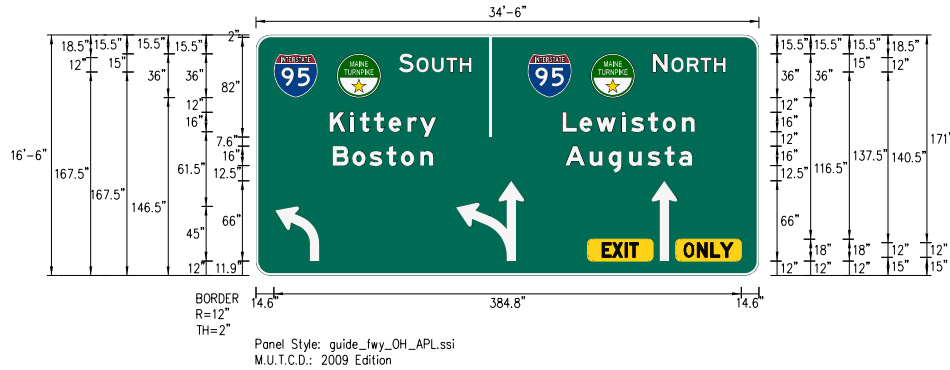
Panel Style: regulatory.ssi
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

LETTER POSITIONS (X)																LENGTH	SERIES/SIZE
E	N	N														9.6	D 2000 4
7.2	10.4	14.1														12.3	D 2000 4
T	O	L	L													16.2	D 2000 4
5.9	8.9	12.6	15.7													15.8	D 2000 4
P	L	A	Z	A													
3.9	7.2	9.9	13.7	16.7													
S	P	E	E	D													
4.3	7.7	11.1	14.2	17.4													

SIGN DETAIL

1:150



Panel Style: guide_fwy_OH_APL.ssi
Dimensions are in inches.tenths

Letter locations are panel edge to lower left corner

SIGN NUMBER	GS-2
WIDTH x HGHT.	34'-6" x 16'-6"
BORDER WIDTH	2"
CORNER RADIUS	12"
MOUNTING	Overhead
BACKGROUND	TYPE: Reflective
	COLOR: Green
LEGEND/BORDER	TYPE: Reflective
	COLOR: WhiteBlackWhite

SYMBOL	ROT	X	Y	WID	HT
M1_1	0	14.6	146.5	36	36
MTA-1	25.2	66.6	146.5	36	36
M1_1	0	223.7	146.5	36	36
MTA-1	25.2	275.7	146.5	36	36
AR_LEFT_ONLY	180	15.8	12	36.2	45
AR_THRU_LEFT	180	164.6	12	56	66
AR_THRU	0	325.6	12	21	66

LETTER POSITIONS (X)																	LENGTH	SERIESSIZE
S	O	U	T	H														E 2000
117.6	132	144.8	156.6	167.6													59.8	15,12
N	O	R	T	H														E 2000
326.7	342	354.8	365.8	376.9													59.9	15,12
K	i	t	t	e	r	y												EM 2000
60.6	77.2	85.2	97.1	109.1	124.6	134.7											87.7	16/12
L	e	w	i	s	t	o	n											EM 2000
252.3	266.2	280	301	308.8	322.7	334.7	350.6										108.8	16/12
B	o	s	t	o	n													EM 2000
63.2	79.2	93.3	107.2	119.2	135.1												82.4	16/12
A	u	g	u	s	t	a												EM 2000
254.6	274.6	290.2	307.1	322.3	336.2	348.2											104.2	16/12
E	X	I	T															D 2000
284.9	293.5	303.7	307.4														30	12
O	N	L	Y															D 2000
352.1	363.2	374.3	382.4														40.7	12

APPENDIX G

PLAZA SAFETY REQUIREMENTS

PLAZA SAFETY REQUIREMENTS

The following are the minimum Plaza Lane closure requirements for completing the work. The limits have been set to protect Turnpike patrons and Toll Attendants from potential harm during the construction. The Contractor shall utilize this information in bidding the work. Drums and construction signs will be paid under their respective pay items. Movement of drums and construction signs will be paid under the Maintenance of Traffic pay item.

The Contractor shall furnish, erect, maintain and relocate twenty 10 inch by 14 inch (minimum dimensions) DANGER – Unauthorized Persons Keep Out, or DANGER – DO NOT ENTER signs, meeting OSHA specifications for size, color and legend, for installation on toll booths or drums, as directed by the Resident. The Contractor shall furnish and install red hazard safety tape between barrels and in cordoned off tunnel and lane areas to identify the hazard areas for Turnpike patrons and Toll Attendants. The purchase, erection, maintenance, and relocation of the hazard signs and hazard safety tape shall be incidental to the mobilization pay item. Providing, maintaining and relocating the specified plywood safety walkways at all locations shall also be incidental to the mobilization pay item.

Unless otherwise specified all labor, materials and equipment required to meet the requirements of Appendix C shall be incidental to the various pay items. Maintenance of Traffic signing shall be in place during plaza work at all times.

APPENDIX H

DEFINED TERMS

DEFINED TERMS

- **AVI (Automatic Vehicle Identification):** a system consisting of an antenna and reader installed in a toll lane for communication with a transponder located on a vehicle for automatic identification of the transponder as it passes through the lane.
- **Canopy Override Switch (COS):** shall mean the switch that controls the signal that is located on the canopy on the entry side of each toll lane.
- **Sensor Loops:** a system for automatic vehicle detection, separation and classification.
- **COMM - Communications**
- **Components:** parts that compose a device or piece of equipment.
- **DVAS (Digital Video Audit System) –** A video camera and image storage system that captures traffic movements in the lane 24 hours a day.
- **EMT - Electrical Metallic Tubing**
- **Gradient Sensor –** Part of the Sensor Loop system - a gradient sensor is placed on each side of the Primary sensor.
- **Contractor:** the Contractor hired by the Authority through a solicitation process to complete the Project.
- **JB - Junction Box**
- **Lane Controller (LC):** A computer system for each type of toll lane that controls the lane equipment.
- **Manual Lane Terminal (or MLT):** A device consisting of an array of touch screen buttons and associated electronics for processing toll transactions in the attended tollbooths.
- **MTA - Maine Turnpike Authority**
- **NTS -Not to Scale**
- **Paypoint Sensor –** Part of the Sensor Loop system. Detects when the vehicle has reached the lane paypoint, in this case the tollbooth door centerline.
- **Primary Sensor –** Part of the Sensor Loop system. Located between two gradient sensors, a 6' x '6 square sensor that participates in vehicle classification.
- **Project:** shall mean the upgrade of the existing toll plaza and the toll collection system described herein.
- **RMC - Rigid Metallic Conduit**
- **RP (Receipt Printer) –** Receipt printer that communicates with the payment system. Located in the booth.
- **Specifications:** shall mean the Technical Specification and instructions included in this document for the purpose of defining the installation procedures
- **SI (Systems Integrator) -** The systems integrator/contractor for the MTA toll system.
- **SS - Stainless Steel**
- **TCP (Traffic Control Pedestal):** A pedestal to mount a traffic signal and screen with a message to patrons.

- **UPS** - Uninterrupted Power Supply
- **VES (Violation Enforcement System)** – Cameras that automatically capture digital photographic images of vehicles and their license plates.

APPENDIX I

PLAZA WORK CHECKLIST

APPENDIX J

PRODUCT DATA SHEETS

Direct-View LED Traffic Controller DOT2424RG-175

PRODUCT NUMBER
5651



CABINET DIMENSIONS
24" H x 24" W x 5" D

ILLUMINATION SOURCE

Super bright, narrow viewing angle LEDs
Available in green, red, blue, amber, and white LEDs
Messages "blankout" when turned off, eliminating confusion
Long life, solid state lighting

ELECTRICAL

Integrated solid state power supply
Photocell for auto photodimming
Standard Voltage: 120 VAC, Optional Voltages: 9-36 V, 240 VAC, 277 VAC
Maximum amps per lighted message (at 120 V) shown in the table below
UL/CUL approved for wet locations

CONSTRUCTION

Faces: Single Faced Sign
Cabinet: (DOT): NEMA 4X Rated, 1/8" wall T5052 aluminum cabinet with continuously welded seams. Optional Visor
Door: Continuous hinge with a 1" x 1/4" silicone gasket and stainless steel tool free door latches
Face Material: impact resistant, 1/4" thick smoke limited polycarbonate

FINISH

Standard Cabinet Color: Black
Custom colors available upon request

MESSAGE	COLOR	HEIGHT	AMPS
X	30° Red Round	18.0"	0.17
Down Arrow	30° Green Round	18.0"	0.13

Trans-Tech

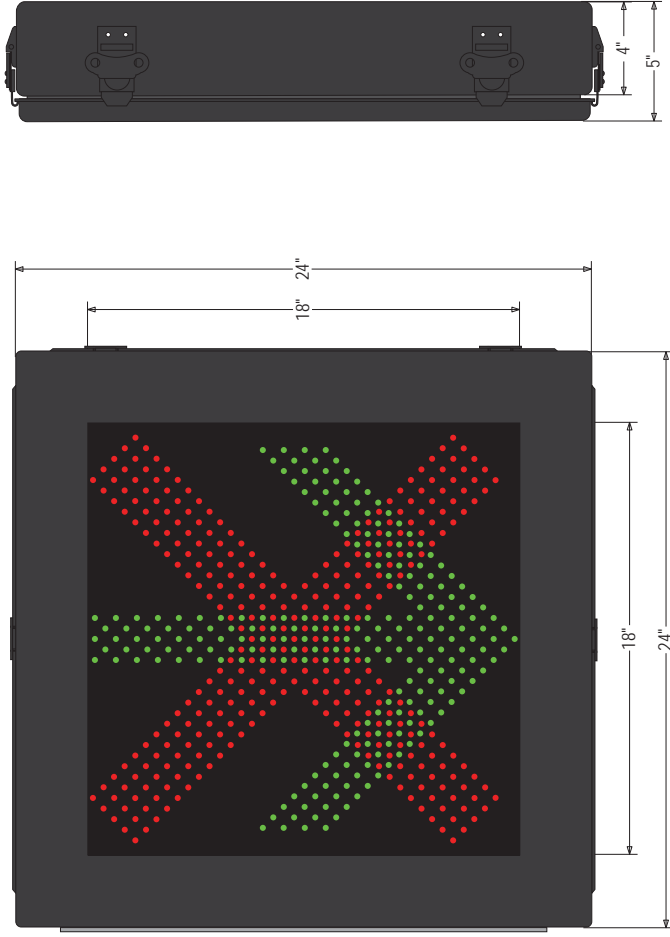
4999 Pittsburgh Ave.
Erie, PA 16509
Phone: (888) 811-7010
Fax: (814) 836-8401
Email: sales@transportation-tech.com
Website: www.transportation-tech.com

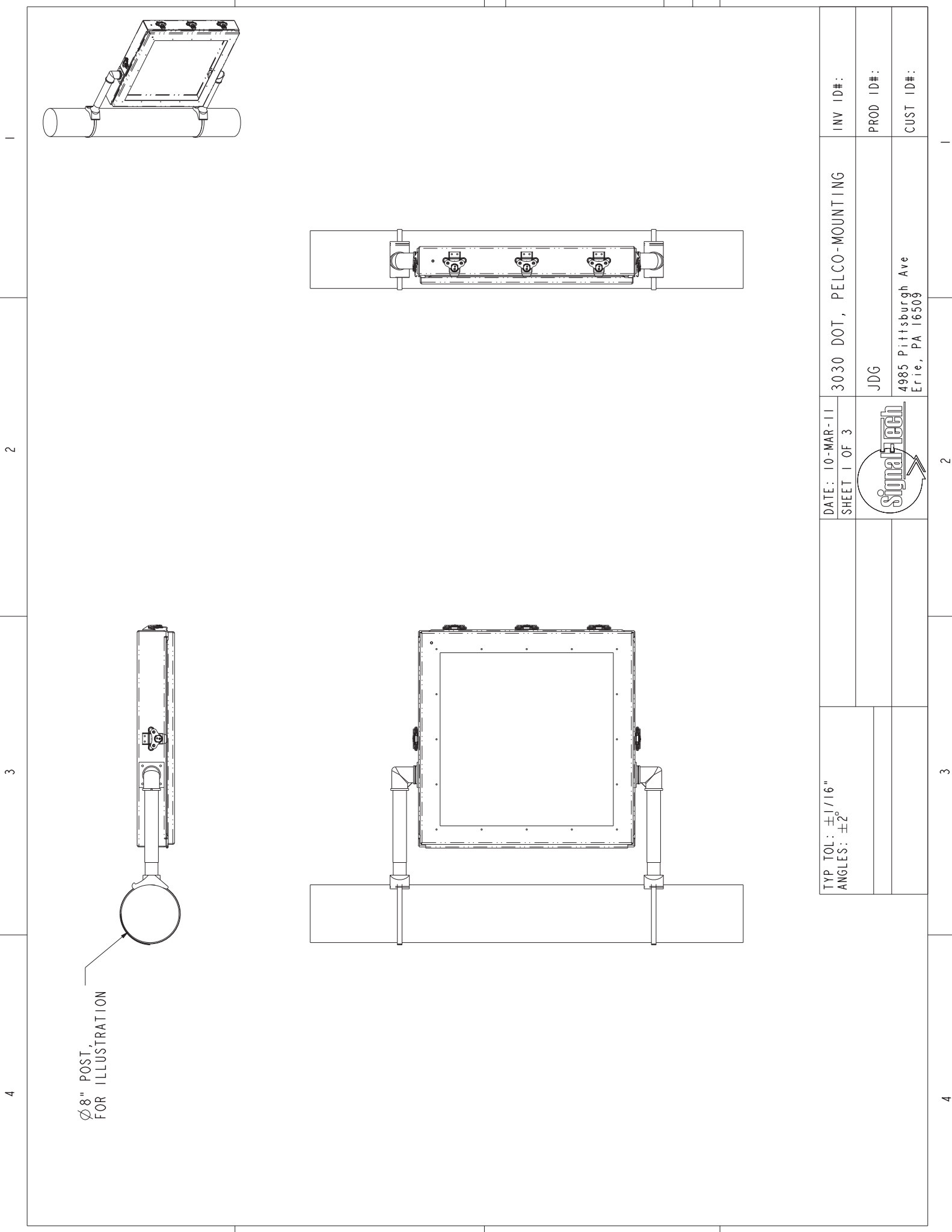


Proudly Made in the USA

Product View

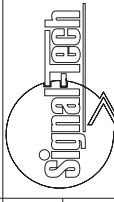
NOTE: Sign image may not exactly represent the finished product. For illustration purposes only.





TYP. TOL: $\pm 1/16''$
 ANGLES: $\pm 2^\circ$

DATE: 10-MAR-11
 SHEET 1 OF 3



3030 DOT, PELCO-MOUNTING

JDG
 4985 Pittsburgh Ave
 Erie, PA 16509

INV ID#:

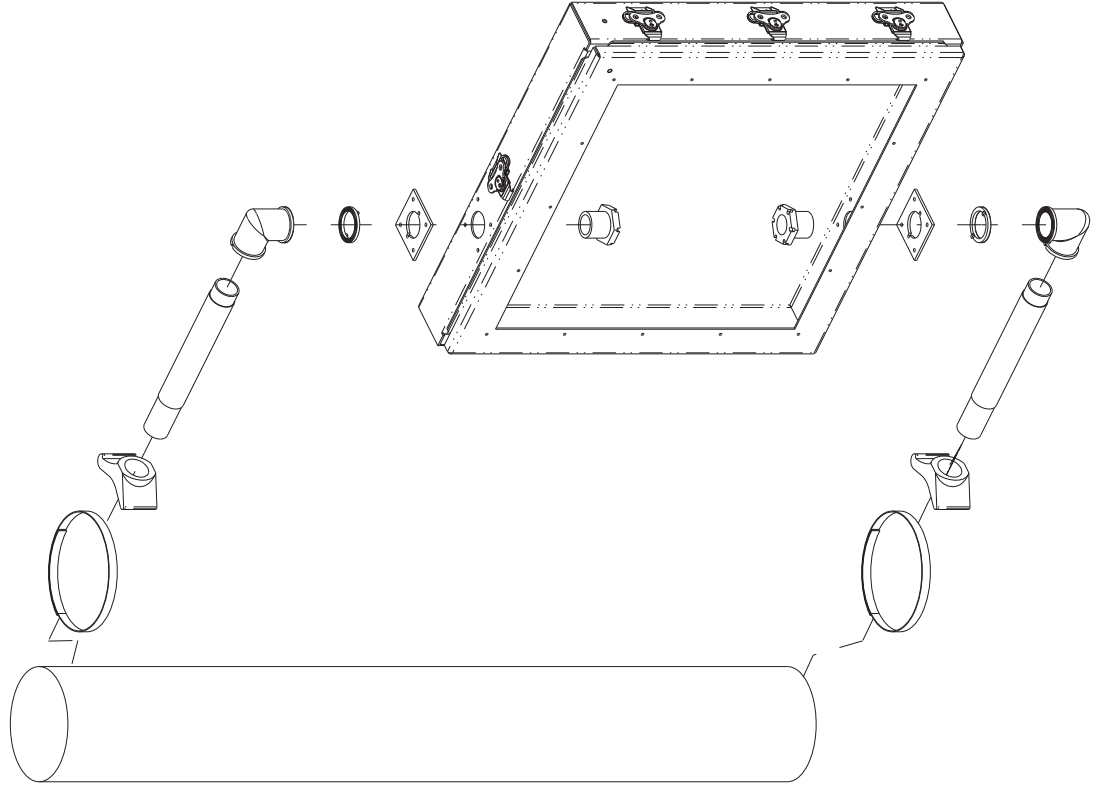
PROD ID#:


CUST ID#:

1 2 3 4

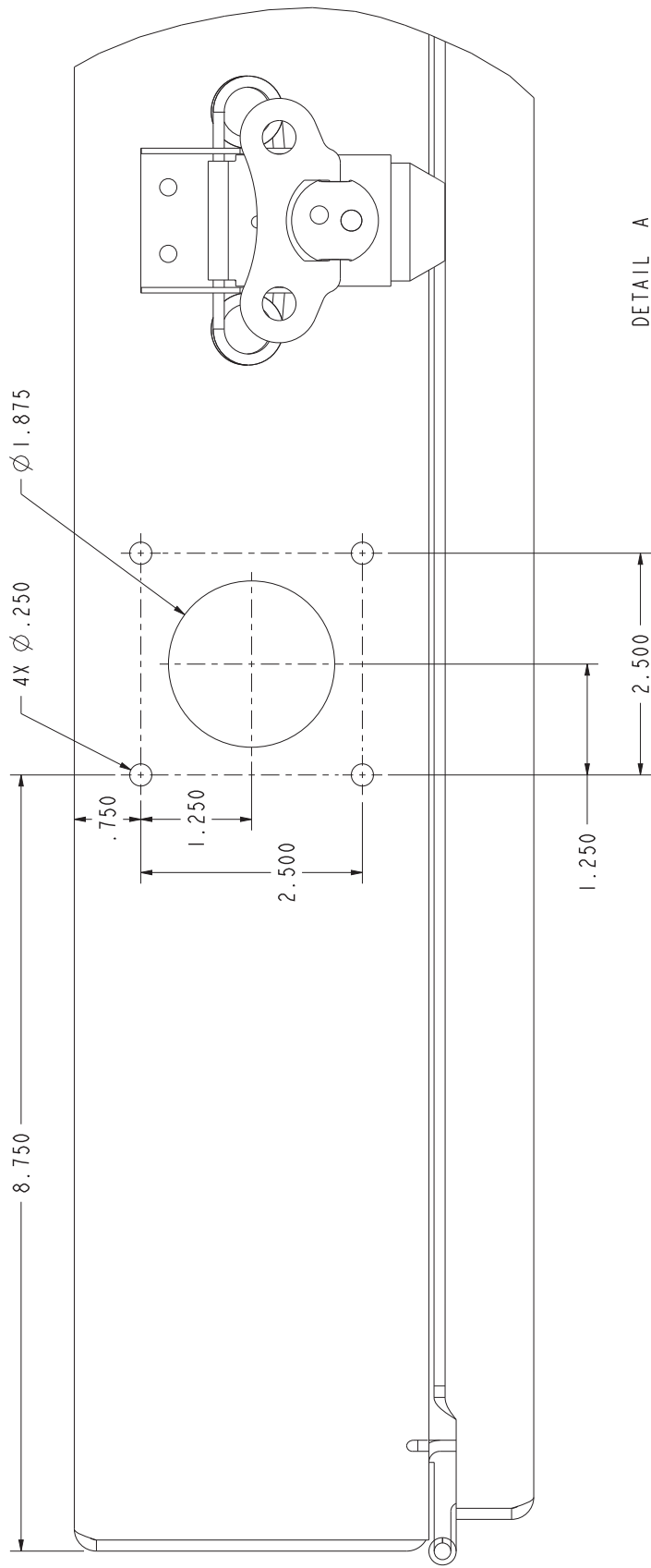
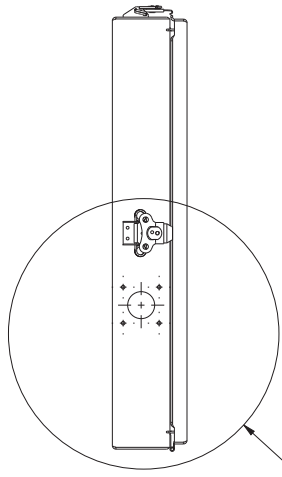
D C B A

1 2 3 4



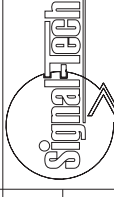
4	3	2	1
D	C	B	A
<p>TYP TOL: $\pm 1/16"$ ANGLES: $\pm 2^\circ$</p>			<p>DATE: 10-MAR-11 SHEET 2 OF 3</p>
			<p>3030 DOT, PELCO-MOUNTING</p>
<p>4985 Pittsburgh Ave Erie, PA 16509</p>			<p>JDG</p>
<p>INV ID#:</p>			<p>PROD ID#:</p>
<p>CUST ID#:</p>			<p>1</p>

4 3 2 1



TYP TOL: $\pm 1/16"$
 ANGLES: $\pm 2^\circ$

DATE: 10-MAR-11
 SHEET 3 OF 3



3030 DOT, PELCO-MOUNTING

JDG

4985 Pittsburgh Ave
 Erie, PA 16509

INV ID#:

PROD ID#:

CUST ID#:

D

C

B

A

4

3

2

1

120W & 240W DIN Rail Mount Power Supplies

Features

- ◆ Low Cost
- ◆ 12V, 24V or 48V Outputs
- ◆ Auto-ranging input (no manual switching)
- ◆ Parallel Function Switch
- ◆ -40⁽²⁾ to +71°C Operation

Key Market Segments & Applications



Industrial



RoHS

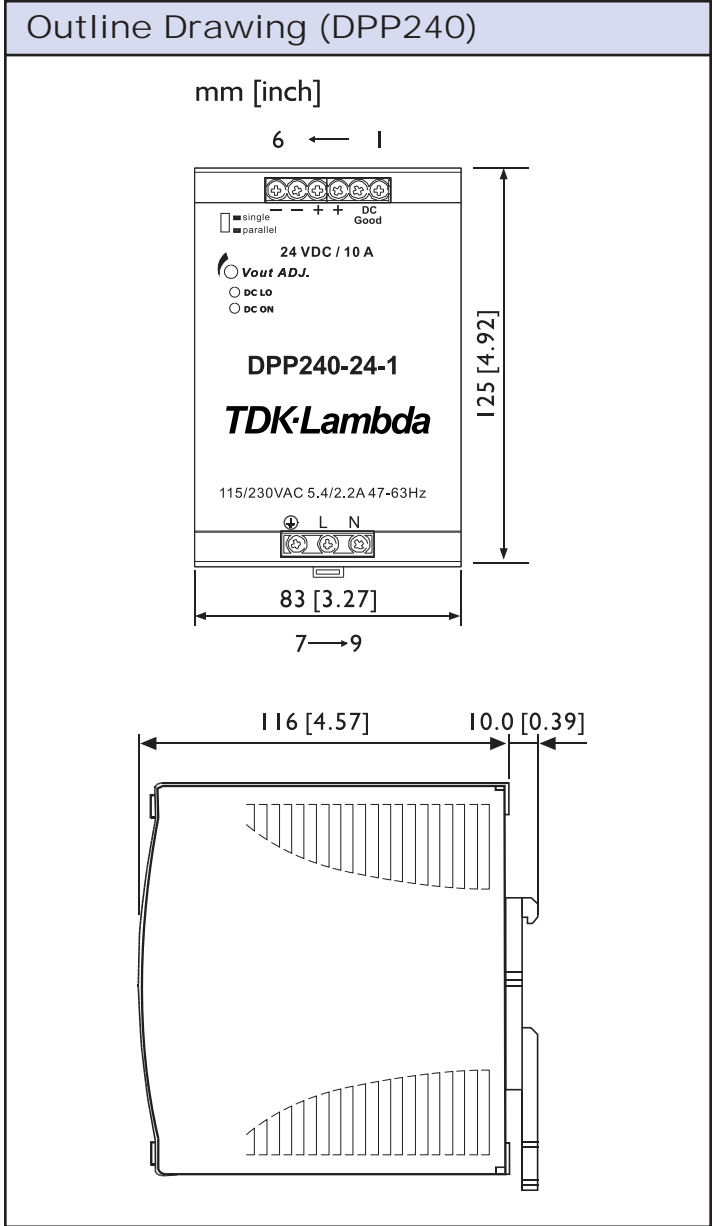
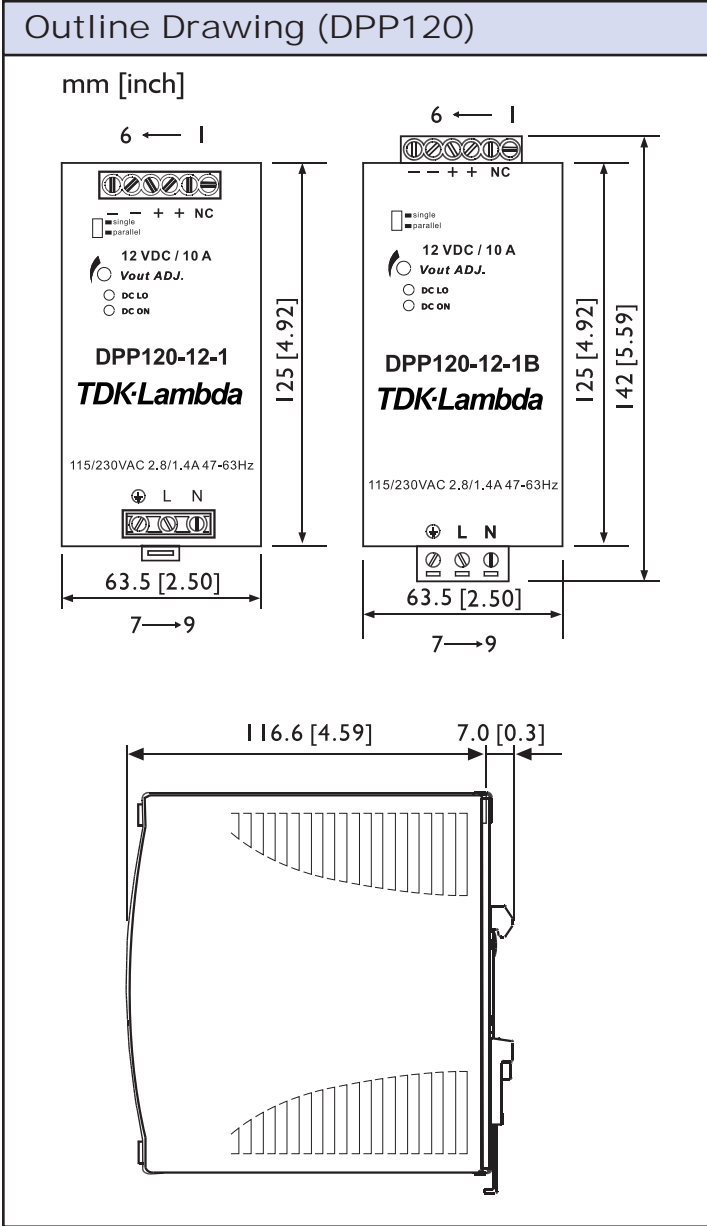
Specifications

Model		DPP120-xx-1	DPP240-xx-1
AC Input Voltage range	VAC	93 - 132 / 186 - 264VAC, single phase. Auto select	
Input Frequency	Hz	47 - 63Hz	
DC Input Voltage range	VDC	210 - 370VDC*	
Inrush Current (115 / 230VAC)	A	24 / 48A	30 / 60A
Power Factor	-	Meets EN61000-3-2	
Input Current (115 / 230VAC)	A	2.8 / 1.4A	5.4 / 2.2A
Output Voltage Accuracy	%	-0, +1% of Nominal	
Line Regulation	%	±0.5%	
Load Regulation	%	±1% (±5% when set in parallel mode)	
Ripple and Noise (20MHz BW)	mV	50mV	100mV
Overcurrent Protection (Typ)	-	110 - 145%	
Overvoltage Protection	V	See model selector	
Overtemperature Protection	-	-	
Hold Up Time (230VAC input)	ms	> 30ms	
Parallel operation	-	Set in parallel (droop) mode - maximum of 3 units	
LED Indicators	-	Green LED = On, Red LED = DC Output Low	
DC Good Relay (24V model only)	-	0.3A rated normally open relay contacts, closes when output is above 17.6 - 19.4V	
Operating Temperature	°C	-40 ⁽²⁾ to +71°C (Derate linearly 2.5%/°C from 61 to 71°C)	
Storage Temperature	°C	-40 to +85°C	
Operating Humidity	-	20 - 95% RH (non condensing)	
Cooling	(1) -	Convection	
Withstand Voltage	-	Input to Output 3kVAC for 1 min.	
Isolation Resistance	-	>100M at 25°C & 70%RH, Output to Ground 500VDC	
Vibration (Operating)	-	IEC 60068-2-6 (Mounting by rail: Random wave, 10-500 Hz, 2G, ea. along X, Y, Z axes 10 min/cycle, 60 min)	
Shock (Operating)	-	IEC 60068-2-27 (Half sine wave, 4G, 22ms, 3 axes, 6 Faces, 3 times for each face)	
Safety Agency Approvals	-	UL508 Listed, UL60950-1, EN60950-1, CE	
Conducted & Radiated EMI	-	EN55022 class B	EN55022 class A
Weight (Typ)	g	920	1000
Size (WxHxD)	(1) in	2.5 x 4.92 x 4.59"	3.27 x 4.92 x 4.57"
Case material	-	Metal	
Warranty	yrs	Three years	

(1) Recommend 1" clearance on all sides

(2) DPP120 -35°C

*Safety certified for AC input only



Model Selector

Model	Voltage	Adjust. Range	Output Curr.	Over-voltage	Eff.
DPP120-12-1	12V	11.4 - 14.5V	10A	15 - 17.4V	84%
DPP120-24-1	24V	22.5 - 28.5V	5A	30 - 34.8V	86%
DPP120-48-1	48V	45 - 55V	2.5A	60 - 69.6V	87%
DPP240-24-1	24V	22.5 - 28.5V	10A	30 - 34.8V	89%
DPP240-48-1	48V	47 - 56V	5A	60 - 69.6V	90%

Terminal Assignments

#	Function
1	DC Good relay
2	DC Good relay
3	+V
4	+V
5	-V
6	-V
7	Chassis ground
8	L
9	N

Other DIN Rail Products

DPP	15W to 100W
DPP480	480W single and three phase
DSP	10W to 100W low profile
DLP	75W to 240W single phase

Snap-on Mounting: snap onto DIN Rail TS35/7.5 or TS35/15. (no tools required)

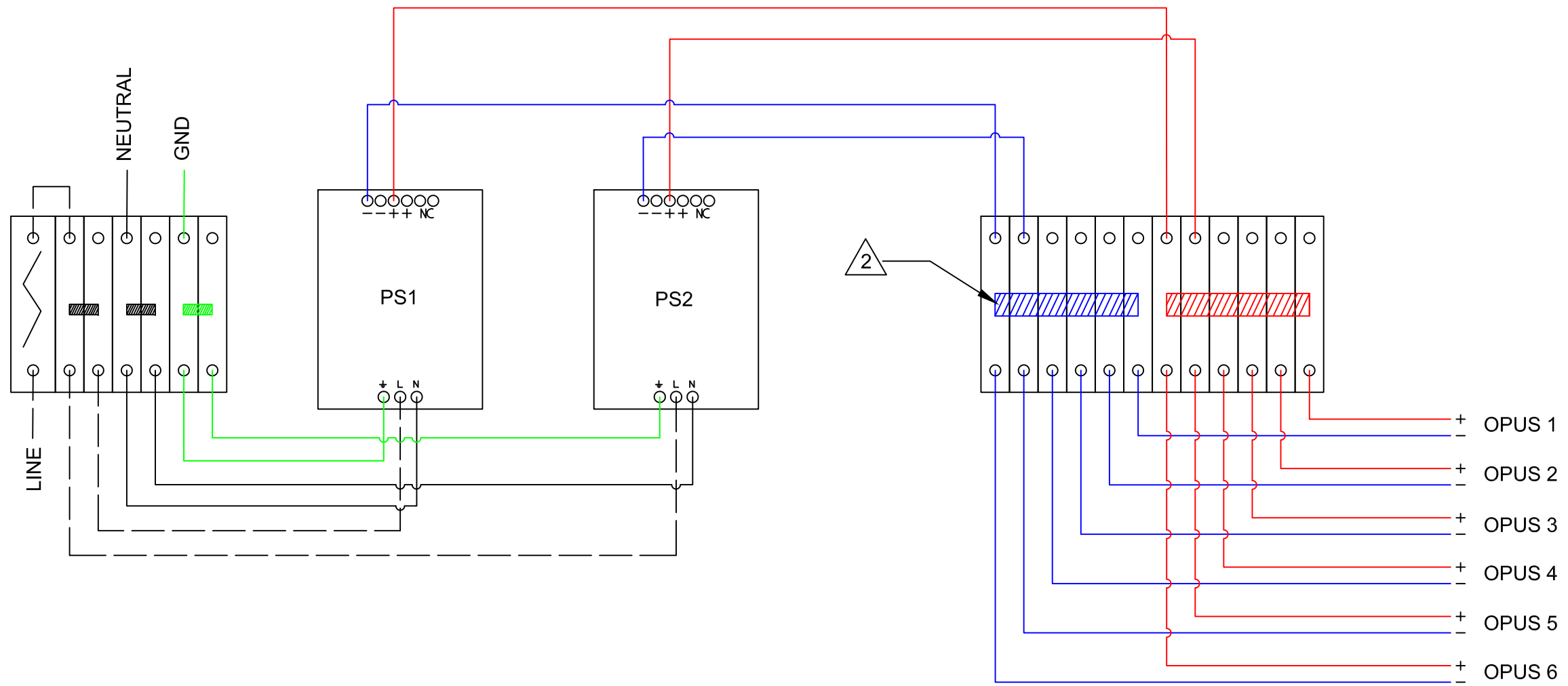
Options

Suffix	Description
Blank	Non detachable connectors
B	Detachable input and output connectors

For Additional Information, please visit us.tdk-lambda.com/lp/products/dpp-series.htm



- NOTES:
- 1 SET EACH POWER SUPPLY TO RUN IN PARALLEL.
 - 2 THE LOCATIONS OF THE JUMPER BARS ARE DEPICTED, SHOWING WHICH TERMINAL BLOCKS NEED CONNECTED.
 - 3 THE "LINE" POWER WIRE IS RUN THROUGH THE FUSE HOLDER TERMINAL BLOCK WITH 10A FUSE BEFORE BEING CONNECTED TO THE MAIN TERMINAL BLOCKS.
 - 4 AFTER INSTALLING ALL WIRING AND CONNECTING ALL CONNECTORS, USE CABLE TIES TO NEATLY LACE AND SECURE TO CABLE TIE POINTS WHERE AVAILABLE.



TOLERANCE UNLESS OTHERWISE SPECIFIED .XX ±.01 .XXX ±.005 ANGLES ±1.0° DIMENSIONS ARE IN INCHES	TRANSORE, INFINITY DIVISION 55 EMERALD MOUNTAIN EXPRESSWAY WETUMPKA, ALABAMA 36093		CONFIDENTIAL AND PROPRIETARY <small>This drawing, as well as any products described herein, is furnished under license and may be used or copied only in accordance with the terms of such license. Except as permitted by such license, no part of this drawing may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, or otherwise, without the expressed written consent of TransCore. Copyright 2015 TransCore. All rights reserved.</small>		DRAWING NUMBER UTS-09001-01	REV A	
	REV. A	DESCRIPTION INITIAL RELEASE - ANDREW JUDY		DATE 7/18/2016	BY BHB	TITLE OPUS PS KIT WIRING DIAGRAM	
						SCALE 1:1	SHEET DESCRIPTION
						DATE 7/15/16	DRAWN BY A. JUDY
						PAGE 1 OF 1	



CSI Code: 03 15 00

NO. 323

AUGUST 2009
(Supersedes April 2004)

CERAMAR®

Flexible Foam Expansion Joint

DESCRIPTION

CERAMAR is a flexible foam expansion joint filler composed of a unique synthetic foam of isomeric polymers in a very small, closed-cell structure. Gray in color, CERAMAR is a lightweight, flexible, highly resilient material offering recovery qualities of over 99%. The compact, closed-cell structure will absorb almost no water.

USES

CERAMAR flexible foam expansion joint filler provides an excellent joint filler and back-up material for use in either horizontal or vertical applications where expansion and contraction movements must be accommodated. CERAMAR is compatible with all currently popular cold-applied sealants, caulks, and hot-pour joint sealing compounds. It is lightweight and easy to cut or form in the field without waste.

CERAMAR compresses easily for use with shrinkage-compensating concrete and it may be used to relieve stress and pressure in concrete pavements.

LEED INFORMATION

May help contribute to LEED credits:

- MR Credit 5.1: Regional Materials: 10% Extracted, Processed & Manufactured Regionally
- MR Credit 5.2: Regional Materials: 20% Extracted, Processed & Manufactured Regionally

FEATURES/BENEFITS

- May be sealed with hot- or cold-applied sealants.
- User friendly, lightweight, flexible foam ... forms or wraps around curved or circular surfaces.
- Cuts easily on the job with a razor knife ... no breakage or waste.
- Offers high resiliency and 99% recovery qualities ... low compression values ... non-extruding ... minimal water absorption.
- Resists ultraviolet degradation ... will not rot or deteriorate.
- Non-impregnated ... no staining or bleeding.
- Bonds easily with common cartridge adhesives.
- Non-gassing.

SPECIFICATIONS

- ASTM D 5249, Type 2
- ASTM D 1752, Sections 5.1 - 5.4, with compression requirement modified to 10 psi (7.03 g/mm²) minimum and 25 psi (17.58 g/mm²) maximum.
- ASTM D 7174-05

TECHNICAL DATA*

Compression, 50%	13 psi (9 g/mm ²) 89.6 kPa
Extrusion	0.1 inch (2.5 mm)
Recovery	99.21%
Water absorption, volume %	0.246

Test Method - ASTM D 545 [1/2" (12.7 mm) thick test specimen]
* All technical data is typical information, but may vary due to test methods, conditions, and operators.

CONTINUED ON REVERSE SIDE...

W. R. MEADOWS, INC.

P.O. Box 338 • HAMPSHIRE, IL 60140-0338
Phone: 847/214-2100 • Fax: 847/683-4544
1-800-342-5976
www.wrmeadows.com

HAMPSHIRE, IL / CARTERSVILLE, GA / YORK, PA
FORT WORTH, TX / BENICIA, CA / POMONA, CA
GOODYEAR, AZ / MILTON, ON / ST. ALBERT, AB

PACKAGING

Furnished in standard sheets 48" (1.22 m) wide, 10' (3.05m) long. Also available in precut widths of 2" - 46" (50.8 mm - 1.17 m).

Thickness	Approx. Wt./100 ft. ²	Approx. Wt./100 m ²	Pcs. per Bundle	Shipping Wt./Bundle
1/4" (6.4 mm)	3.13 lb.	15.29 kg	100	160 lb. (72.58 kg)
3/8" (9.5 mm)	4.70 lb.	22.93 kg	100	240 lb. (108.86 kg)
1/2" (12.7 mm)	6.25 lb.	30.52 kg	75	250 lb. (113.40 kg)
3/4" (19.1 mm)	9.40 lb.	45.90 kg	50	240 lb. (108.86 kg)
1" (25.4 mm)	12.50 lb.	61.03 kg	40	260 lb. (117.94 kg)

APPLICATION

For horizontal applications, position CERAMAR against the forms, at interrupting columns and objects or adjacent to abutting structures, before placing the concrete. Vertical applications may call for CERAMAR to be placed between panels, panel-to-column joints, or in block wall joints prior to sealing. CERAMAR may be used with all hot- and cold-applied sealants.

PRECAUTIONS

Due to its light weight, CERAMAR will float and must be held in place by compression or with a sealant.

HEALTH AND SAFETY

Refer to Material Safety Data Sheet (MSDS) for complete health and safety information.

For most current data sheet, further LEED information, and MSDS, visit www.wrmeadows.com.



LIMITED WARRANTY

“W. R. MEADOWS, INC. warrants at the time and place we make shipment, our material will be of good quality and will conform with our published specifications in force on the date of acceptance of the order.” Read complete warranty. Copy furnished upon request.

Disclaimer

The information contained herein is included for illustrative purposes only, and to the best of our knowledge, is accurate and reliable. W. R. MEADOWS, INC. cannot however under any circumstances make any guarantee of results or assume any obligation or liability in connection with the use of this information. As W. R. MEADOWS, INC. has no control over the use to which others may put its product, it is recommended that the products be tested to determine if suitable for specific application and/or our information is valid in a particular circumstance. Responsibility remains with the architect or engineer, contractor and owner for the design, application and proper installation of each product. Specifier and user shall determine the suitability of products for specific application and assume all responsibilities in connection therewith.



PRODUCT DATA SHEET

Sikasil®-728 RCS

TWO-PART, SELF-LEVELING, RAPID CURE, ULTRA LOW MODULUS, HORIZONTAL APPLICATION, NEUTRAL CURE SILICONE SEALANT

PRODUCT DESCRIPTION

Sikasil®-728 RCS (Rapid Cure System) is a self-leveling, two-component, very rapid cure, ultra low modulus elastomeric, neutral cure silicone sealant. Exceeds the requirements of ASTM C-920, Type M, Grade P, Class 100/50, Use T, M, G, A, O; TT-S-00227E, Type I, and various AASHTO reports and state DOT approvals.

USES

Construction Application

- Horizontal expansion joints
- Highway and bridge joints
- Saw cut joints - new and remedial
- Plaza decks
- Parking decks
- Bridges
- Airports
- Stadiums
- Driveways

Location

- Horizontal
- Interior and exterior
- Above grade or on grade

Substrate

- Concrete, steel, glass, aluminum, tile, ceramic, masonry, brick, stone and granite

CHARACTERISTICS / ADVANTAGES

- No tooling, less labor
- Excellent flexibility for extreme high and low temperature conditions
- Excellent flexibility for dynamic joint movement
- Bonds to most substrates without priming
- Open to traffic in one hour
- All season ease of application
- Good contact/adhesion with hard to reach areas
- Ideal for cold climates
- Excellent for use on runways and tarmacs
- Jet fuel resistant
- Resistant to road salts

PRODUCT INFORMATION

Packaging

40 fl. oz. unit - 2 20 oz. sausages/20 per case;
9 gal. unit (34.11 L) – 2 pails each containing 4.5 gal. (17 L);
104 gal. unit (394.16 L) – 2 drums each containing 52 gal. (197.08 L)

Color	Limestone and Charcoal Gray (when Part A, dark gray and Part B, white, are mixed).
Shelf Life	When stored in the original, unopened containers at or below 90 °F (32 °C), shelf life is one year. A product skin may form in pails and drums, remove prior to use
Storage Conditions	Store in unopened containers at temperatures at or below 90 °F (32 °C)
Volatile organic compound (VOC) content	2.4 % by wt., 30 g/l, 0.25 lb./gal

TECHNICAL INFORMATION

Shore Hardness	50 ± 5 4 - 6	Shore OO Shore A	(7 days at 77° F (25° C), 50% R.H.) (ASTM C-661 & ASTM D-2240)
Tensile Strength	70 psi (0.48 MPa)		(7 days, at 77 °F (25 °C) and 50 % R.H.) (ASTM D-412)
Secant Tensile Modulus	5		(7 days, at 77 °F (25 °C) and 50 % R.H.) (ASTM D-5329 [a] [b]) (100 % elongation)
Tensile Stress at Specified Elongation	25 psi (0.17 MPa)		(7 days, at 100 % and 77 °F (25 °C) and 50 % R.H.) (ASTM D-412)
Elongation	725 %		(7 days, at 77 °F (25 °C) and 50 % R.H.) (ASTM D-5329 [a] [b])
Elongation at Break	> 1000 %		(7 days, at 77 °F (25 °C) and 50 % R.H.) (ASTM D-412)
Adhesion in Peel	30 pli		(7 days, at 77 °F (25 °C) and 50 % R.H.) (glass, aluminum and concrete) (ASTM C-794)
Movement Capability	+100 %, -50 %		(7 days, at 77 °F (25 °C) and 50 % R.H.) (ASTM C-719) (glass, aluminum and concrete)
Resistance to Weathering	Excellent		
Service Temperature	-80–350 °F (-62.2–176.6 °C)		
Joint Design	The number of joints and the joint width may be designed for high movement capability. For joints one to three inches in width, the sealant will accept movements +100% and -50% and for three to four inches in width, the sealant will accept movements of ±50% of joint width at time of installation. The depth of the sealant should be 1/2 the width of the joint. The minimum depth is 1/4 inch (6 mm) and the maximum is 1/2 inch (12 mm). For joints greater than 1 inch (25.4 mm), do not exceed 1/2 inch (6 mm) in depth.		
Extrusion Rate	50 g/min. 1/8" orifice @ 50 psi Specific Gravity 1.25 - 1.35		(ASTM C-1183 modified, Type S)

APPLICATION INFORMATION

Coverage

20 oz Sausage: Yield in Linear feet

Width/Depth	1/4"	3/8"	1/2"
1/4"	48.1		
3/8"	32.1	21.4	
1/2"	24.1	16.0	12.0
3/4"	16.0	10.7	8.0
1"			6.0
1.25"			4.8
1.5"			4.0

1 gallon: Yield in Linear feet

Width/Depth	1/4"	3/8"	1/2"
1/4"	307.9		
3/8"	205.3	136.8	
1/2"	153.9	102.6	77.0
3/4"	102.6	68.4	51.3
1"			38.5
1.25"			30.8
1.5"			25.7

Backing Material

To control joint depth, use closed cell polyethylene or non-gassing polyolefin backer rod. If joint depth does not allow for backer rod, use polyethylene bond breaker tape to prevent three-sided adhesion. Closed cell backer rod should be 25% larger than joint width; do not compress more than 40%. Never use open cell rod in on grade horizontal joints.

Sag Flow

self-leveling @ 120 °F (49 °C)

(ASTM C-639)

Cure Time

90 % in 1 h

(at 77 °F (25 °C) and 50 % R.H.) (MNA Method)

Skin Time

10 min.

(at 77 °F (25 °C), 50 % R.H.) (MNA Method)

Tack Free Time

25 min.

(at 77 °F (25 °C), 50 % R.H.) (ASTM C-679)

APPLICATION INSTRUCTIONS

SUBSTRATE PREPARATION

The substrate must be clean, dry, frost free, sound and free of any oils, greases or incompatible sealers, paints or coatings that may interfere with adhesion.

Porous Substrates – clean by mechanical methods to expose a sound surface free of contamination and laitance.

Non-porous substrates – for cleaning non-porous substrates, use two rag wipe method using xylene or an approved commercial solvent. Allow solvent to evaporate prior to sealant application.

Priming

Sikasil-728 RCS is designed to obtain adhesion without the use of a primer; however, best results are obtained when horizontal joints are primed. Test by applying the sealant and/or primer sealant combination to confirm results and proposed application methods. Refer to Technical Data Sheet for Sikasil Primer and contact Technical Service for additional information.

APPLICATION METHOD / TOOLS

Joint Design: The number of joints and the joint width

may be designed for high movement capability. For joints one to three inches in width, the sealant will accept movements +100 % and -50 % and for three to four inches in width, the sealant will accept movements of ±50 % of joint width at time of installation. The depth of the sealant should be 1/2 the width of the joint. The minimum depth is 1/4 inch (6 mm) and the maximum is 1/2 inch (12 mm). For joints greater than 1 inch (25.4 mm), do not exceed 1/2 inch (6 mm) in depth

Joint Backing: To control joint depth, use closed cell polyethylene or non-gassing polyolefin backer rod. If joint depth does not allow for backer rod, use polyethylene bond breaker tape to prevent three-sided adhesion. Closed cell backer rod should be 25 % larger than joint width; do not compress more than 40%. Never use open cell rod in on grade horizontal joints.

Apply sealant using consistent, positive pressure to force sealant into the joint. Apply the sealant so that it is recessed 1/8 in. (3 mm) below the surface. For parking deck joints, recess 1/4 in. (6 mm). For highway joints, recess 1/2 in. (12.7 mm). Sikasil®-728 RCS is self-leveling - no tooling is needed. DO NOT use soapy water or other liquids. Consult full application guide for further

information. Sikasil®-728 RCS will obtain adhesion to aged, cured asphalt. Never use on newly poured asphalt. Conduct a field test to document and confirm adhesion under actual jobsite conditions. For sausages use a 16 element, 3/4 (19 mm) diameter static mixing nozzle.

Removal

Remove excess sealant from substrate while uncured using a commercial solvent, such as xylene according to the solvent manufacturer's warnings and instructions for use. Cured sealant can only be removed by mechanical means.

LIMITATIONS

- Do not allow sealant to come in contact with solvent during cure.
- Do not allow sealant to come in contact with curing polyurethane sealants during cure.
- Not intended for immersion.
- Sealant may be applied below freezing temperatures if substrates are completely dry, frost free and clean. Contact Technical Service for more information.
- Contact Technical Service prior to using in joints over 3 in. (76 mm) wide.
- Not intended for structural glazing.
- Test recommended for absorptive surfaces such as limestone, granite or marble where staining may occur.
- Do not apply to substrates that bleed oil, plasticizers or solvent.
- Do not apply to damp or wet substrates.
- Lower temperature and humidity will extend tack free and cure rates.
- Allow treated wood to age six months before application.
- Brass and copper may discolor. Test apply prior to application.
- Test sensitive substrates, such as mirror backings for compatibility before use.

BASIS OF PRODUCT DATA

Results may differ based upon statistical variations depending upon mixing methods and equipment, temperature, application methods, test methods, actual site conditions and curing conditions.

OTHER RESTRICTIONS

See Legal Disclaimer.

ENVIRONMENTAL, HEALTH AND SAFETY

For further information and advice regarding transportation, handling, storage and disposal of chemical products, user should refer to the actual Safety Data Sheets containing physical, environmental, toxicological and other safety related data. User must read the current actual Safety Data Sheets before using any products. In case of an emergency, call CHEMTREC

at 1-800-424-9300, International 703-527-3887.

LEGAL DISCLAIMER

- KEEP CONTAINER TIGHTLY CLOSED
- KEEP OUT OF REACH OF CHILDREN
- NOT FOR INTERNAL CONSUMPTION
- FOR INDUSTRIAL USE ONLY
- FOR PROFESSIONAL USE ONLY

Prior to each use of any product of Sika Corporation, its subsidiaries or affiliates ("SIKA"), the user must always read and follow the warnings and instructions on the product's most current product label, Product Data Sheet and Safety Data Sheet which are available at usa.sika.com or by calling SIKA's Technical Service Department at 1-800-933-7452. Nothing contained in any SIKA literature or materials relieves the user of the obligation to read and follow the warnings and instructions for each SIKA product as set forth in the current product label, Product Data Sheet and Safety Data Sheet prior to use of the SIKA product.

SIKA warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Product Data Sheet if used as directed within the product's shelf life. User determines suitability of product for intended use and assumes all risks. User's and/or buyer's sole remedy shall be limited to the purchase price or replacement of this product exclusive of any labor costs. **NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SIKA SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. SIKA SHALL NOT BE RESPONSIBLE FOR THE USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT OR ANY OTHER INTELLECTUAL PROPERTY RIGHTS HELD BY OTHERS.**

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Fax: 52 442 2250537



Product Data Sheet
Sikasil®-728 RCS
October 2018, Version 01.01
020515060000000001

Sikasil-728RCS-en-US-(10-2018)-1-1.pdf





PRODUCT DATA SHEET

Sikasil®-728 NS

NON-SAG, ULTRA LOW MODULUS, HIGHWAY/PARKING GARAGE, NEUTRAL CURE SILICONE SEALANT

PRODUCT DESCRIPTION

Sikasil®-728 NS is a high performance, non-sag, one-component, ultra low modulus elastomeric, neutral cure silicone sealant. Meets the requirements of ASTM D-5893: ASTM C-920, Type S, Grade NS, Class 100/50, Use NT, T, M, G, A, O with ultra low Shore Hardness: TT-S-00230C, Type II, Class A; Class A.

USES

Construction Application

- Highway joints
- Bridges
- Stadiums
- Parking garages
- Plaza decks
- Driveways
- Decks
- Expansion joints
- Saw cut joints

Substrate

- Concrete, steel, glass, aluminum, ceramic, masonry, brick, stone and granite

CHARACTERISTICS / ADVANTAGES

- Durable
- Ideal for cold climates
- Excellent flexibility for extreme high and low temperature conditions
- Excellent flexibility for dynamic joint movement
- Bonds to most substrates without priming; best performance obtained in horizontal joints when primed
- Ready to use, labor cost reduction
- Non sag, excellent for vertical joints
- All season ease of application
- Excellent for use on all types of concrete joints
- Jet fuel resistant
- Resistant to road salts

PRODUCT INFORMATION

Chemical Base	Neutral cure silicone
Packaging	4.5 gal (17 l) in a 5 gal pail 52 gal (197 l) in 55 gal drum 29 oz. cartridge/12 per case
Color	Limestone and Charcoal Gray

Shelf Life When stored in the original, unopened containers at or below 90 °F (32 °C), shelf life is one year. A product skin may form in pails and drums, remove prior to use.

Storage Conditions Store in unopened containers at temperatures at or below 90 °F (32 °C).

Volatile organic compound (VOC) content 1.64 % by wt., 21 g/l, 0.18 lb./gal.

TECHNICAL INFORMATION

Shore Hardness 50 Shore OO (after 7 days) (ASTM C-661, ASTM D 2240)
5-10 Shore A (after 7 days)

Tensile Strength 175 psi (1.20 MPa) (ASTM D-412)

Tensile Stress at Specified Elongation 35 psi (0.24 MPa) at 100 % elongation (ASTM D-412)

Elongation at Break ~1 000 % (ASTM D-412)

Adhesion in Peel ~7 N/mm (40 lbf/in) on mortar substrate (ASTM C-794)

Movement Capability +100 % / -50 % (ASTM C-719)

Resistance to Weathering Excellent

Service Temperature -80 °F min. (-62 °C) / +350 °F max. (177 °C)

Joint Design

Joint Design: The number of joints and the joint width should be designed for a recommended joint movement of +25 % and -25 % at time of installation. The depth of the sealant should be 1/2 the width of the joint. The maximum depth is 1/2 inch (13 mm) and the minimum is 3/8 inch (10 mm). For joints greater than 1 inch (25.4 mm), do not exceed 1/2 inch (13 mm) in depth.

Joint Backing: To control joint depth, use closed cell polyethylene or non-gassing polyolefin backer rod. If joint depth does not allow for backer rod, use polyethylene bond breaker tape to prevent three-sided adhesion. Closed cell backer rod should be 25 % larger than joint width; do not compress more than 40 %.

APPLICATION INFORMATION

Coverage	1 gallon: Yield in Linear feet			
	Width/Depth	1/4"	3/8"	1/2"
	1/4"	307.9		
	3/8"	205.3	136.8	
	1/2"	153.9	102.6	77.0
	3/4"	102.6	68.4	51.3
	1"			38.5
	1.25"			30.8
	1.5"			25.7
	29 oz Cartridge: Yield in Linear feet			
	Width/Depth	1/4"	3/8"	1/2"
	1/4"	69.8		
	3/8"	46.5	31.0	
	1/2"	34.9	23.3	17.4
	3/4"	23.3	15.5	11.6
	1"			8.7
	1.25"			7.0
	1.5"			5.8
Backing Material	Use closed cell, polyethylene foam backing rods 25 % larger than the joint width. If the joint depth does not allow for a backer rod, use polyethylene bond breaker tape to prevent three-sided adhesion.			
Sag Flow	none			(ASTM D-2202)
Cure Time	1/16" / 24 hours			(MNA Method)
Skin Time	15–25 minutes		(77 °F (25 °C) / 50 % R.H.)	(MNA Method)
Tack Free Time	30–40 minutes		(77 °F (25 °C) / 50 % R.H.)	(ASTM C-679)

APPLICATION INSTRUCTIONS

SUBSTRATE PREPARATION

The substrate must be clean, dry, frost free, sound and free of any oils, greases or incompatible sealers, paints or coatings that may interfere with adhesion.

Porous Substrates – clean by mechanical methods to expose a sound surface free of contamination and laitance.

Non-porous substrates – for cleaning non-porous substrates, use two rag wipe method using xylene or an approved commercial solvent. Allow solvent to evaporate prior to sealant application.

Primer

Sikasil®-728 NS is designed to obtain adhesion without the use of a primer; however, best results are obtained when horizontal joints are primed. Test by applying the sealant and/or primer sealant combination to confirm results and proposed application methods. Refer to Technical Data Sheet for Sikasil Primer 2100 and contact Technical Service for additional information.

APPLICATION METHOD / TOOLS

Ready to use, apply using professional caulking gun or dispensing equipment. Do not open product container until preparation work has been completed. Apply sealant using consistent, positive pressure to force sealant into the joint. Apply the sealant so that it is recessed 1/8 inch (3 mm) below the surface. For parking deck joints, recess 1/4 inch (6 mm). For highway joints, recess 1/2 inch (13 mm). Tool sealant to create a concave joint shape and maximum adhesion. Dry tooling is recommended. DO NOT use soapy water or other liquids when tooling. Remove excess sealant from substrate while uncured using a commercial solvent, such as xylene. Strictly follow the solvent manufacturer's warnings and instructions for use. Cured sealant may be removed by mechanical means.

LIMITATIONS

- Do not allow sealant to come in contact with solvent during cure.
- Do not allow sealant to come in contact with curing polyurethane sealants during cure.
- Not intended for immersion.

- Sealant may be applied below freezing temperatures if substrates are completely dry, frost free and clean. Contact Technical Service for more information.
- Not recommended for structural glazing applications.
- Test recommended for absorptive surfaces such as granite, limestone or marble where staining may occur.
- Do not apply to substrates that bleed oil, plasticizers or solvent.
- Do not apply to damp or wet substrates.
- Lower temperature and humidity will extend tack free time and cure rates.
- Allow treated wood to age six months before application.

BASIS OF PRODUCT DATA

Results may differ based upon statistical variations depending upon mixing methods and equipment, temperature, application methods, test methods, actual site conditions and curing conditions.

OTHER RESTRICTIONS

See Legal Disclaimer.

ENVIRONMENTAL, HEALTH AND SAFETY

For further information and advice regarding transportation, handling, storage and disposal of chemical products, user should refer to the actual Safety Data Sheets containing physical, environmental, toxicological and other safety related data. User must read the current actual Safety Data Sheets before using any products. In case of an emergency, call CHEMTREC at 1-800-424-9300, International 703-527-3887.

LEGAL DISCLAIMER

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- KEEP OUT OF REACH OF CHILDREN
- NOT FOR INTERNAL CONSUMPTION
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Prior to each use of any product of Sika Corporation, its subsidiaries or affiliates ("SIKA"), the user must always read and follow the warnings and instructions on the product's most current product label, Product Data Sheet and Safety Data Sheet which are available at usa.sika.com or by calling SIKA's Technical Service Department at 1-800-933-7452. Nothing contained in any SIKA literature or materials relieves the user of the obligation to read and follow the warnings and instructions for each SIKA product as set forth in the current product label, Product Data Sheet and Safety Data Sheet prior to use of the SIKA product.

SIKA warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Product Data Sheet if used as directed within the product's shelf life. User determines suitability of product for intended use and assumes all risks. User's and/or buyer's sole remedy shall be limited to the purchase price or replacement of this product exclusive of any labor costs. **NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SIKA SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. SIKA SHALL NOT BE RESPONSIBLE FOR THE USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT OR ANY OTHER INTELLECTUAL PROPERTY RIGHTS HELD BY OTHERS.**

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Carretera Libre Celaya Km. 8.5
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Phone: 52 442 2385800
Fax: 52 442 2250537



Product Data Sheet
Sikasil®-728 NS
March 2019, Version 01.02
020515030000000004

Sikasil-728NS-en-US-(03-2019)-1-2.pdf

BUILDING TRUST



PRODUCT DATA SHEET

Sikaflex[®]-1A

ELASTOMERIC JOINT SEALANT / ADHESIVE

PRODUCT DESCRIPTION

Sikaflex[®]-1A is a premium-grade, high-performance, moisture-cured, 1-component, polyurethane-based, non-sag elastomeric sealant. Sikaflex-1a can be used in green and damp concrete applications. Meets Federal Specification TT-S-00230C, Type II, Class A. Meets ASTM C-920, Type S, Grade NS, Class 35, use T, NT, O, M, G, I, A. Canadian standard CAN/CGSB 19.13-M87.

USES

- Designed for all types of joints where maximum depth of sealant will not exceed 1/2 in.
- Excellent for small joints and fillets, windows, door frames, reglets, flashing, common roofing detail applications, and many construction adhesive applications.
- Suitable for vertical and horizontal joints; readily placeable at 40°F
- Has many applications as an elastic adhesive between materials with dissimilar coefficients of expansion.
- Submerged conditions, such as canal and reservoir joints.

CHARACTERISTICS / ADVANTAGES

- Eliminates time, effort, and equipment for mixing, filling cartridges, pre-heating or thawing, and cleaning of equipment.
- Fast tack-free and final cure times.
- High elasticity - cures to a tough, durable, flexible consistency with exceptional cut and tear -resistance.
- Stress relaxation.
- Excellent adhesion - bonds to most construction materials without a primer.
- Excellent resistance to aging, weathering.

- Proven in tough climates around the world.
- Can be applied to green concrete 24 hours after pour
- Can be applied to damp concrete 1 hour after getting wet
- Odorless, non-staining.
- Jet fuel resistant.
- Certified to the NSF/ANSI Standard 61 for potable water.
- Urethane-based; suggested by EPA for radon reduction.
- Paintable with water-, oil- and rubber-based paints.
- Capable of ±35% joint movement.

APPROVALS / STANDARDS

- ASTM C 920, Type S, Grade NS, Class 35, use NT, A, M
- Federal specification TT-S-00230 C Type II, Class A
- Canadian Standard CAN/CGSB 19.13-M87
- Certified to NSF/ANSI standard 61 for portable water

PRODUCT INFORMATION

Packaging	10.1 fl. oz. (300 mL) Cartridge, 20 fl. oz. uni-pac Sausages, 4.5 gal (17 L) in a 5 gal pail, 52 gal (197 L) in a 55 gal drum
Color	White, colonial white, aluminum gray, limestone, black, dark bronze, capitol tan, stone and medium bronze. Special architectural colors on request.
Shelf Life	Cartridge and Sausage: 12 months in original, unopened packaging. Pail and Drum: 6 months in original, unopened packaging.
Storage Conditions	Store at 40°-95°F (4°-35°C).

TECHNICAL INFORMATION

Shore A Hardness	(21 day) 45±5	(ASTM C 661)												
Tensile Stress at Specified Elongation	21 day Tensile Stress Stress @ 100%	<u>175 psi (1.21 MPa)</u> <u>85 psi (0,59 N/mm²)</u> (ASTM D 412)												
Elongation at Break	550 %	(ASTM D-412)												
Adhesion in Peel	<table><thead><tr><th>Substrate</th><th>Peel Strength</th><th>Adhesion loss</th></tr></thead><tbody><tr><td>Concrete</td><td>20 lbs</td><td>0 %</td></tr><tr><td>Aluminium</td><td>20 lbs</td><td>0 %</td></tr><tr><td>Glass</td><td>20 lbs</td><td>0 %</td></tr></tbody></table>	Substrate	Peel Strength	Adhesion loss	Concrete	20 lbs	0 %	Aluminium	20 lbs	0 %	Glass	20 lbs	0 %	(ASTM C-794) (TT-S-00230C)
Substrate	Peel Strength	Adhesion loss												
Concrete	20 lbs	0 %												
Aluminium	20 lbs	0 %												
Glass	20 lbs	0 %												
Tear Strength	55 lb./in.	(ASTM D-624)												
Movement Capability	±35 %	(ASTM C-719)												
Chemical Resistance	Good resistance to water, diluted acids, and diluted alkalines. Consult Technical Service for specific data.													
Resistance to Weathering	Excellent													
Service Temperature	-40 °F to +170 °F													

APPLICATION INFORMATION

Coverage

10.1 oz Cartridge: Yield in Linear Feet

Width/Depth	1/4"	3/8"	1/2"
1/4"	24.3		
3/8"	16.2	10.8	
1/2"	12.1	8.1	6.1
3/4"	8.1	5.4	4.0
1"			3.0
1.25"			2.4
1.5"			2.0

20 oz Sausage: Yield in Linear Feet

Width/Depth	1/4"	3/8"	1/2"
1/4"	48.1		
3/8"	32.1	21.4	
1/2"	24.1	16.0	12.0
3/4"	16.0	10.7	8.0
1"			6.0
1.25"			4.8
1.5"			4.0

1 gallon: Yield in Linear Feet

Width/Depth	1/4"	3/8"	1/2"
1/4"	307.9		
3/8"	205.3	136.8	
1/2"	153.9	102.6	77.0
3/4"	102.6	68.4	51.3
1"			38.5
1.25"			30.8
1.5"			25.7

Cure Time Final cure: 4 to 7 days

Curing Rate Tack-free time 3 to 6 hours
Tack-free to touch 3 hours

APPLICATION INSTRUCTIONS

SUBSTRATE PREPARATION

Product Conditioning: Condition material to 65°-75°F before using.

Clean all surfaces. Joint walls must be sound, clean, frost-free, and free of oil and grease. Curing compound residues and any other foreign matter must be thoroughly removed. A roughened surface will also enhance bond. Install bond breaker tape or backer rod to prevent bond at base of joint. Priming is not usually necessary. Most substrates only require priming if testing indicates a need or where sealant will be subjected to water immersion after cure.

For green concrete applications control joints must be cut 8 hours prior to sealant installation and in expansion joint forms must be removed 4 hours prior to sealant installation. For wet concrete applications all excess or standing water must be displaced and concrete must

then dry for a minimum of 60 min prior to sealant installation. Consult Sikaflex Primer Technical Data Sheet or Technical Service for additional information on priming.

APPLICATION METHOD / TOOLS

Recommended application temperatures: 40°-100°F. For cold weather application, condition units at approximately 70°F; remove prior to using. For best performance, Sikaflex-1a should be gunned into joint when joint slot is at mid-point of its designed expansion and contraction. Place nozzle of gun into bottom of the joint and fill entire joint. Keep the nozzle in the sealant, continue on with a steady flow of sealant preceding the nozzle to avoid air entrapment. Avoid overlapping of sealant to eliminate entrapment of air.

Sikaflex-1a can be applied on green concrete after the concrete has cured for a minimum of 24 hours at 75°F. Control joints must be cut and open for min of 8 hours prior to application. Expansion joints must have

forms removed a minimum of 4 hours prior to application. For damp concrete applications Sikaflex-1a can be applied 60 minutes after any and all water has been displaced.

Tooling & Finishing

Tool sealant to ensure full contact with joint walls and remove air entrapment. Joint dimension should allow for 1/4 inch minimum and 1/2 inch maximum thickness for sealant. Proper design is 2:1 width to depth ratio, For use in horizontal joints in traffic areas, the absolute minimum depth of the sealant is 1/2 in. and closed cell backer rod is recommended.

Removal

Use personal protective equipment (chemical resistant gloves/goggles/clothing). Without direct contact, remove spilled or excess product and placed in suitable sealed container. Dispose of excess product and container in accordance with applicable environmental regulations.

Over Painting

Allow 1-week cure at standard conditions when using Sikaflex-1a in total water immersion situations and prior to painting.

CLEANING OF TOOLS

Clean all tools and application equipment with Sika® Remover-208 immediately after use. Hardened material can only be removed mechanically. For cleaning skin use Sika® Cleaning Wipes-100.

AVAILABILITY/WARRANTY

- Pre-treatment Sealing and Bonding Chart
- Method Statement: Joint Sealing
- Method Statement: Joint Maintenance, Cleaning and Renovation
- Technical Manual: Facade Sealing

LIMITATIONS

- Allow 1 week cure at standard conditions when using Sikaflex-1a in total water immersion situations.
- When overcoating with water, oil and rubber based paints, compatibility and adhesion testing is essential.
- Sealant should be allowed to cure for 7 days prior to overcoating
- Avoid exposure to high levels of chlorine. (Maximum continuous level is 5 ppm of chlorine.)
- Maximum depth of sealant must not exceed 1/2 in.; minimum depth is 1/4 in.
- Maximum expansion and contraction should not exceed 35% of average joint width.
- Do not cure in the presence of curing silicone sealants.
- Avoid contact with alcohol and other solvent cleaners during cure.
- Do not apply when moisture-vapor-transmission condition exists from the substrate as this can cause

bubbling within the sealant.

- Use opened cartridges and uni-pac sausages the same day.
- When applying sealant, avoid air-entrapment.
- Since system is moisture-cured, permit sufficient exposure to air.
- White color tends to yellow slightly when exposed to ultraviolet rays.
- Light colors can yellow if exposed to direct gas fired heating element.
- The ultimate performance of Sikaflex-1a depends on good joint design and proper application with joint surfaces properly prepared.
- The depth of sealant in horizontal joints subject to traffic is 1/2 in.
- Do not tool with detergent or soap solutions.
- Do not use in contact with bituminous/asphaltic materials.
- In green concrete applications sealing joints in poor or low strength concrete 24 hours after pour may impact ability of sealant to gain proper adhesion.
- In damp concrete applications all standing water and excess water must be eliminated prior to the 60 minute waiting time.

BASIS OF PRODUCT DATA

Results may differ based upon statistical variations depending upon mixing methods and equipment, temperature, application methods, test methods, actual site conditions and curing conditions.

OTHER RESTRICTIONS

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SIKA warrants this product for one year from date of installation to be free from manufacturing defects and to meet the technical properties on the current Product Data Sheet if used as directed within the product's shelf life. User determines suitability of product for intended use and assumes all risks. User's and/or buyer's sole remedy shall be limited to the purchase price or replacement of this product exclusive of any labor costs.

NO OTHER WARRANTIES EXPRESS OR IMPLIED SHALL APPLY INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. SIKA SHALL NOT BE LIABLE UNDER ANY LEGAL THEORY FOR SPECIAL OR CONSEQUENTIAL DAMAGES. SIKA SHALL NOT BE RESPONSIBLE FOR THE USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT OR ANY OTHER INTELLECTUAL PROPERTY RIGHTS HELD BY OTHERS.

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Phone: 52 442 2385800
Fax: 52 442 2250537



Product Data Sheet
Sikaflex®-1A
August 2019, Version 01.01
020511010000000008

Sikaflex-1A-en-US-(08-2019)-1-1.pdf

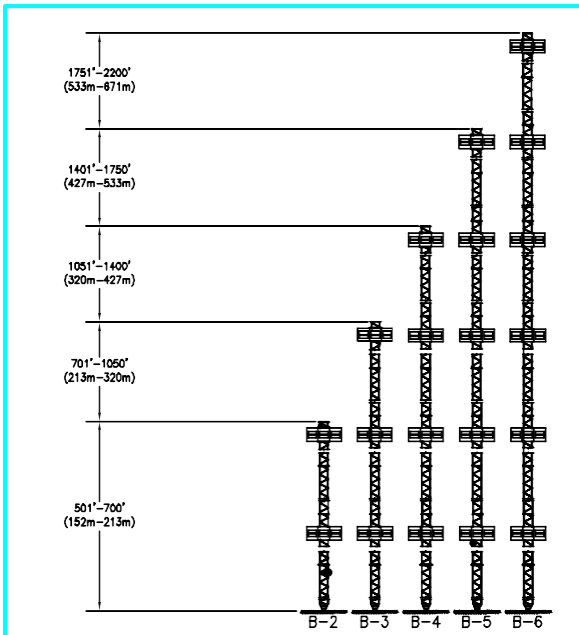
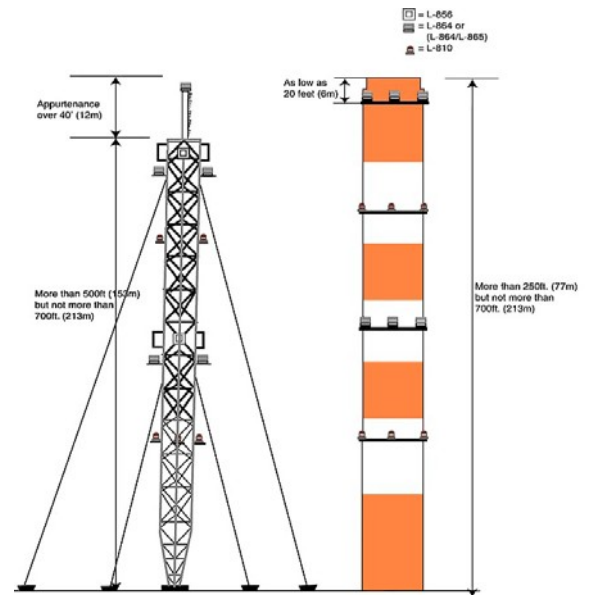
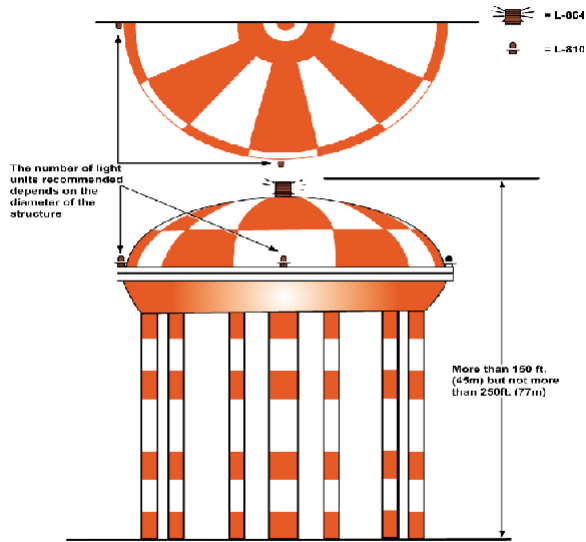


APPENDIX K

FAA RESTRICTIONS



Obstruction Marking and Lighting





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

CHAPTER 1. ADMINISTRATIVE AND GENERAL PROCEDURES

1.1 Reporting Requirements.

A Sponsor proposing any type of construction or alteration of a structure that may affect the National Airspace System (NAS) as required under the provisions of Code of Federal Regulations (CFR), Title 14, Aeronautics and Space, Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace (14 CFR, Part 77), is to notify the Federal Aviation Administration (FAA) by completing the FAA Form 7460-1, Notice of Proposed Construction or Alteration.

This form should be filed electronically at <https://oeaaa.faa.gov>. The website includes the FAA Notice Criteria Tool for Sponsors use to determine if the structure exceeds criteria threshold and requires a notice to be filed.

1.2 Preconstruction Notice.

The notice must be submitted:

1. At least 45 days prior to the date of proposed construction or alteration is to begin.
2. On or before the date an application for a construction permit is filed with the Federal Communications Commission (FCC). The FCC advises its applicants to file with the FAA well in advance of the 45-day period to expedite FCC processing.

1.3 FAA Acknowledgement.

The FAA will acknowledge, electronically, each FAA Form 7460-1 notice received.

1.4 Supplemental Notice Requirement.

1. If required, the FAA will include a statement requiring the filing of FAA Form 7460-2, Notice of Actual Construction or Alteration, on the determination. All FAA Forms 7460-2 should be filed electronically at <https://oeaaa.faa.gov>.
2. FAA Form 7460-2, Part 1, must be submitted to the FAA at least ten days prior to starting the actual construction or alteration of a structure. The FAA Form 7460-2, Part 2, completed within five days after the structure has reached its greatest height.
3. In addition, notification of dismantlement or abandonment of construction must be submitted to the FAA using the supplemental notice FAA Form 7460-2.

Note: Notification as required in the determination is critical to aviation safety.

1.5 Modifications and Deviations.

Requests for modification or deviation from the standards outlined in this AC must be submitted to the FAA Obstruction Evaluation Group (OEG). The Sponsor is responsible for adhering to approved marking and/or lighting limitations, and recommendations given, and should notify the FAA and FCC (for those structures regulated by the FCC) prior to making any changes, such as removal of marking and/or lighting. Requests received for any changes after a determination has been issued will require a new aeronautical study and may result in a modified determination, including updated marking and/or lighting recommendations.

1. Modification examples. Modifications will be based on whether they impact aviation safety. Examples of modifications are as follows:
 - a. Marking and/or lighting only a portion of an object. The object may be located with respect to other objects or terrain that only a portion of it needs to be marked and/or lighted.
 - b. No marking and/or lighting. The object may be located with respect to other objects or terrain, removed from the general flow of air traffic, or may be so conspicuous by its shape, size, or color that marking or lighting would serve no useful purpose.
 - c. Voluntary marking and/or lighting. The object may be located with respect to other objects or terrain that the Sponsor feels increased conspicuity would better serve aviation safety. Sponsors who desire to voluntarily mark and/or light their structure should do so in accordance with this AC.
 - d. Marking or lighting an object in accordance with the standards for an object of greater height or size. The object may present such an extraordinary hazard potential that higher standards may be recommended for increased conspicuity to ensure aviation safety.
2. Deviations. The assigned Obstruction Evaluation Specialist will conduct an aeronautical study of the proposed deviation(s) and forward their recommendation to their FAA Team Manager for final approval. Examples of deviations that may be considered:
 - a. Colors of objects.
 - b. Dimensions of color bands or rectangles.
 - c. Colors/types of lights.
 - d. Basic signals and intensity of lighting.
 - e. Night/day lighting combinations.
 - f. Flash rate.

The FAA strongly recommends that owners become familiar with the different types of lighting systems and to specifically request the type of lighting system desired when submitting FAA Form 7460-1. Information regarding types of lighting systems is provided in Chapters 5 - 10, and specifications regarding lighting equipment classifications in Table A-1, in this AC. While the FAA will make every effort to accommodate the structure Sponsor's request, Sponsors should also request information from system manufacturers to determine which system best meets their needs based on purpose, installation, and maintenance costs.

1.6 Additional Notification.

Proper authorization and annotations of obstruction marking and lighting may require notice to the FCC prior to making any change to the submitted information which the FAA based its determination. This includes modification, deviation, or optional upgrade to white lighting on structure, which may be subject to inspection and enforcement of marking and lighting requirements by the FCC. FCC Forms and Bulletins can be obtained from the FCC's National Call Center at 1-888-CALL-FCC (1-888-225-5322) or online at: <https://www.fcc.gov/wireless-telecommunications>. Additionally, upon completion of the actual change, complete the "Add Supplemental Notice (FAA Form 7460-2)" at the <https://oeaaa.faa.gov> website.

CHAPTER 2. GENERAL

2.1 Structures to be Marked and Lighted.

Any temporary or permanent structure, including all appurtenances, that exceeds any obstruction standard contained in 14 CFR Part 77 or an overall height of 200 feet (60.96m) above ground level (AGL) should be marked and/or lighted. However, an FAA aeronautical study may reveal that the absence of marking and/or lighting will not impair aviation safety. Conversely, the object may present such an extraordinary hazard potential that higher standards may be recommended for increased conspicuity to ensure aviation safety. Recommendations for marking and/or lighting structures can vary, depending on terrain features, weather patterns, geographic location, number of structures, and overall design layout. The FAA may also recommend marking and/or lighting a structure that does not exceed 200 feet (60.96 m) AGL or 14 CFR Part 77 standards because of its particular location. The marking and lighting configurations are illustrated in Appendix A.

2.2 Guyed Structures.

The guys of a 2,000-foot (609.60 m) skeletal tower are anchored between 1,600 feet (487.68 m) and 2,000 feet (609.60 m) from the base of the structure. This places a portion of the guys 1,500 feet (457.20 m) from the tower at a height of between 125 feet (38.10 m) and 500 feet (152.40 m) AGL. Title 14 CFR Part 91, Section 119, requires pilots, when operating over other than congested areas, to remain at least 500 feet (152.40 m) from man-made structures. Therefore, the tower must be cleared by 2,000 feet (609.60 m) horizontally to avoid all guy wires. Properly maintained marking and lighting are important for increased conspicuity because the guys of a structure are difficult to see until the aircraft is dangerously close.

2.3 Marking and Lighting Equipment.

Considerable effort and research was expended to determine the minimum marking and lighting systems and quality of materials that will produce an acceptable level of aviation safety. The FAA will recommend only those marking and lighting systems that meet established technical standards and commercial outside lighting should not be used in lieu of FAA recommended marking and/or lighting. While additional lights may be desirable to identify an obstruction to air navigation, and may on occasion be recommended, the FAA will recommend minimum standards in the interest of safety, economy, and related concerns. Therefore, to provide an adequate level of safety, obstruction lighting systems should be installed, operated, and maintained in accordance with the recommended standards herein. Chapter 15 contains descriptions of FAA- approved obstruction marking and lighting equipment and information referred to in this AC.

2.4 Light Failure Notification.

Sponsors should consider that conspicuity is achieved only when all recommended lights are working. Partial equipment outages decrease the margin of safety. Any outage should be corrected as soon as possible. Failure of steady-burning side or intermediate lights should be corrected as soon as possible, but notification is not required.

Note: On September 11, 2020, the FAA changed specifications for LED-based red obstruction lights to make them visible to pilots using certain night vision goggle systems. Effective with 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.

Because the new specification ensures the light is visible to pilots operating with night vision goggles, there is risk of a pilot misinterpreting the tower height if a legacy intermediate-level light is replaced with one that meets the new specification unless the top light meets the new specification as well. Therefore, if a legacy specification intermediate-level LED-based light is replaced with a light that meets the new specifications, then the top-level light(s) on the obstruction must also meet the new specification to ensure the entire obstruction is visible during the use of night vision goggles.

- 2.4.1. Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light, flashing obstruction light regardless of its position, wind turbine lighting fixture, or wind turbine synchronization should be reported immediately by calling Outage Reporting and Notice to Airmen (NOTAM) at 877-487-6867, or in Alaska 800-478- 3576, so a NOTAM can be issued. For structures that are regulated by the FCC, the FCC advises that noncompliance with notification procedures could subject the Sponsor to penalties or monetary forfeitures. Voluntarily installed lights (not required by an FAA determination) do not require a NOTAM.
- 2.4.2. The following information should be specified for outage reporting:
1. Name of persons or organizations reporting the light failures, including any title, address, and telephone number.
 2. The type of structure.
 3. Location of structure (including latitude and longitude, prominent structures, landmarks, etc.).
 4. Height of structure AGL/above mean sea level (AMSL) if known.
 5. Return to service date.
 6. FCC Antenna Structure Registration Number (for structures that are regulated by the FCC).

Note: When the primary lamp in a double obstruction light fails and the secondary lamp comes on, no report is required.

2.5 Notification of Restoration.

As soon as normal operation is restored, notify Outage Reporting and NOTAM Offices (see Paragraph 2.4.1).

Note: For structures regulated by the FCC, the FCC advises that noncompliance with notification procedures could subject the Sponsor to penalties or monetary forfeitures.

2.6 Federal Communications Commission (FCC) Requirement.

The use of a high-intensity flashing white lighting system on structures located in residential neighborhoods (as defined by applicable zoning laws) trigger requirements for FCC licenses and an environmental assessment.

2.7 Voluntary Marking of Meteorological Evaluation Towers (MET) Less Than 200 Feet (60.96 m) AGL.

The FAA recommends voluntary marking of MET less than 200 feet (60.96 m) AGL in accordance with marking guidance contained in this AC. Historically this guidance has not been applied, however the FAA recognizes the need to address safety impacts to low-level agricultural flight operations and believes that voluntarily marking MET less than 200 feet (60.96 m) AGL in remote and rural areas enhance the conspicuity of these structures.

1. Painting. The MET should be painted in accordance with the standards and criteria contained in Chapters 3 and 15, with alternating bands of aviation orange and white paint. In addition, paragraph 3.3.1 states that all markings should be replaced when faded or otherwise deteriorated.
2. High-visibility sleeves. It is recommended that several high-visibility sleeves be installed on the MET outer guy wires (see Figure A-2). One high-visibility sleeve should be installed on each guy wire, as close to the anchor point as possible, but at a height well above the crop or vegetation canopy. A second sleeve should be installed on the same outer guy wires midway between the location of the lower sleeve and the upper attachment point of the guy wire to the MET.

Spherical markers. It is also recommended that high-visibility aviation orange spherical marker (or cable) balls be attached to the guy wires. Spherical markers should be installed and displayed in accordance to Chapter 11. The FAA, however, recognizes various weather conditions and manufacturing placement standards may affect the placement and use of high-visibility sleeves and/or spherical markers. Thus, some flexibility is allowed when determining sleeve length and marker placement on the MET.

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 5. RED OBSTRUCTION LIGHT SYSTEM

5.1 Purpose.

Red steady burning (L-810) and flashing (L-810 F or L-864) Obstruction Light Systems are used to increase conspicuity during nighttime, however additional marking and/or lighting during daytime and twilight is required. Recommendations on lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures.

5.2 Standards.

The red obstruction light system is composed of flashing omnidirectional lights (L-864) and/or steady-burning or flashing (L-810/L-810 (F)) lights. When one or more levels are comprised of flashing lights, the lights should flash simultaneously. To determine the number of light levels needed, refer to Figure A-6.

1. Single Obstruction Light. A single red obstruction light may be used when more than one obstruction light is required either vertically or horizontally, or when maintenance is needed, and can be installed within a reasonable time.
 - a. Top level. A single steady-burning light may be used to identify low structures, such as airport instrument landing system buildings, as well as long horizontal structures, such as perimeter fences and building roof outlines.
 - b. Intermediate level. Single flashing or steady-burning lights (as appropriate for size and type of structure) may be used on skeletal and solid structures when more than one level of lights is installed and there are two or more single lights per level.
2. Double Obstruction Light. A double steady-burning light should be installed when used as a top light, at each end of a row of single obstruction lights, and in areas or locations where the failure of a single unit could cause an obstruction to be totally unlighted.
 - a. Top level. Structures 150 feet (45.72 m) AGL or less should have one or more double steady-burning lights installed at the highest point and operating simultaneously.
 - b. Intermediate level. Double flashing or steady-burning lights (as appropriate for size and type of structure) should be installed at intermediate levels when a malfunction of a single light could create an unsafe condition and in remote areas where immediate maintenance cannot be performed. Both units may operate simultaneously, or a transfer relay may be used to switch to a spare unit should the active system fail.

- c. Lowest level. The lowest level of light units may be installed at a higher elevation than normal on a structure if the surrounding terrain, trees, or adjacent building(s) would obscure the lights. In certain instances, as determined by the FAA, the lowest level of lights may be eliminated.

5.3 Control Device.

Red obstruction lights should be operated by an acceptable control device (e.g., photocell, timer, etc.) adjusted so the lights will be turned on when the northern sky illuminance reaching a vertical surface falls below a level of 60 foot-candles (645.83 lux) but before reaching a level of 35 foot-candles (376.73 lux). The sensing device should, if practical, face the northern sky in the Northern Hemisphere (see AC 150/5345-43, Specification for Obstruction Lighting Equipment). The control device should turn the lights off when the northern sky illuminance rises to a level of not more than 60 foot-candles (645.83 lux). The lights may also remain on continuously.

5.4 Alternate Method of Displaying Obstruction Lights.

In certain cases, instead of installing lights on the obstruction, the FAA may recommend the placement of a light(s) on an adjacent pole of equal height.

5.5 Poles, Towers, and Similar Skeletal Structures.

The following standards apply to radio and television towers, supporting structures for overhead transmission lines, and similar structures.

1. Top-Mounted Obstruction Lights.

- a. Structures 150 feet (45.72 m) AGL or less. Two or more steady-burning red (L- 810) lights should be installed in a manner to ensure an unobstructed view of one or more lights by a pilot.
- b. Structures exceeding 150 feet (45.72 m) AGL. At least one red flashing (L- 864) light should be installed in a manner to ensure an unobstructed view of one or more lights by a pilot.
- c. Appurtenances 40 feet (12.19 m) or less. If a rod, antenna, or other appurtenance 40 feet (12.19 m) or less in height is incapable of supporting a red flashing light, then it may be placed at the base of the appurtenance. If the mounting location does not allow an unobstructed view of the light by a pilot approaching in any direction, then additional lights should be added.
- d. Appurtenances exceeding 40 feet (12.19 m). If a rod, antenna, or other appurtenance exceeding 40 feet (12.19 m) in height is incapable of supporting a red flashing light, a

supporting mast with one or more lights should be installed adjacent to the appurtenance. Adjacent installations should not exceed the appurtenance's height and be within 40 feet (12.19 m) of the tip to allow the pilot an unobstructed view of at least one light. If the rod, antenna, or other appurtenance is 7/8 inch wide or more, at least two lights must be installed on the supporting mast to provide the necessary unobstructed view.

2. Mounting Intermediate Levels. The number of light levels is determined by the height of the structure, including all appurtenances, as shown in , Figure A-6. The number of lights on each level is determined by the shape and height of the structure. These lights should be mounted to ensure an unobstructed view of at least one light by a pilot approaching in any direction.
 - a. Steady-burning lights (L-810).
 - i. Structures 150 feet (45.72 m) AGL or less. Two or more steady-burning lights should be installed diagonally or on diametrically opposite positions.
 - ii. Structures exceeding 150 feet (45.72 m) AGL. These structures do not require steady-burning lights.
 - b. Flashing lights (L-810 F). For structures exceeding 150 feet (45.72 m) but not more than 350 feet (106.68 m), two or more flashing lights should be mounted outside at diagonally opposite positions at intermediate levels. These lights should be configured to flash simultaneously with the L-864 flashing light on the top of the structure at a rate of 30 flashes per minute (fpm) (± 3 fpm).
 - c. Flashing lights (L-864).
 - i. Structures 350 feet (106.68 m) AGL or less. These structures do not require flashing (L-864) lights at intermediate levels.
 - ii. Structures exceeding 350 feet (106.68 m) AGL. At intermediate levels, two (L-864) lights should be mounted outside at diagonally opposite positions.

5.6 Chimneys, Flare Stacks, and Similar Solid Structures (except Hyperbolic Cooling Towers).

5.6.1 Number of Light Units.

The number of units recommended depends on the diameter of the structure at the top. The number of lights recommended below is the minimum (see Figure A- 10).

1. Structures 20 feet (6.10 m) or less in diameter. Three light units per level.
2. Structures exceeding 20 feet (6.10 m) but not more than 100 feet (31 m) in diameter. Four

light units per level.

5.6.2 Top-Mounted Obstruction Lights.

1. Structures 150 feet (45.72 m) AGL or less. L-810 lights should be installed horizontally at regular intervals at or near the top.
2. Structures exceeding 150 feet (45.72 m) AGL. At least three L-864 lights should be installed.
3. Chimneys, Cooling Towers, and Flare Stacks. Lights may be displayed as low as 20 feet (6.10 m) below the top (, Figure A-7) to avoid the obscuring effect of deposits and heat generally emitted by this type of structure. It is important that these lights are readily accessible for cleaning and lamp replacement. It is understood that with flare stacks, as well as any other structures associated with the petrol-chemical industry, normal lighting requirements may not be necessary. This could be due to the location of the flare stack/structure within a large, well-lighted, petrol-chemical plant, or the fact that the flare, or working lights surrounding the flare stack/structure, is as conspicuous as obstruction lights.

5.6.3 Mounting Intermediate Levels.

The number of light levels is determined by the height of the structure including all appurtenances. Structures between 150 feet and 350 feet (45.72 m and 106.68 m) AGL should have a second level of steady-burning red light units installed approximately at the midpoint of the structure and in a vertical line with the top level of lights. Structures exceeding 350 feet (106.68 m) AGL should have a second level of flashing light units. For cooling towers 600 feet (182.88 m) AGL or less, intermediate light levels are not necessary.

1. Steady-burning (L-810) lights. The recommended number of light levels is shown in Figure A-6. At least three lights should be installed on each level.
2. Flashing (L-864) lights. The recommended number of light levels is shown in Figure A-6.
 - a. Structures 350 feet (106.68 m) AGL or less. These structures do not need intermediate levels of flashing lights.
 - b. Structures exceeding 350 feet (106.68 m) AGL. At least three flashing (L-864) lights should be installed on each level in a manner allowing an unobstructed view of at least one light.

5.7 Prominent Buildings, Bridges, and Similar Extensive Obstructions.

When objects within a group of obstructions are approximately the same overall height above the surface and are located a maximum of 150 feet (45.72 m) apart, the group of obstructions may be considered an extensive obstruction. Light units should be installed on the same horizontal plane at the highest portion, or edge, of the prominent obstructions. Light units should be placed to

ensure the light is visible to a pilot approaching from any direction. If the structure is a bridge (see Figure A-8) and is over navigable water, the sponsor must obtain prior approval of the lighting installation from the Commander of the District Office of the U.S. Coast Guard to avoid interference with marine navigation. Steady-burning lights should be displayed to indicate the extent of the obstruction as follows:

1. Structures 150 feet (45.72 m) or less in any horizontal direction. If the structure/bridge/extensive obstruction is 150 feet (45.72 m) or less horizontally, at least one steady-burning light (L-810) should be displayed on the highest point at each end of the obstruction's major axis. If this is impractical because of the overall shape, display a double obstruction light in the center of the highest point.
2. Structures exceeding 150 feet (45.72 m) in at least one horizontal direction. If the structure/bridge/extensive obstruction exceeds 150 feet (45.72 m) horizontally, at least one steady-burning light should be displayed for each 150 feet (45.72 m), or fraction thereof, of the overall length of the major axis. At least one of these lights should be displayed on the highest point at each end of the obstruction. Additional lights should be displayed at approximately equal intervals, not to exceed 150 feet (45.72 m) on the highest points along the edge between the end lights. If an obstruction is located near a landing area and two or more edges are the same height, the edge nearest the landing area should be lighted.
3. Structures exceeding 150 feet (45.72 m) AGL. Steady-burning red obstruction lights should be installed on the highest point at each end. At intermediate levels, steady-burning red lights should be displayed for each 150 feet (45.72 m), or fraction thereof. The vertical position of these lights should be equidistant between the top lights and the ground level, as the shape and type of obstruction will permit. A steady-burning red light should be displayed at each outside corner on each level with the remaining lights evenly spaced between the corner lights.
4. Exceptions. Flashing red lights (L-864) may be used instead of steady-burning lights if early or special warning is necessary. These lights should be displayed on the highest points of an extensive obstruction at intervals not exceeding 3,000 feet (914.40 m). At least three lights should be displayed on one side of the extensive obstruction to indicate a line of lights.
5. 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.

5.8 Group of Obstructions.

With the exception of wind turbines, when individual structures within a group of obstructions differ in height and are spaced no more than 150 feet (45.72 m) apart, the prominent structures within the group should be lighted in accordance with the standards for individual obstructions

based on its corresponding height. Shorter structures within the group of obstructions do not need to be lighted. When structures are shorter than the prominent structure and are located on the outside of the group of obstructions, those structures should be lighted in accordance with the standards for individual obstructions based on its corresponding height. In addition to lighting the shorter structures on the outside of the group, at least one flashing light should be installed either at the top of the tallest, most prominent center structure, or on a dedicated tower that is located near the center of the group and is the same height as the most prominent structure. Light units should be placed on the structures to ensure that the lights are visible to a pilot approaching from any direction. If one or more of the structures within the group are a solid mass (non-skeletal), additional lighting may be necessary to make sure that the light is not being blocked by the more prominent structure(s). For the purpose of marking and lighting these structures, a group of obstructions is considered to be three or more structures.

CHAPTER 14. MARKING AND LIGHTING TEMPORARY STRUCTURES

14.1 Purpose.

This chapter provides general guidelines for marking and lighting temporary structures, such as construction equipment, cranes, derricks, oil and drilling rigs, etc. The purpose of marking and lighting these obstructions is to indicate the presence and general outline of the structure to assist pilots when approaching from any direction to identify and avoid these obstacles. These guidelines are not to be considered all-inclusive, each obstacle must be evaluated individually and the determination will provide lighting requirements that are specific to the structure.

14.2 General Standards.

Due to the temporary nature, potential mobility, and ability to instantaneously extend to full height, accommodations must be made to mitigate the effects of these structures on the airspace for safe operations. Temporary structures are unique based on the structure type, size, and use, and the aeronautical study evaluates the potential effect on airspace. Proximity to airports, navigational aids (NAVAIDS), air routes, and local flight activity, as well as the duration of the project are considered during the evaluation process.

Marking and/or lighting of these structures is intended to provide day and night conspicuity and to assist pilots in identifying and avoiding these obstacles. In some cases, the Sponsor will also be required to initiate a NOTAM to provide additional mitigation procedures for the safe operation of the temporary obstacle due to the proximity of these aviation elements.

14.3 Marking Standards.

Marking is used to increase conspicuity of structures for daytime conditions. Flags are used to mark certain structures or objects when it is technically impractical to use paint. When using paint, various types of paint colors and patterns are used to mark structures and the pattern should ensure the paint contrasts with the surrounding environment.

14.3.1 Flag Markers.

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. Refer to Section 3.5.2 for full details.

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 colored flag must be aviation orange.

- b. When using two colors, arrange two triangular sections, one aviation orange and the other white to form a rectangle.
 - c. 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. Display. Flag markers should be displayed around, on top, or along the highest edge of the obstruction. The flag staff should be strong enough to support the flag and be higher than the surrounding ground, structures, and/or objects of natural growth.

14.3.2 Paint.

1. Ideally cranes should be painted aviation orange or alternating aviation orange and white, however with flags and/or lights, contrasting bright colors that do not merge into the surrounding environment are acceptable. Colors that camouflage with the surrounding environment (i.e., sky blue, forest green, etc.) should be avoided.
2. Refer to paragraph 3.2, Paint Standard, for details.

14.3.3 Alternative to Marking.

1. Along with, or as an alternative to paint, medium intensity white lighting can be used to make the obstacle more conspicuous during daytime conditions for structures over 200 feet AGL.
2. High intensity lighting is not recommended on temporary structures.

14.4 Lighting Standards.

Lighting is used to increase conspicuity of structures for day or nighttime conditions and must be visible to a pilot approaching in any direction. When a temporary structure cannot be removed from site or lowered below the no-effect height, the addition of lighting will be used to alert pilots of their presence. Generally, red lights are recommended during the hours between sunset and sunrise and periods of reduced visibility, using marking for the remainder of the time with occasional exceptions. Lights must be mounted at the highest point of the structure, and in cases of more extensive structures additional lights may be necessary at intermediate levels and furthest horizontal points (i.e., horizontal boom ends, etc.) to clarify the outline of the structure (see Figure A-31).

1. Structures 150 feet (45.72 m) AGL or less. Two or more steady-burning or flashing red (L-810/L-810 F) lights should be installed on the highest part of the structure in a manner to ensure an unobstructed view of one or more lights by a pilot.
2. Structures exceeding 150 feet (45.72 m) AGL and not more than 350 feet (106.68 m) AGL. At least one red flashing (L-864) light should be installed on the highest part of the structure and intermediate levels of one or more flashing red lights (L-810 F) should be mounted in a manner to ensure an unobstructed view of one or more lights by a pilot.

- a. Mounting Intermediate Level Lights. The number of light levels required is determined by the height of the structure, including all appurtenances, as shown in, Figure A-6. The number of lights on each level is determined by the shape and width of the structure. At least two or more of these lights (L-810 F) should be mounted diagonally or on diametrically opposite positions to ensure an unobstructed view of at least one light at each level by a pilot approaching in any direction. These lights should be configured to flash simultaneously with the L-864 flashing light on the top of the structure at a rate of 30 flashes per minute (fpm) (± 3 fpm). Steady burning lights (L-810) and red flashing lights (L-864) are not used as intermediate level lights on these types of structures.
3. Structures exceeding 350 feet (106.68 m) AGL. At least one red flashing (L-864) light should be installed on the highest part of the structure in a manner to ensure an unobstructed view of one or more lights by a pilot. In addition, intermediate levels of lights of flashing red (L-864) will be required.
 - a. Intermediate Levels Lights. The number of light levels required is determined by the height of the structure, including all appurtenances, as shown in, Figure A-6. The number of lights on each level is determined by the shape and width of the structure. At least two or more of these lights (L-864) should be mounted diagonally or on diametrically opposite positions to ensure an unobstructed view of at least one light at each level by a pilot approaching in any direction. These lights should be configured to flash simultaneously with the L-864 flashing light on the top of the structure at a rate of 30 flashes per minute (fpm) (± 3 fpm). Steady burning lights are not used on these types of structures.

14.4.1 Construction Cranes or Rigs (Oil and Drilling).

When a crane or rig cannot be removed from site or lowered below the no-effect height, the addition of lighting will be used to alert pilots of their presence during the hours between sunset and sunrise and periods of reduced visibility. Lights must be mounted at the highest point, and in cases of more extensive structures additional lights may be necessary at intermediate levels and furthest horizontal (i.e., horizontal boom ends, etc.) points to clarify the outline of the structure (see Figure A-32).

1. Systems. Steady burning and flashing red lights (L-864/L-810) may be used to light cranes and rigs. High-intensity lights (L-856) are not recommended.
2. Display. The flashing light (L-864) should be displayed on the highest point, and the steady light (L-810) at the ends of boom, and other various locations along the top of the structure to best define the outline. Additionally, in certain cases, intermediate level lighting or sidelights (L-810) may be required. For construction cranes with angular booms, the lights must be mounted on a pivot axis so the fixture remains level when the boom tilts to ensure the lights remain level and is not obscured by the structure.

3. Exceptions.

- a. Architectural lighting or floodlights may be used in addition to, but not in place of, standard lighting provided they do not cause an adverse effect on the obstruction light fixture's photometrics and do not result in an obscured view of one of more obstruction lights by a pilot.
- b. In some cases, the boom or rig may be lowered below the no-effect height or removed from site, and nighttime lighting is not required.

14.4.2 Container Cranes.

1. These structures are generally used in brightly lit areas, however lighting must be used to alert pilots of the current configuration and presence of the obstruction during the hours between sunset and sunrise and periods of reduced visibility. Extensive structures require additional lights at intermediate levels and furthest horizontal points, (i.e., horizontal boom ends, etc.), as well as horizontal mid-points as necessary, to clarify the outline of the structure for pilots approaching from any direction.
2. Systems. Medium intensity white lights (L-865) may be used, however high-intensity lights (L-856) are not recommended.
3. Display. The lights should be displayed on the highest point, ends of boom, and other various ways to best define the size and shape of the structure. Lights must be mounted at the highest point at all times during usage. For large container cranes with angular booms, the lights must be mounted on a pivot axis so the fixture remains level when the boom tilts to ensure the lights remain level and is not obscured by the structure (see Figure A-33).
4. Exceptions. Architectural lighting or floodlights may be used in addition to, but not in place of, standard lighting provided they do not cause an adverse effect on the obstruction light fixture's photometrics and do not result in an obscured view of one of more obstruction lights by a pilot.

14.5 Operational Characteristics.

When using flashing lights, the lights should flash simultaneously.

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).





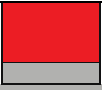
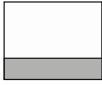
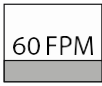

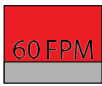
15.5 Availability of Military Specifications.

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)

APPENDIX A: SPECIFICATIONS FOR OBSTRUCTION LIGHTING EQUIPMENT CLASSIFICATION

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

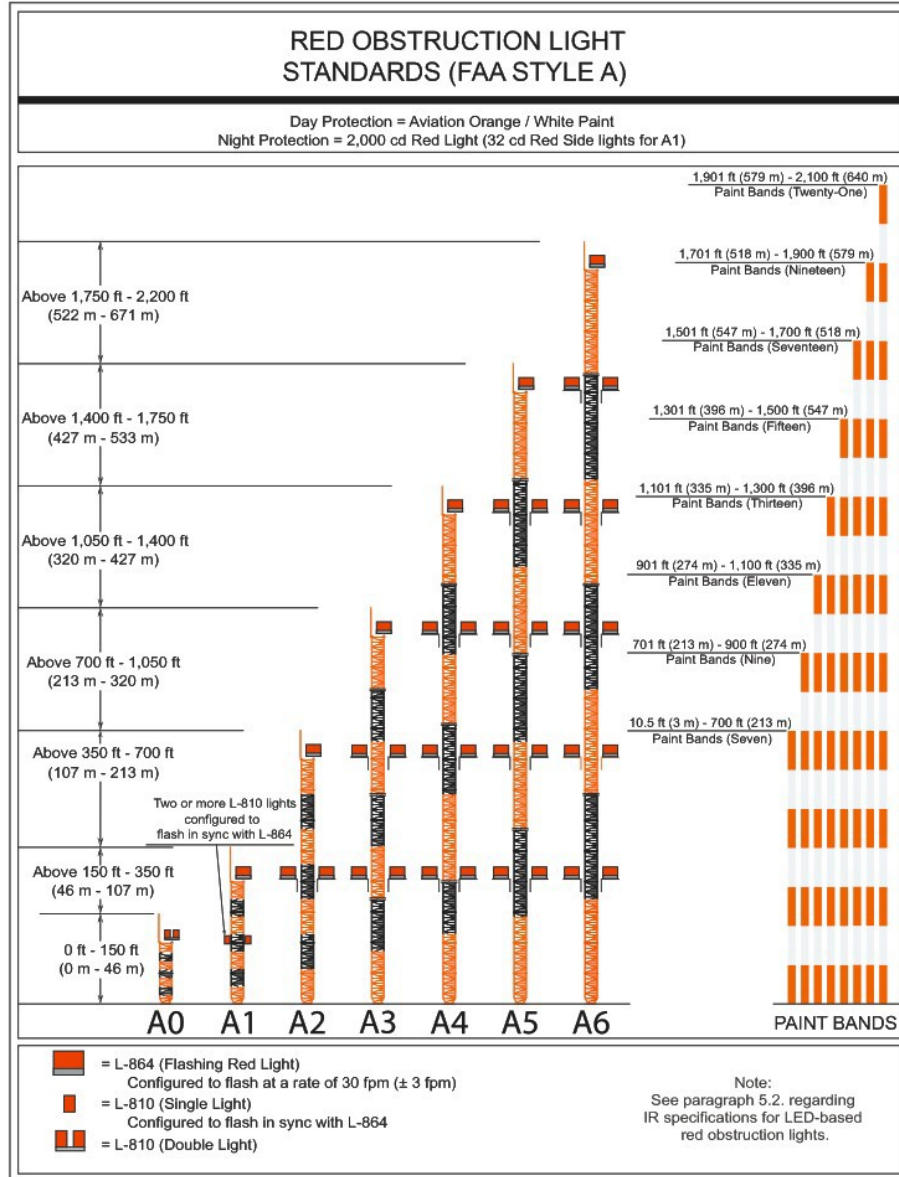


Figure A-6. Red Obstruction Light Standards (FAA Style A)

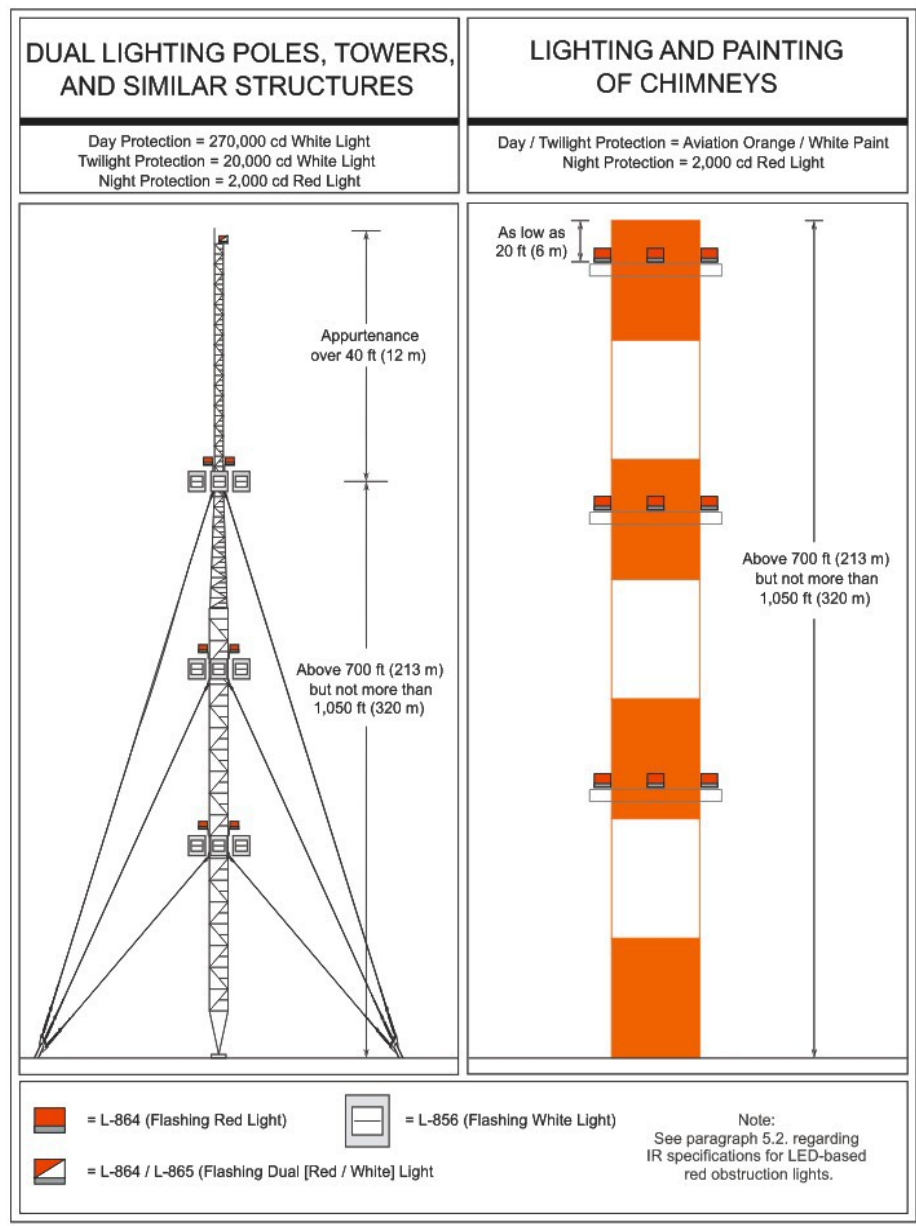


Figure A-7. Dual Lighting of Poles, Towers, and Similar Structures/Lighting and Painting of Chimneys

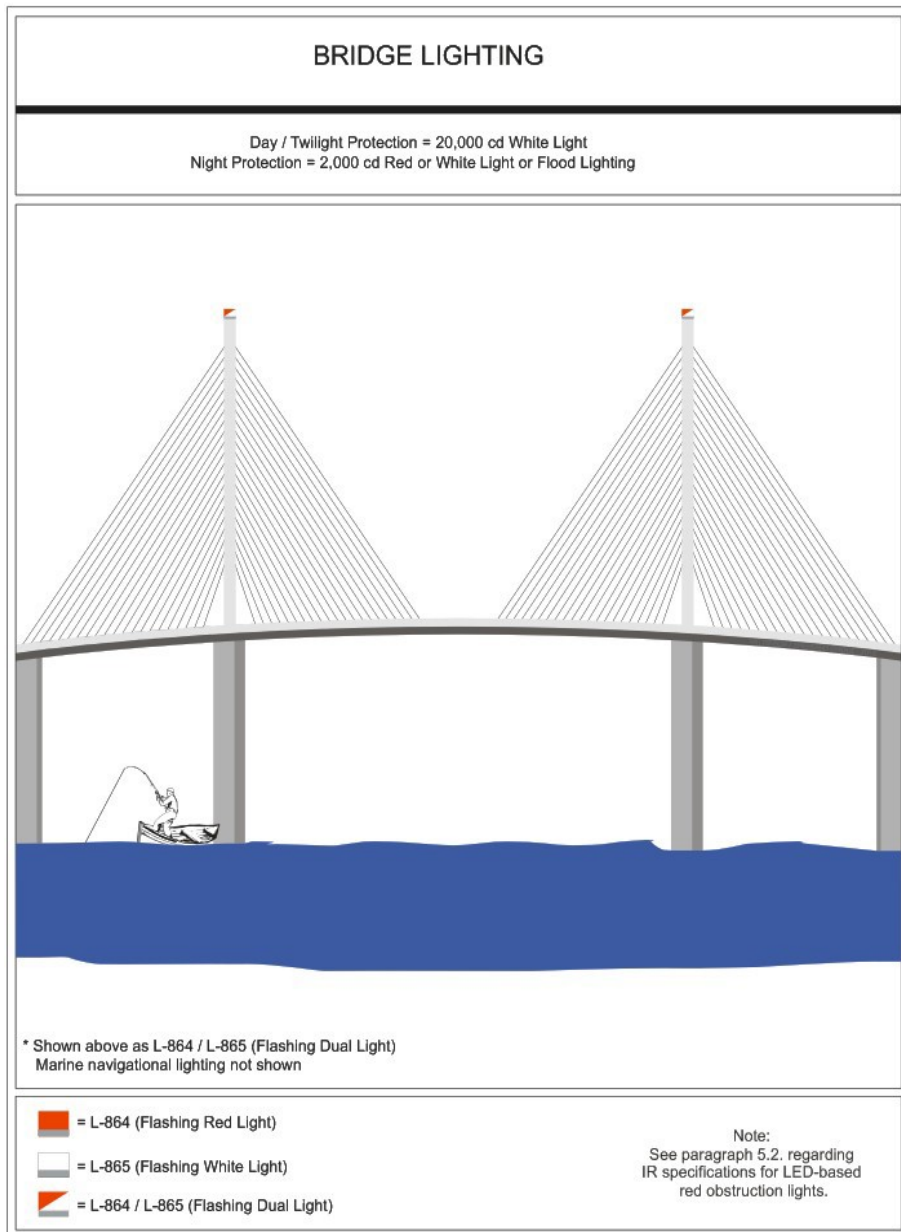


Figure A-8. Bridge Lighting

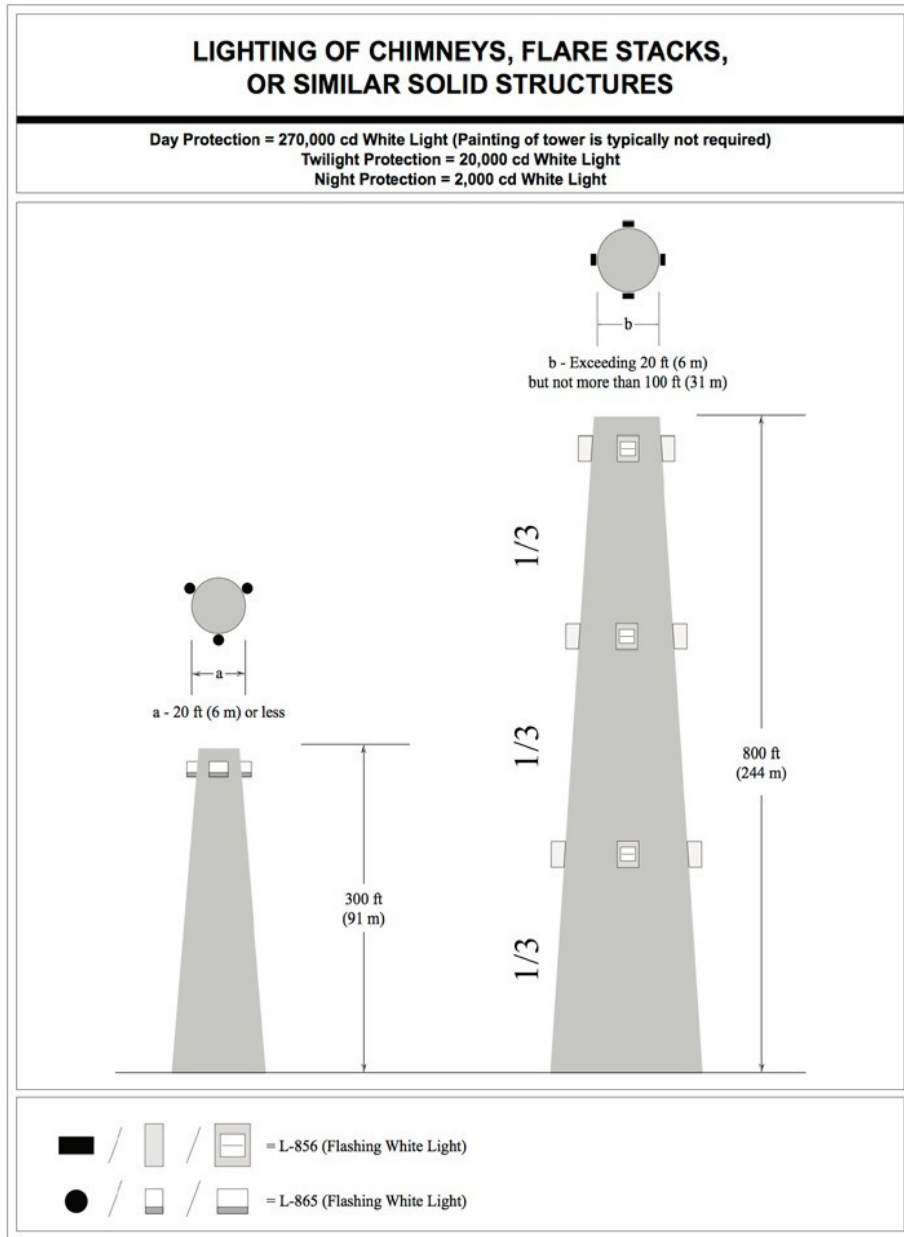


Figure A-10. Lighting of Chimneys, Flare Stacks, or Similar Solid Structures

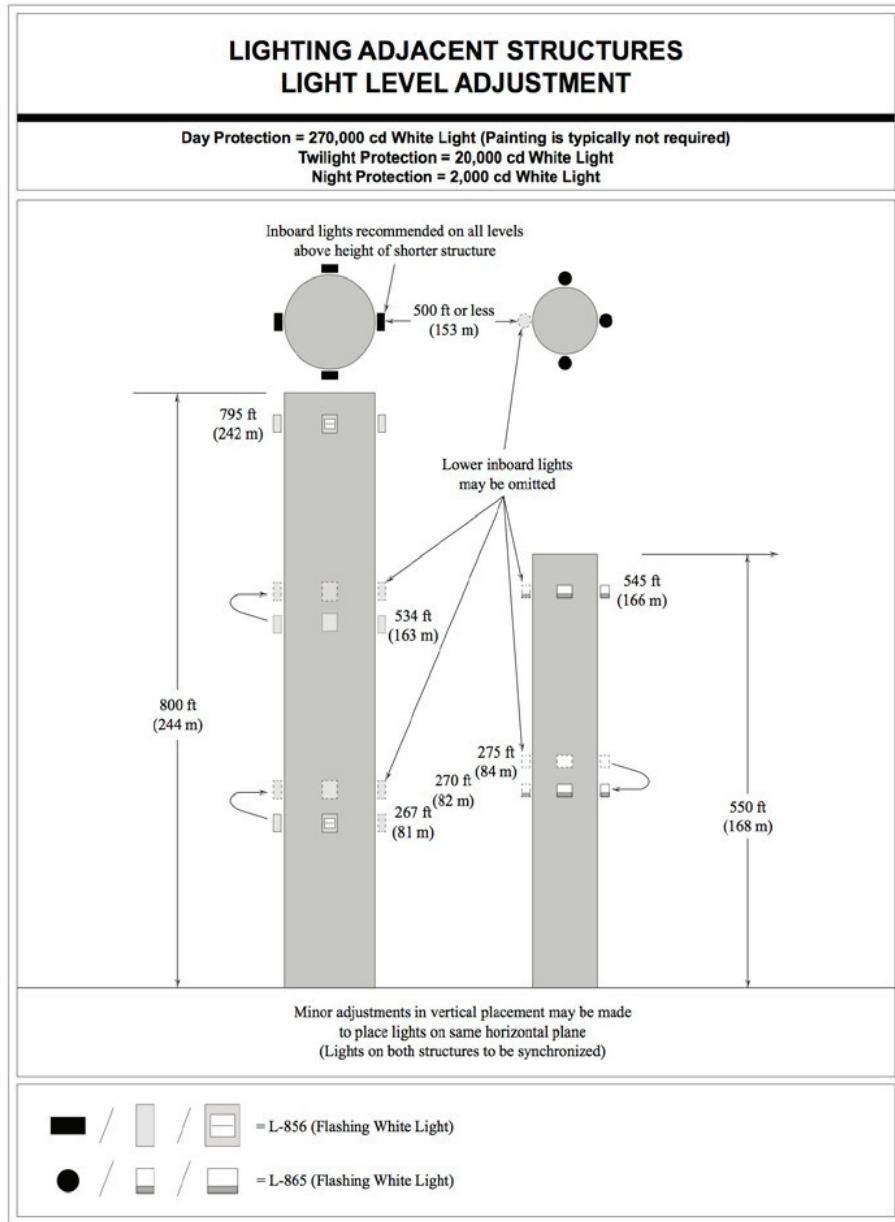


Figure A-11. Lighting Adjacent Structures—Light Level Adjustment

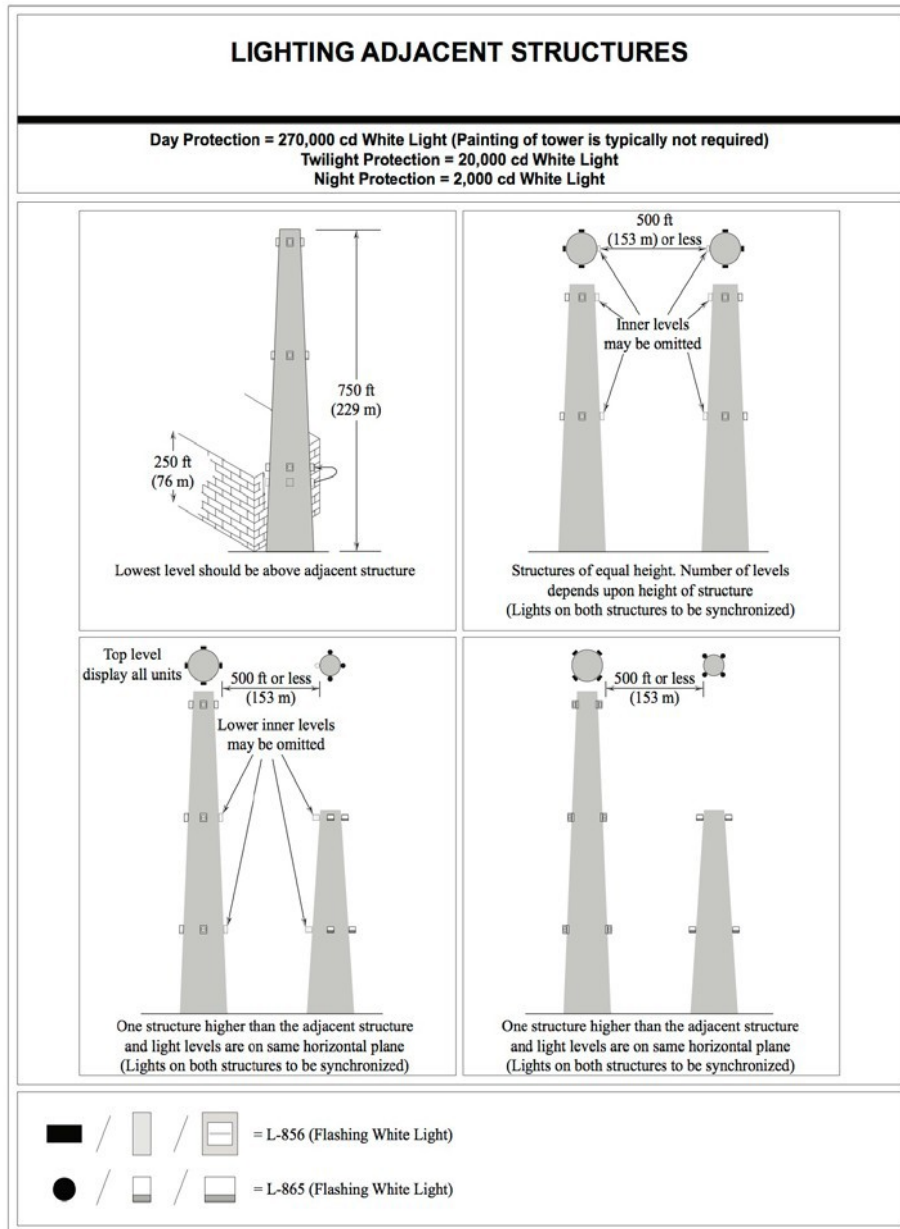


Figure A-12. Lighting Adjacent Structures

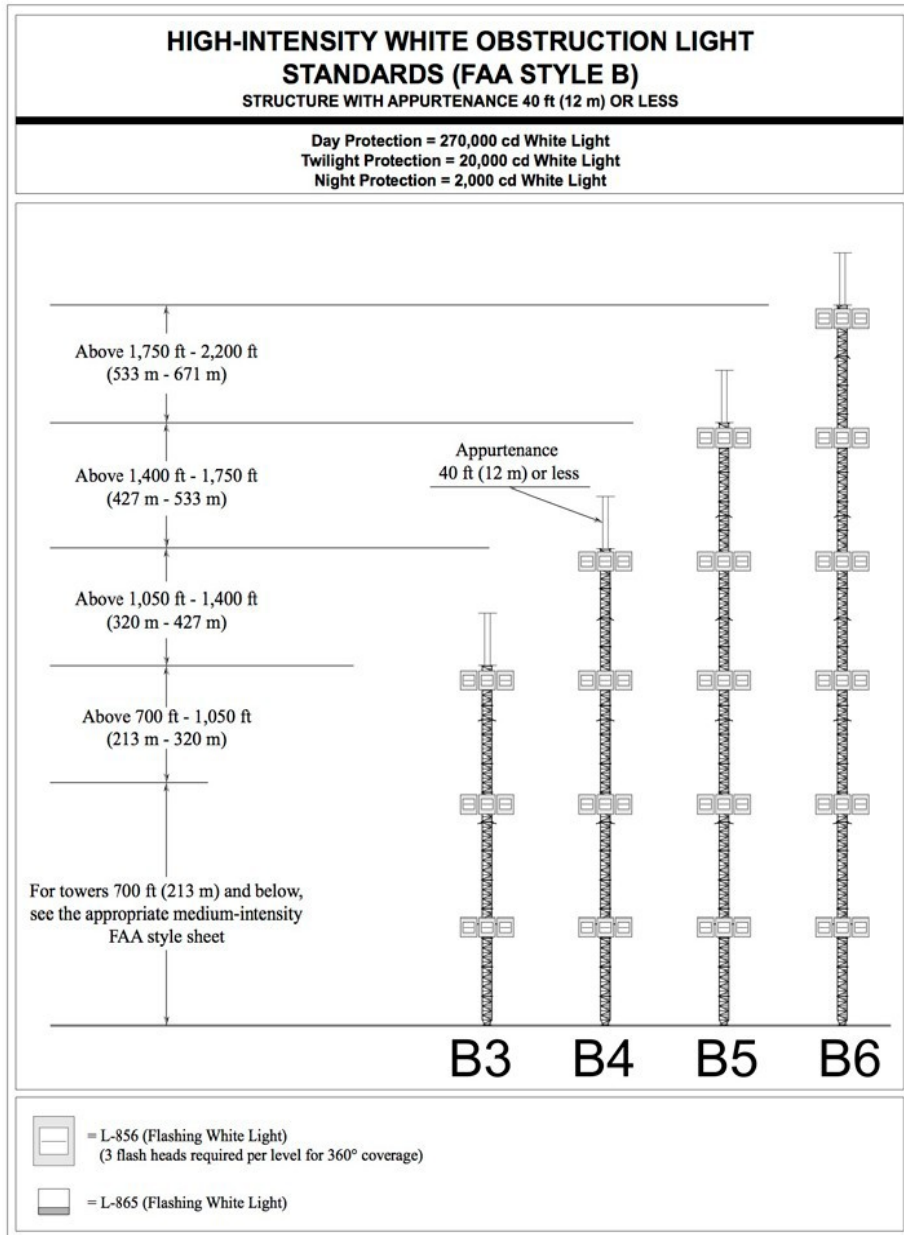


Figure A-13. High-Intensity White Obstruction Light Standards (FAA Style B)—With Appurtenance 40 Feet or Less

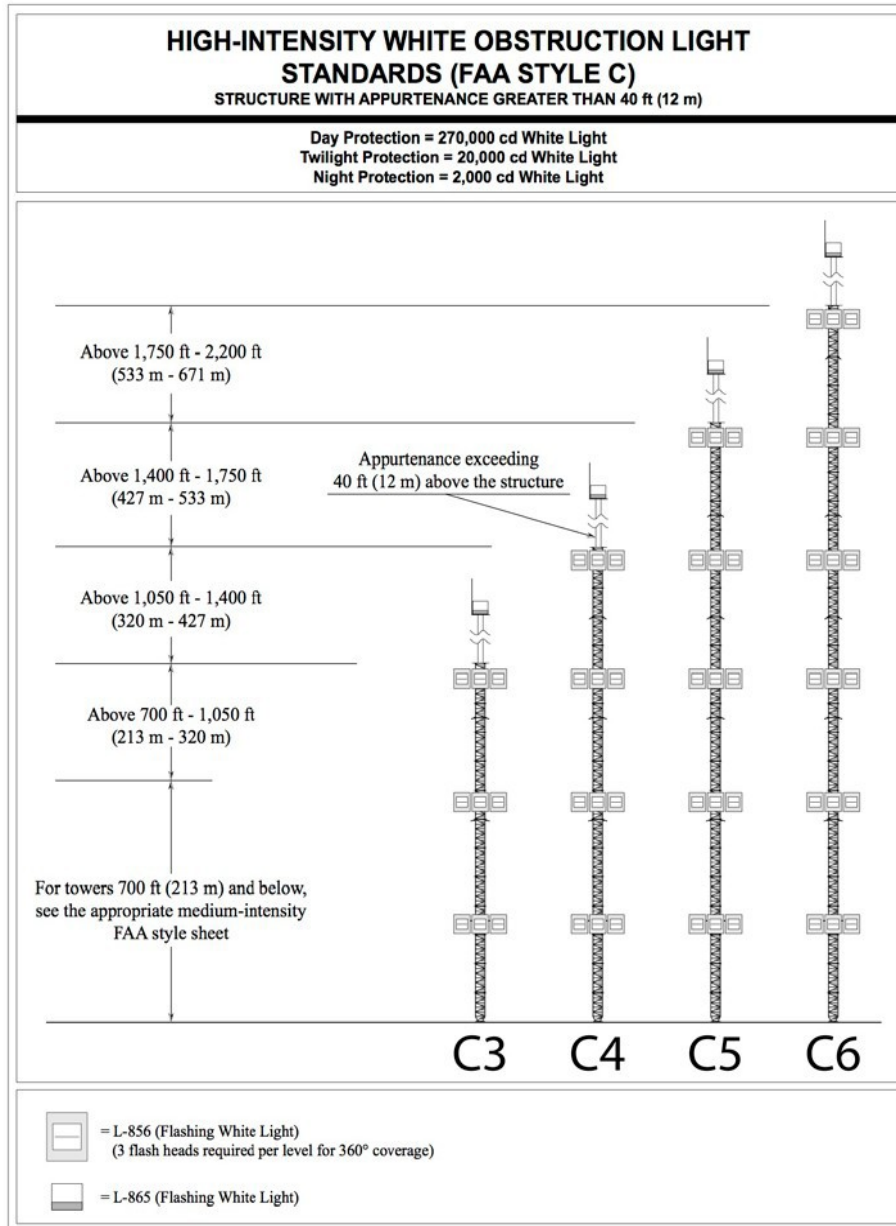


Figure A-14. High-Intensity White Obstruction Light Standards (FAA Style C)—With Appurtenance Over 40 Feet High

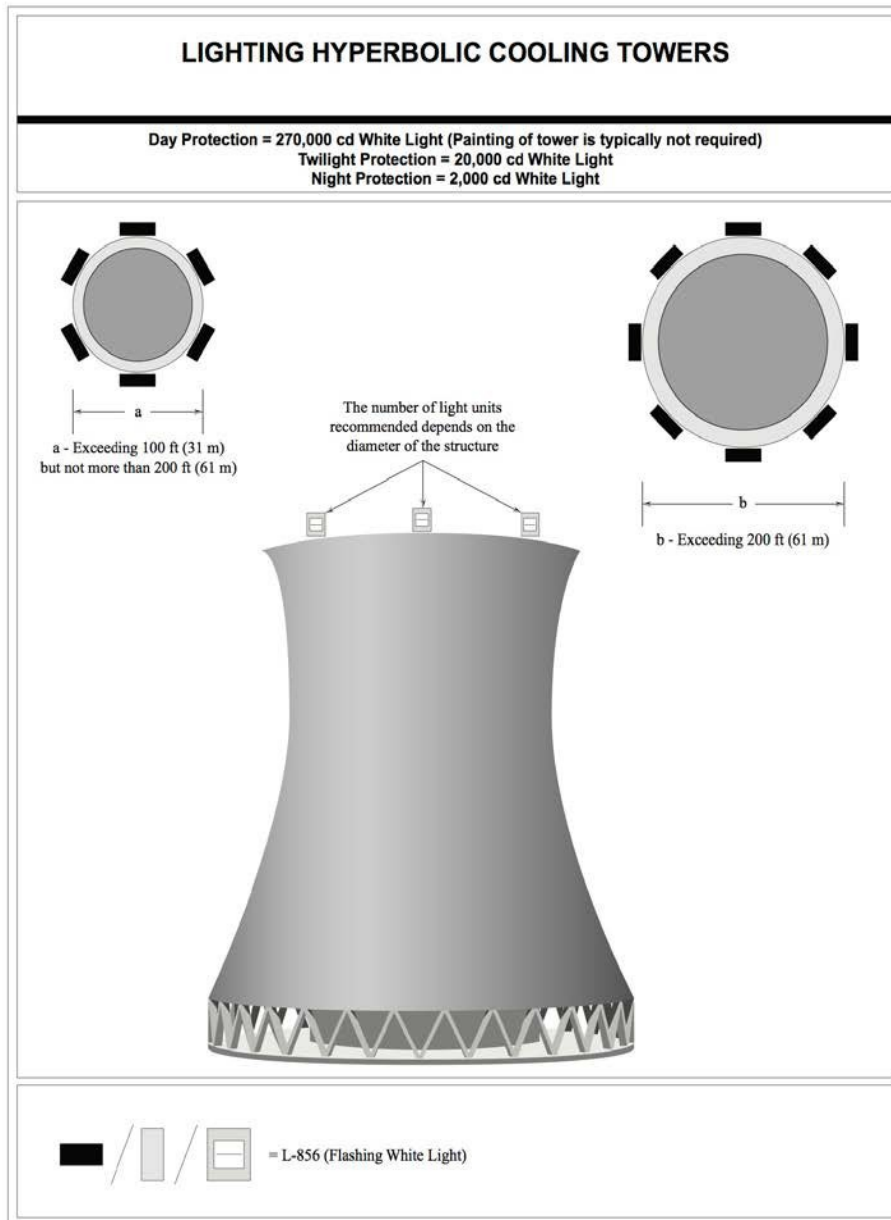


Figure A-15. Lighting Hyperbolic Cooling Tower

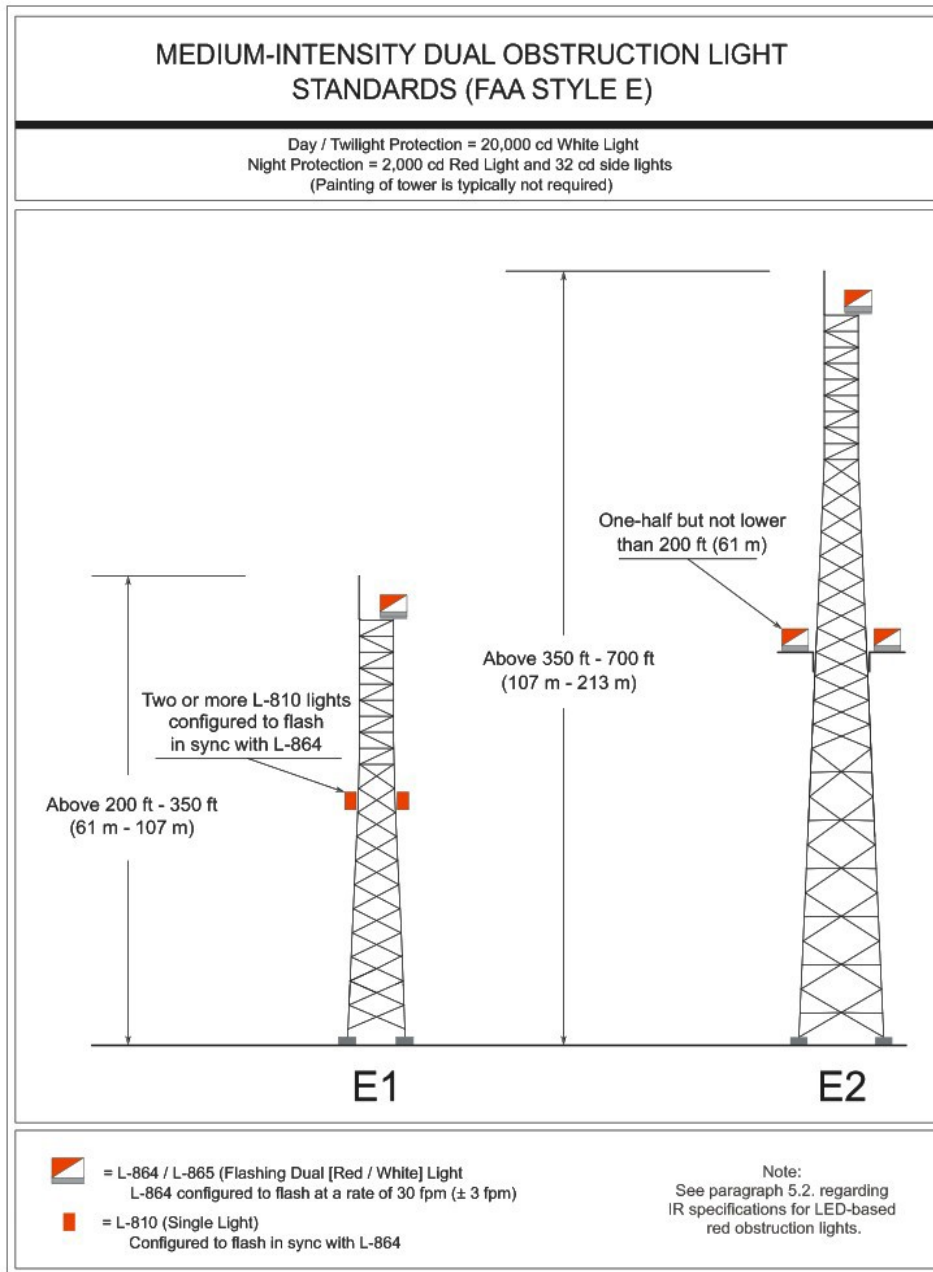


Figure A-16. Medium-Intensity Dual Obstruction Light Standards (FAA Style E)

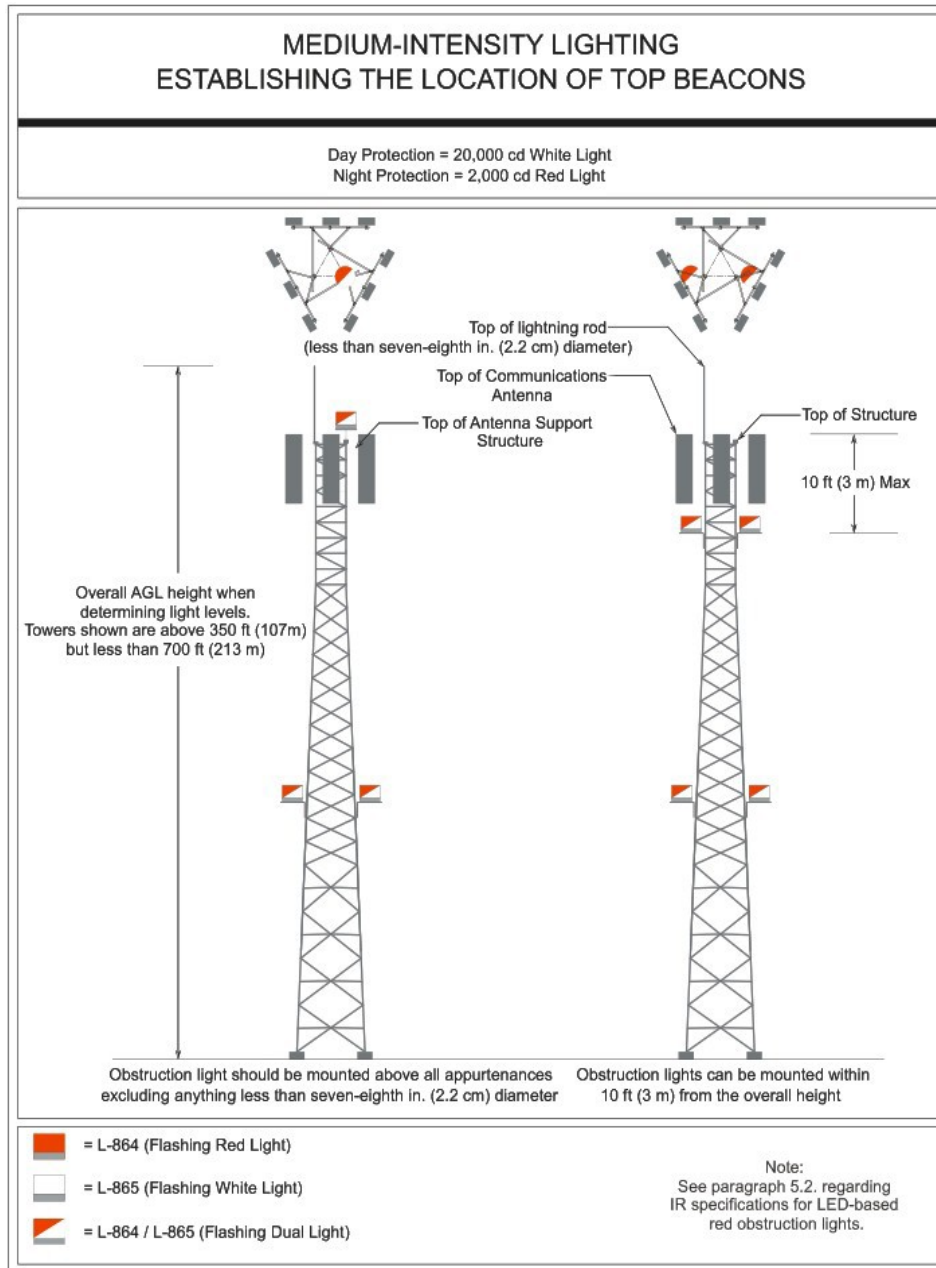


Figure A-17. Medium-Intensity Lighting—Establishing the Location of Top Beacons

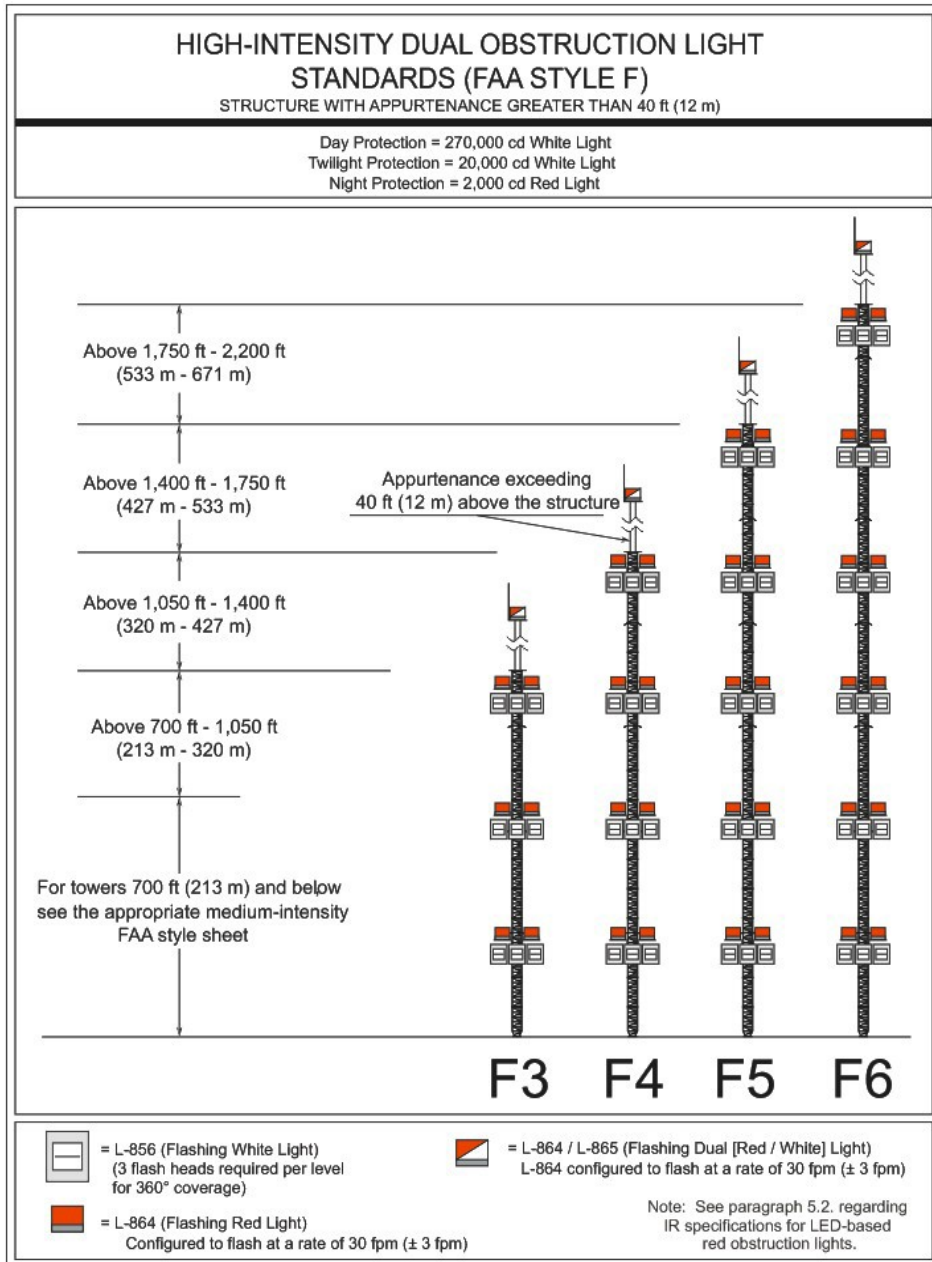


Figure A-18. High-Intensity Dual Obstruction Light Standards (FAA Style F)—With Appurtenance Over 40 Feet High

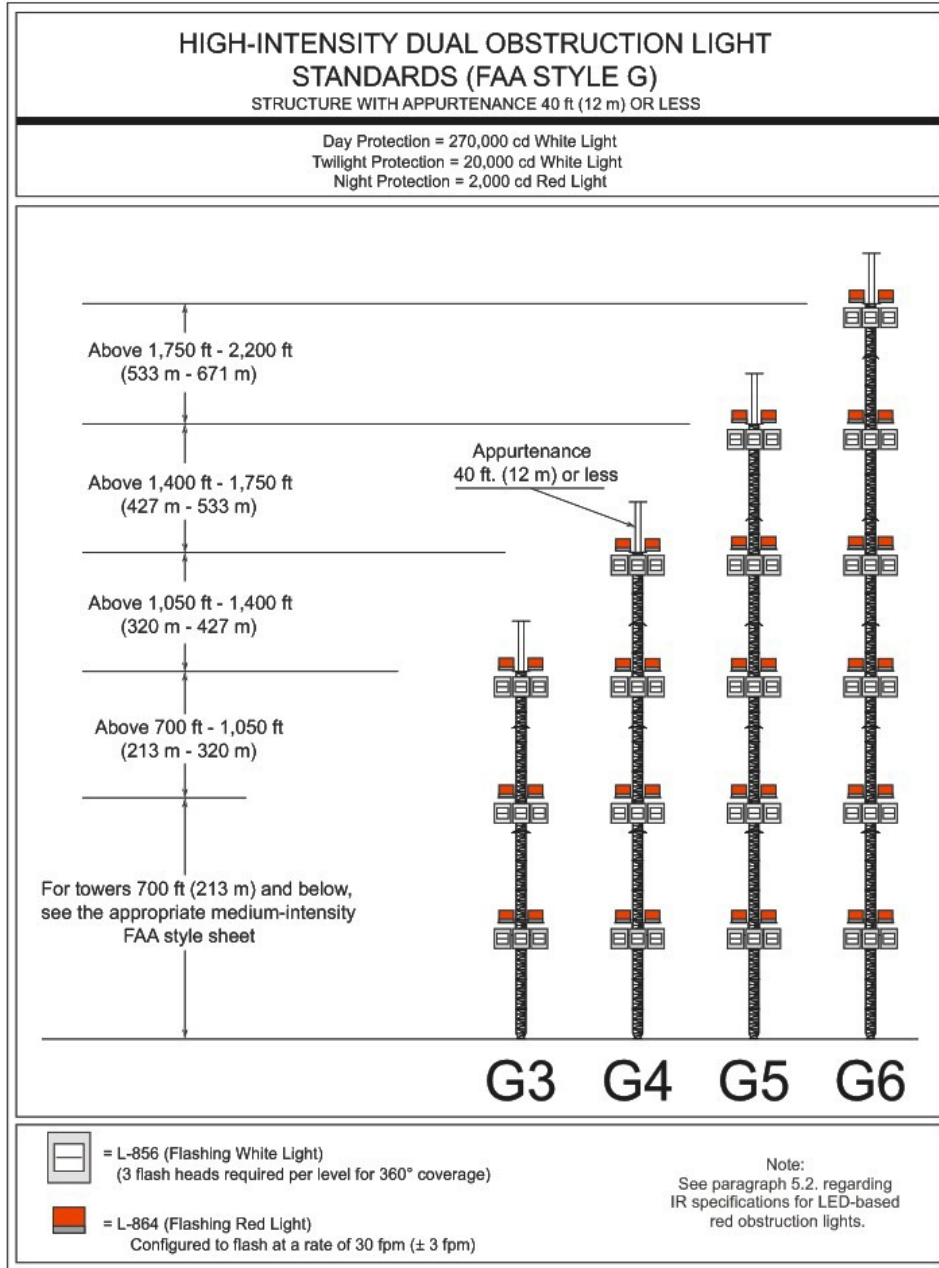


Figure A-19. High-Intensity Dual Obstruction Light Standards (FAA Style G)—With Appurtenance 40 Feet or Less

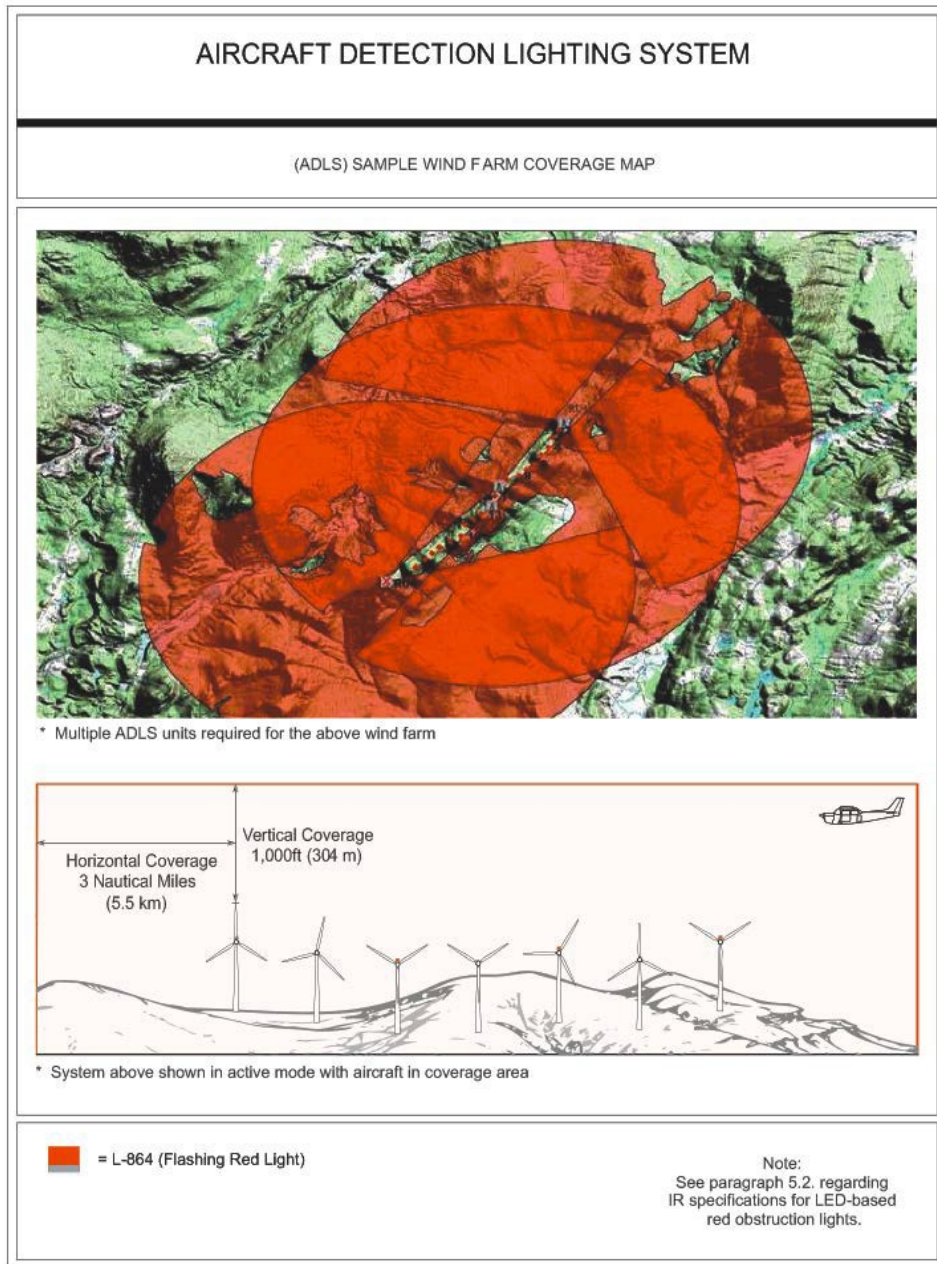


Figure A-20. Aircraft Detection Lighting System (sample coverage map)

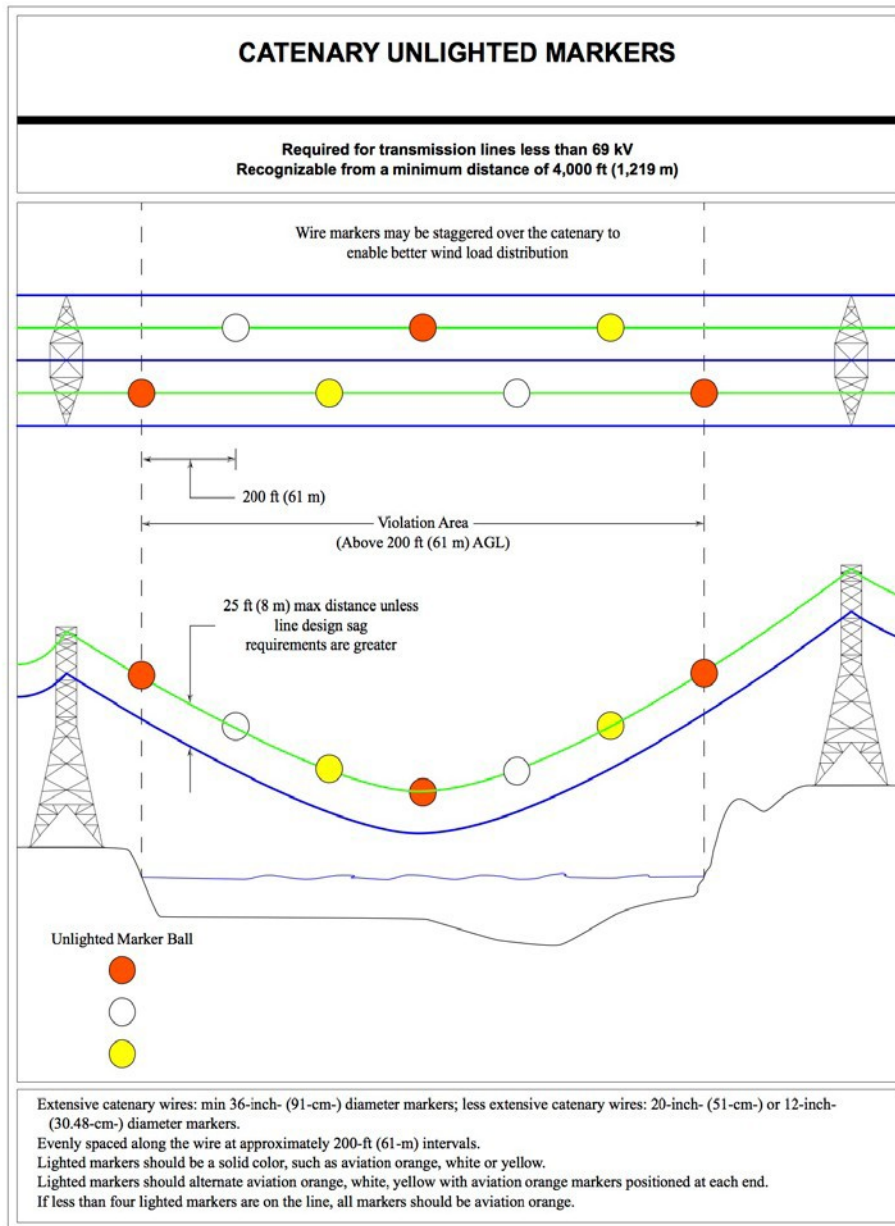


Figure A-21. Catenary Unlighted Markers (less than 69 kV)

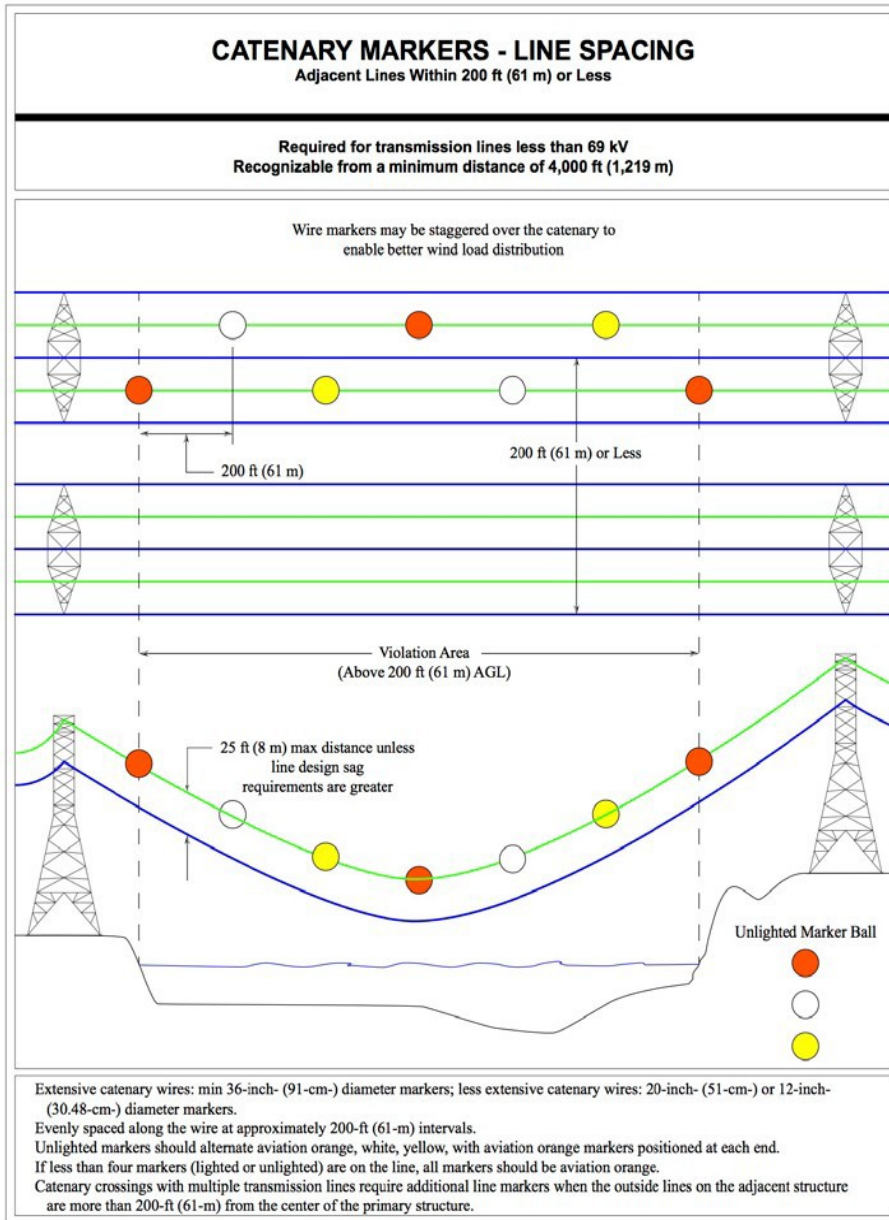


Figure A-22. Catenary Markers – Line Spacing (Adjacent Lines Within 200 ft. (60.96 m) or Less)

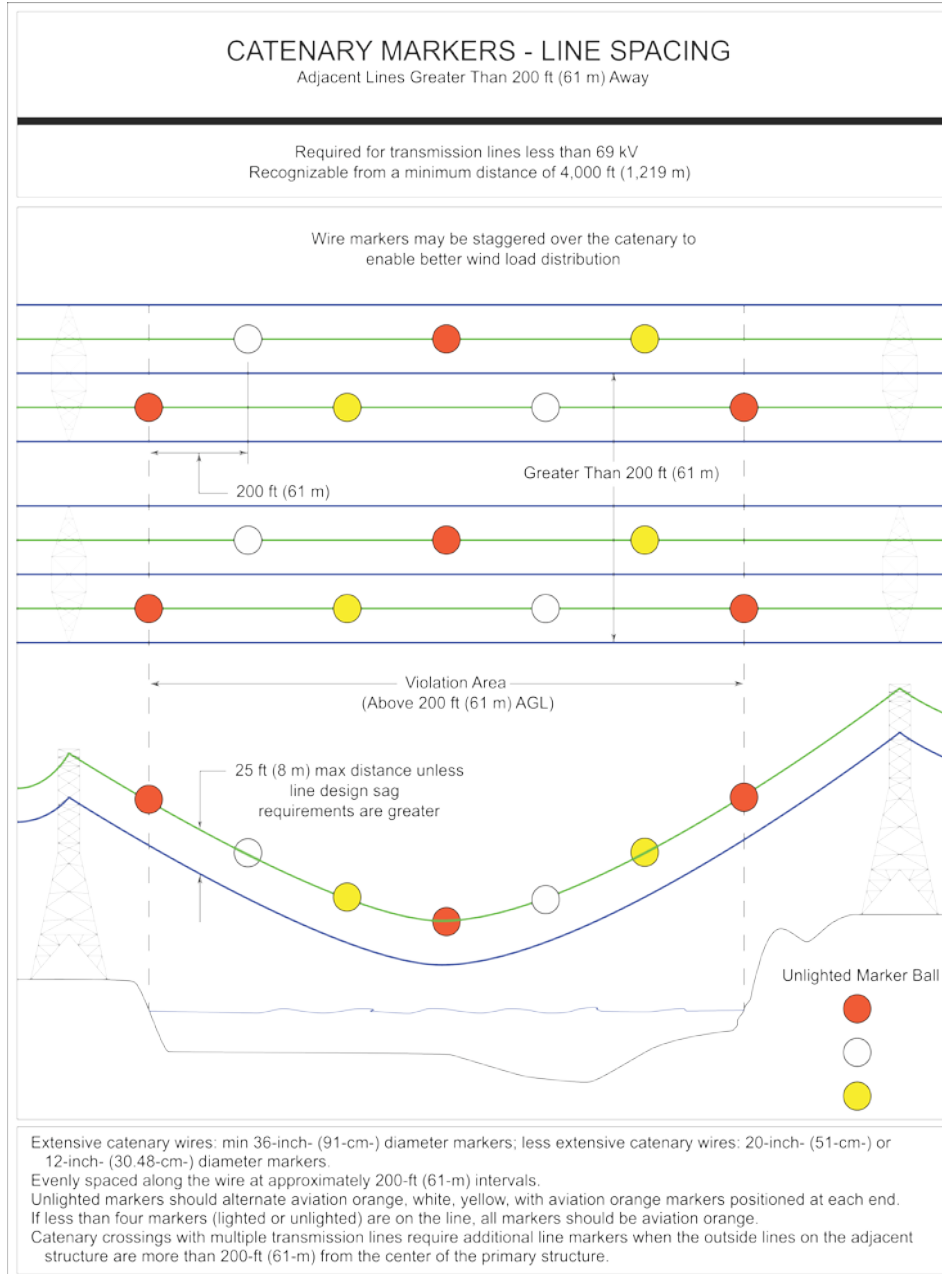


Figure A-23. Catenary Markers - Line Spacing (Adjacent Lines Greater Than 200 ft. (60.96 m) Away)

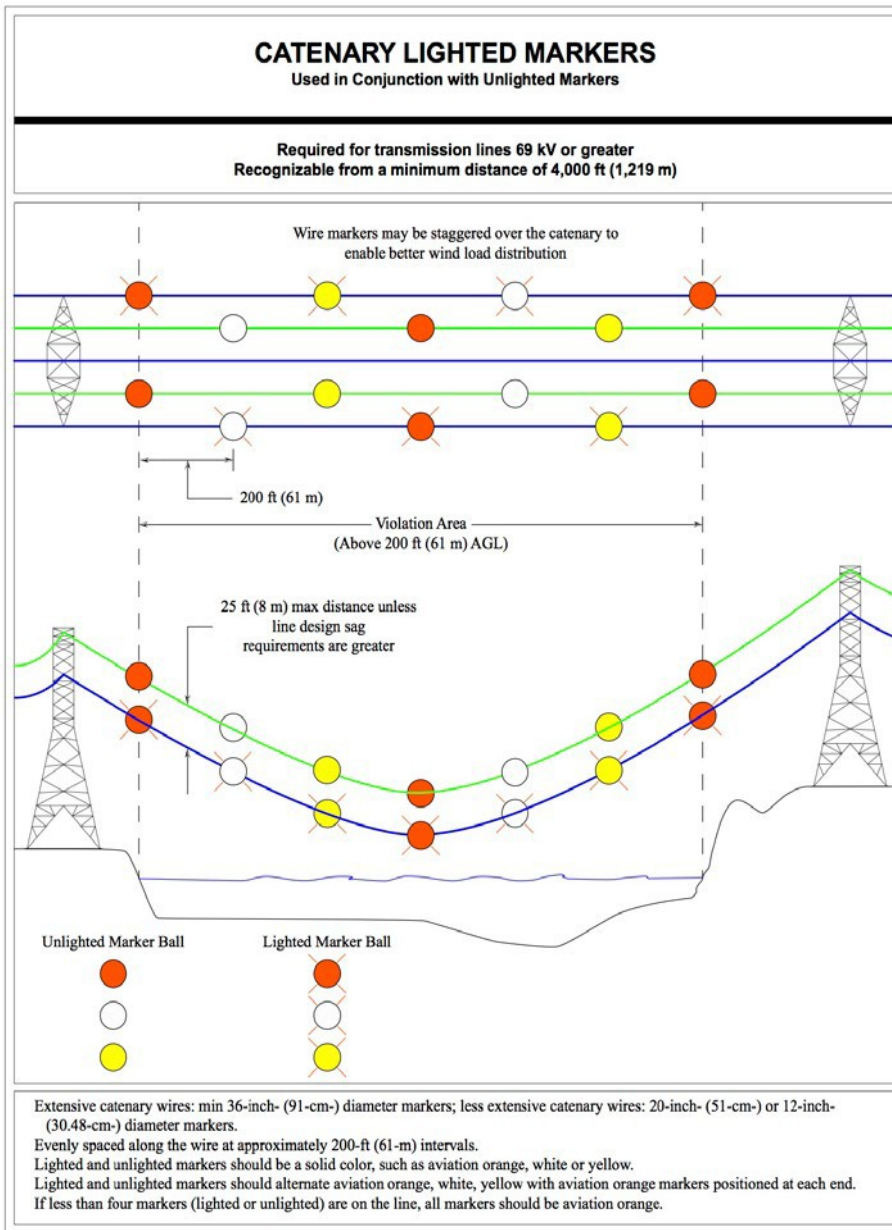


Figure A-24. Catenary Lighted Markers – Used in Conjunction with Unlighted Markers (69 kV or greater)

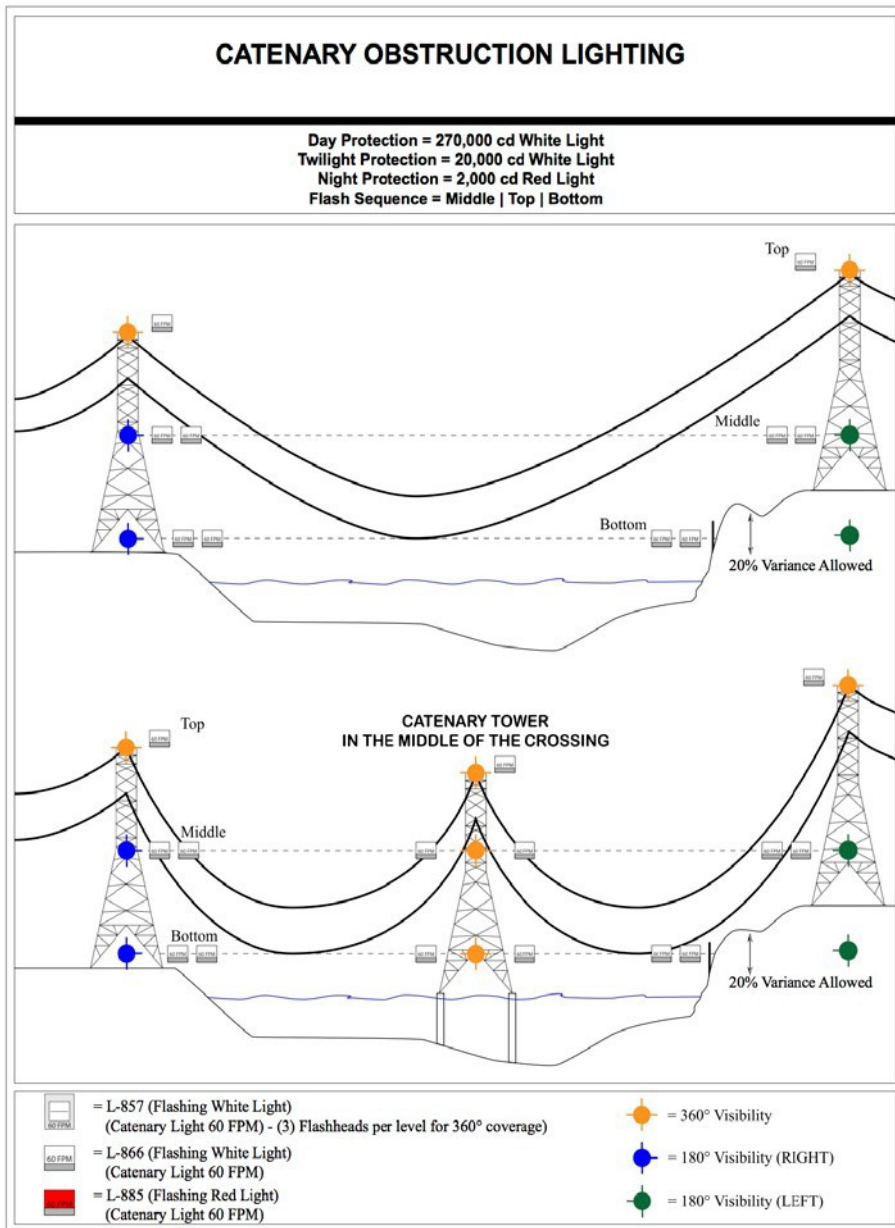


Figure A-25. Catenary Obstruction Lighting

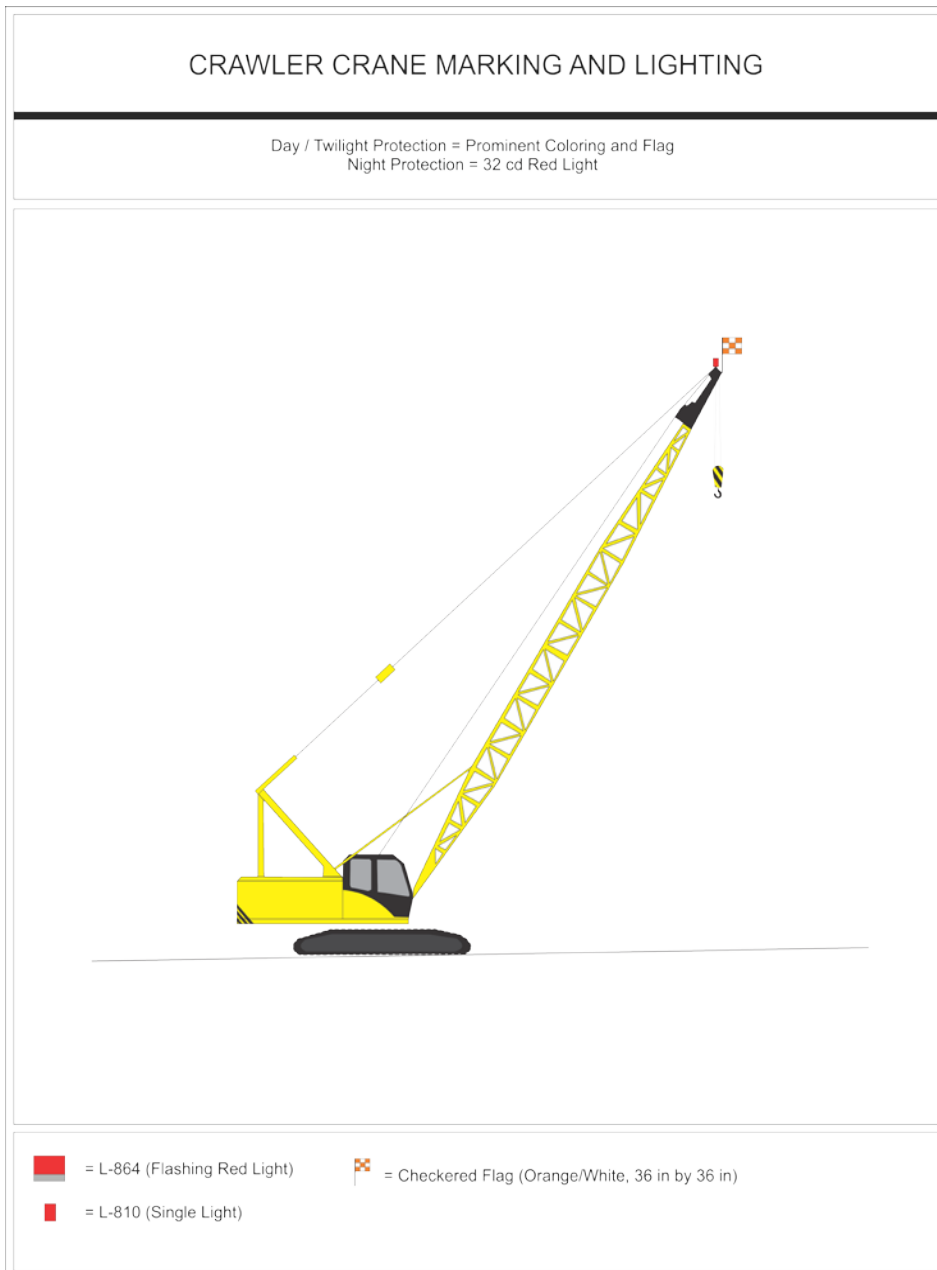


Figure A-31. Crawler Crane Marking and Lighting

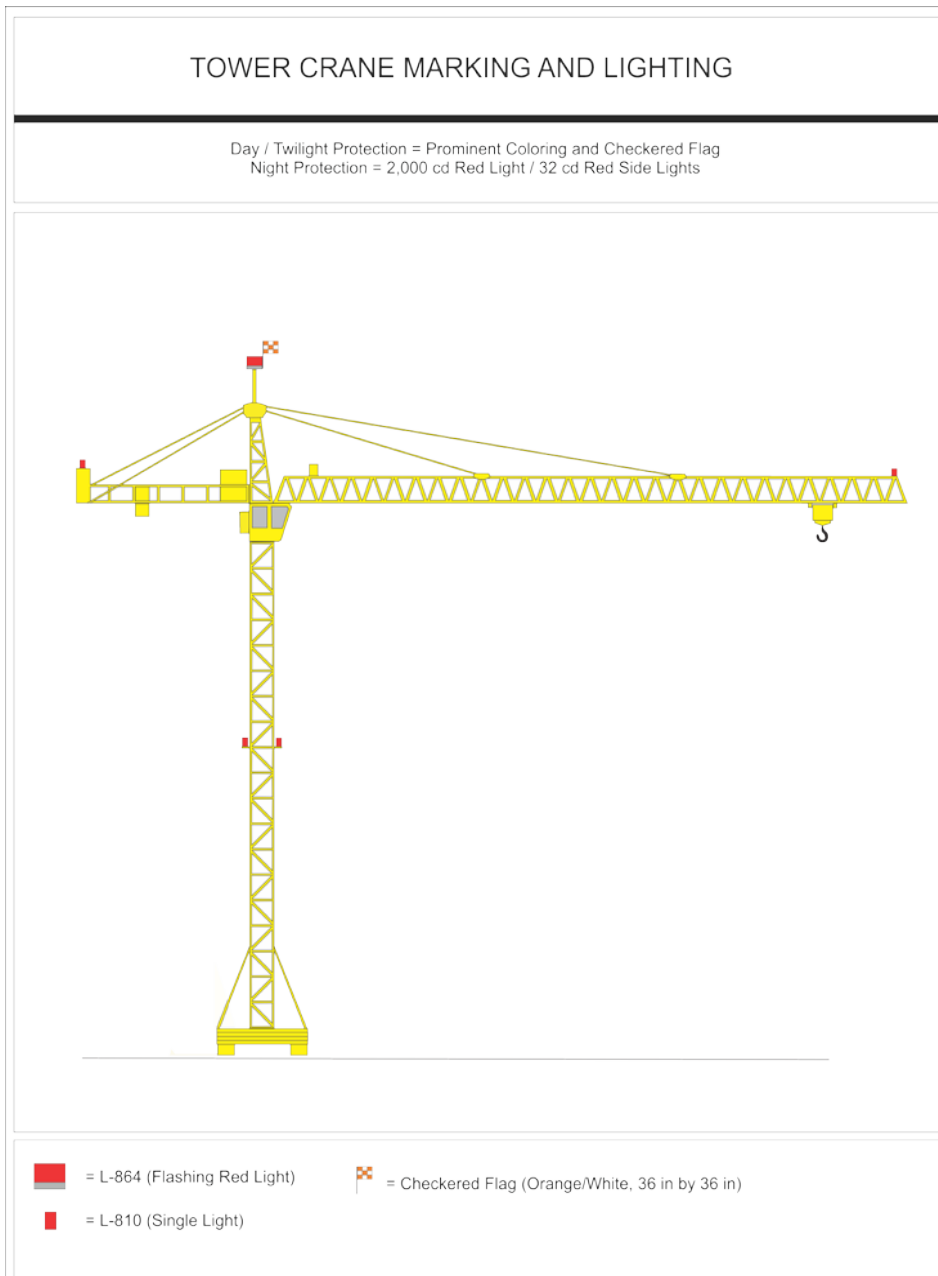


Figure A-32. Tower Crane Marking and Lighting

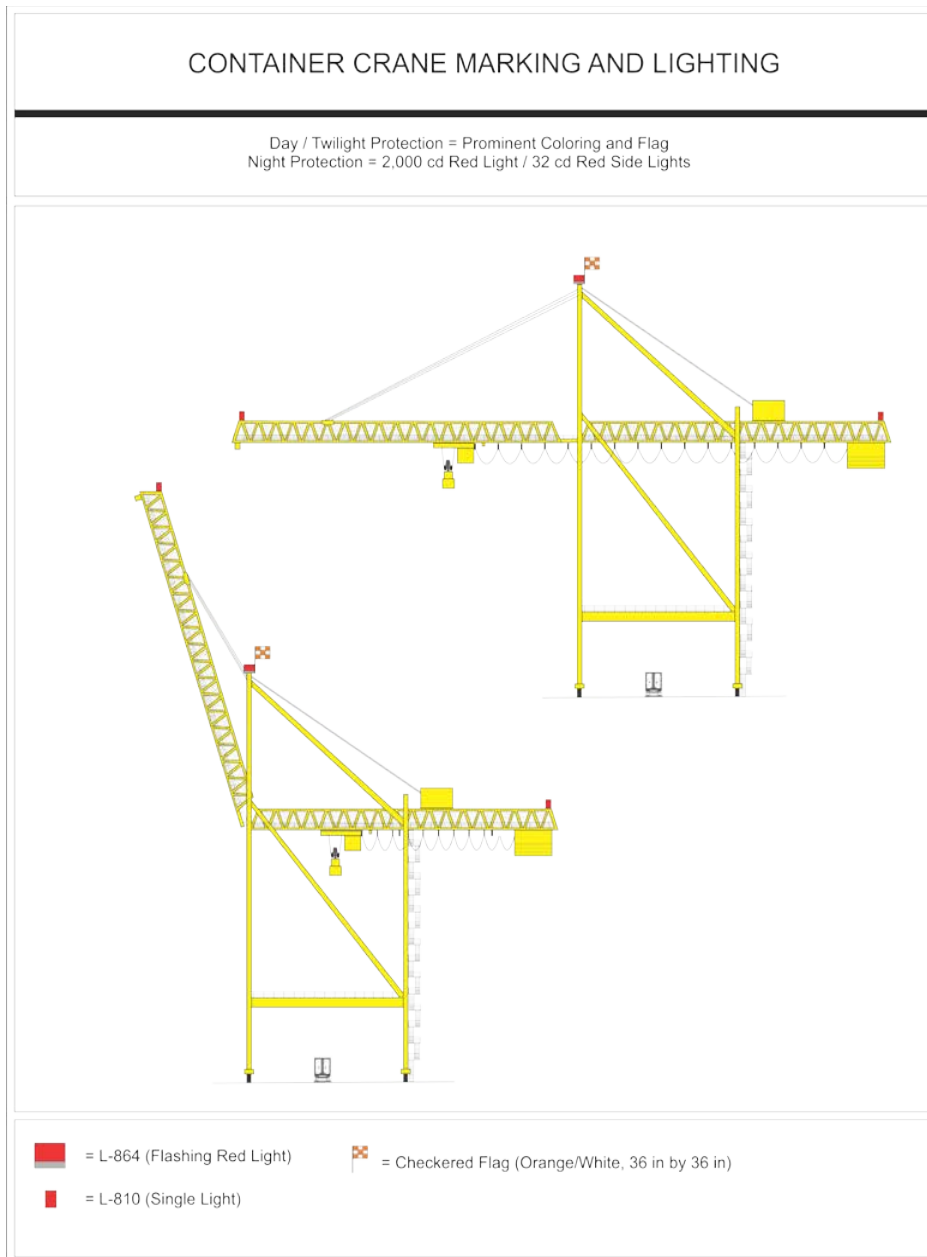


Figure A-33. Container Crane Marking and Lighting

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%)

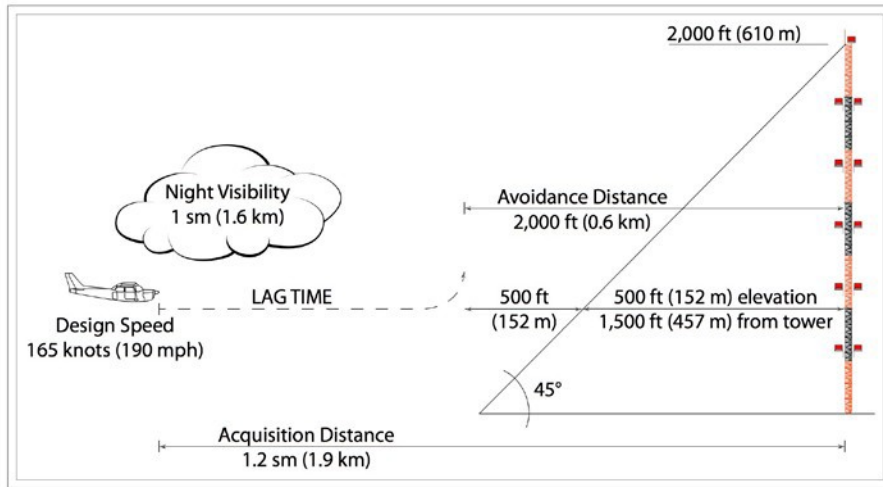
Note: Distance calculated for north sky illuminance

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

B-4. Definitions.



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-4.1 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 Sea 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 L

Electrical Panel Schedules

EXIT 45

Panel Schedule

Panel ID	DP-1	Bus Rating	Main	Phase	Voltage
Panel Location	Utility Room	400 Ampere	300A/3P MCB	Three Phase	120/208
Fed From	400A/3P Utility Service				

Pole	Amps	Description			Description	Amps	Pole
3	30	HVAC OU-1	1	2	HVAC OU-2	30	3
3	30	HVAC OU-1	3	4	HVAC OU-2	30	3
3	30	HVAC OU-1	5	6	HVAC OU-2	30	3
2	15	HVAC IU-1 and IU-2	7	8	EWB-1	20	1
2	15	HVAC IU-1 and IU-2	9	10	EWB-2	20	1
2	30	Water Heater	11	12	Baseboard Heater EBB-2	20	2
2	30	Water Heater	13	14	Baseboard Heater EBB-2	20	2
2	20	Baseboard Heater EBB-1	15	16	Baseboard Heater EBB-3	20	2
2	20	Baseboard Heater EBB-1	17	18	Baseboard Heater EBB-3	20	2
1	20	ERV-1	19	20	De-Icing Cable	30	1
1	20	Fire Alarm Panel	21	22	Door Controls	20	1
1	20	Spare	23	24	Receptacle Outlets	20	1
1	20	Spare	25	26	Spare	20	1
1	20	Lights	27	28	Booth DP Feed	100	3
1	20	Gen. Battery Charger	29	30	Booth DP Feed	100	3
1	20	Gen. Block Heater	31	32	Booth DP Feed	100	3
1	20	Toll Room Sump Pump (NB Only)	33	34	AVI Reader	20	1
1	20	Septic Pump (NB Only)	35	36	Highway Lights	30	2
1	20	Spare	37	38	Highway Lights	30	2
1	20	Spare	39	40	Flashing Yellow Bumper Lights	20	1
1	20	Spare	41	42	Generator Controls	10	1
1	20	Spare	43	44	Transfer Switch Feed	150	3
1	20	Spare	45	46	Transfer Switch Feed	150	3
1	20	Spare	47	48	Transfer Switch Feed	150	3
1	20	Spare	49	50	Booth DP Feed	100	3
1	20	Spare	51	52	Booth DP Feed	100	3
1	20	Spare	53	54	Booth DP Feed	100	3
1	20	Spare	55	56	Panel HP1	100	3
1	20	Spare	57	58	Panel HP1	100	3
1	20	Spare	59	60	Panel HP1	100	3
1	20	Spare	61	62	Spare	20	1
1	20	Spare	63	64	Spare	20	1
1	20	Spare	65	66	Spare	20	1
1	20	Spare	67	68	Spare	20	1
1	20	Spare	69	70	Spare	20	1
1	20	Spare	71	72	Spare	20	1

EXIT 45

Panel Schedule

Panel ID	HP1	Bus Rating	Main	Phase	Voltage
Panel Location	Storage Room	100 Ampere	MLO	Three Phase	120/208
Fed From	Panel DP-1				

Pole	Amps	Description		Description	Amps	Pole
1	20	Spare	1	Receptades	20	1
1	20	Spare	3	Receptades	20	1
1	20	Spare	5	Drinking Fountain	20	1
1	20	Spare	7	Refrigerator	20	1
1	20	Spare	9	Receptades	20	1
1	20	Spare	11	Microwave	20	1
1	20	Spare	13	Lights	20	1
1	20	Spare	15	Lights	20	1
1	20	Spare	17	Spare	20	1
1	20	Spare	19	Spare	20	1
1	20	Spare	21	Spare	20	1
1	20	Spare	23	Spare	20	1

EXIT 45

Panel Schedule

Panel ID	CP1	Bus Rating	100 Ampere	Main	100A/3P MCB	Phase	Three Phase	Voltage	120/208
Panel Location	Utility Room								
Fed From	UPS								

Pole	Amps	Description			Description	Amps	Pole
1	20	CurrencyScanner	1	2	Admin. Bldg. Receptacles	20	1
1	20	CurrencyScanner	3	4	Admin. Bldg. Receptacles	20	1
1	20	CurrencyScanner	5	6	Admin. Bldg. Receptacles	20	1
1	20	South Traffic Pedestal	7	8	Server	20	1
1	20	South Booth Receptacle	9	10	North Traffic Pedestal	20	1
1	20	South Lane Controller	11	12	North Booth Receptacle	20	1
1	20	South AVI Reader Cabinet	13	14	North Lane Controller	20	1
1	20	Spare	15	16	North AVI Reader Cabinet	20	1
1	20	Spare	17	18	Spare	20	1
1	20	Spare	19	20	Spare	20	1
1	20	Spare	21	22	Spare	20	1
1	20	Spare	23	24	Spare	20	1

EXIT 45 - 2021.07

General Information

Panel ID Booth Sub-panel - Typical for Lanes 1 NB & SB
 Panel Location Toll Booth 1 NB & SB
 Fed From DP- 1 in Toll Building Toll Utility Room

Breaker Details

Main Breaker 100 AMP

Phase Type

Three Phase

Voltage Type

120/208

Pole	Amps	Decription		Decription	Amps	Pole
2	30	Booth Heat Pump	1	2 Under Counter Heater Fan	20	1
2	30	Booth Heat Pump	3	4 DP receptacles (Strip)	20	1
1	20	Flashing Yellow Beacon	5	6 Booth lights	20	1
1	20	Canopy Override Switch	7	8 canopy lights	20	1
1	20	Canopy Drain De-icing Tape (as needed)	9	10 DP receptacles (Quads)	20	1
1	20	Lane Use Signal	11	12 Canopy Sign Lights	20	1
		Spare	13	14 Spare		
		Spare	15	16 Spare		
		Spare	17	18 Spare		
		Spare	19	20 Spare		
		Spare	21	22 Spare		
		Spare	23	24 Spare		
		Spare	25	26 Spare		
		Spare	27	28 Spare		
		Spare	29	30 Spare		

EXIT 45 - 2021.07

General Information

Panel ID Booth Sub-panel - Typical for Lanes 2 NB & SB
 Panel Location Toll Booth 2 NB & SB
 Fed From DP- 1 in Toll Building Toll Utility Room

Breaker Details

Main Breaker 100 AMP

Phase Type

Three Phase

Voltage Type

120/208

Pole	Amps	Decription	Decription	Amps	Pole
2	30	Booth Heat Pump	1 2 Under Counter Heater Fan	20	1
2	30	Booth Heat Pump	3 4 DP receptacles (Strip)	20	1
1	20	Flashing Yellow Beacon - Lane 2	5 6 Booth lights	20	1
1	20	Canopy Override Switch - Lane 2	7 8 Canopy lights - Lane 2	20	1
1	20	Canopy Drain De-icing Tape (as needed)	9 10 DP receptacles (Quads)	20	1
1	20	Lane Use Signal - Lane 2	11 12 Canopy Sign Lights - Lane 3	20	1
1	20	Flashing Yellow Beacon - Lane 3	13 14 Lane Use Sign (VMS) -Lane 2	20	1
1	20	Canopy Override Switch - Lane 3	15 16 Canopy lights - Lane 3	20	1
1	20	Lane Use Signal - Lane 3	17 18 Spare		
		Spare	19 20 Spare		
		Spare	21 22 Spare		
		Spare	23 24 Spare		
		Spare	25 26 Spare		
		Spare	27 28 Spare		
		Spare	29 30 Spare		